THE POMPEIAN BAKERIES
An Analysis of the Urban Distribution of the Bakeries and Pastry Shops at Pompeii

Briar L. Teron
Senior Honors Thesis in Classical Archaeology
Professor R. B. Ulrich
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for Craig, the love of my life,
who inspired me to undertake a thesis and supported me throughout the process
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— Table of Contents —

Title......................................................................................................................... 1

Dedication................................................................................................................... 2

Acknowledgements................................................................................................... 3

Table of Contents.................................................................................................... 4

Preface....................................................................................................................... 5

Chapter I: An Introduction ....................................................................................... 10

Chapter II: The Pompeian Bakery ........................................................................... 17

Chapter III: Economy and Food Production at Pompeii ....................................... 55

Chapter IV: Analysis of the Distribution of Bakeries ............................................. 77

Figures...................................................................................................................... 109

References............................................................................................................... 110

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1 Front cover image: sketch of a Pompeian bakery by French architect, Félix Duban, 1823-1828.

Preface

The focus of this undergraduate honors thesis in Classical Archaeology is a thorough examination of the Roman bakeries at Pompeii, dating primarily from the first century B.C.E. to the first century C.E. There are three main sections of the paper. The most important component—essentially the principal discussion toward which the rest of the paper builds—is the final section: a discussion of the place of the bakeries in the urban layout of Pompeii. In this section, I hope to carefully examine the physical location of bakeries in the city both as a group and divided into subgroups on the basis of particular bakery features and to evaluate these distributions relative to one another, relative to essential services (such as water sources and markets), relative to other commercial establishments, and relative to particular city regions (defined by such variables as population density, expansion phase of the city, etc). A tool that I have created to illustrate many of these distributions and to therefore facilitate their analysis is a digital map of Pompeii with a series of layers that can be selected. Selecting a layer marks the locations of a particular group (such as “fountains” or “bakeries with sales areas”) on the map. With forty-five possible layers, as well as the option of adding blow-up floor plans of any of the thirty-one bakeries, the map serves as a very useful model for analyzing the distribution of bakeries.

In order to fully appreciate the discussion on the location of bakeries, it is important to understand their management and operation and their place in the local economy. For this reason, the first two sections of the paper are an overview of the components, operation, and management of bakeries, followed by an examination of food production in general at Pompeii and the place of bakeries in the local economy.

There is a tremendous amount of available material for an examination of the Pompeian bakeries, including archaeological, pictorial, and literary evidence. The archaeological evidence
includes the preserved physical plants of thirty-one bakeries and pastry shops, complete with millstones, ovens, kneading machines, pastry and bread molds, baking implements, table supports, sales counters, and carbonized bread products, among other examples. Not only are the bakeries numerous, varied, and well-preserved, but the entire excavated portion of the city presents an unparalleled opportunity to study urban planning and the place of a bakery within its larger urban context. In addition to archaeological remains at Pompeii, there is supplementary evidence about Roman baking from the remnants of bakeries at Herculaneum, Ostia, and other such sites. I was able to obtain much of this information from both secondary sources (excavation reports and catalogues) and by traveling to Pompeii myself to conduct some of my own research in the autumn of 2007. For a more thorough discussion of the archaeological importance of Pompeii, see Chapter I.

There are certainly limitations to using the archaeological evidence. For example, the upper stories of the bakeries are mostly destroyed, the perishable components of the physical plants and technological remains are lost (such as wooden or terracotta fixtures, wooden shelving and tables, etc), and the role of the human operator in the baking establishment becomes largely speculative. It is also difficult to ascertain whether portable items—such as tools, molds, etc—are still in situ, since many objects were moved during the excavations. Finally, conclusively identifying particular structures as bakeries can be tenuous. Complications can arise from damaged remains, incorrect reconstructions, or the removing of portable objects from their original locations. For instance, the discovery of an oven in a home could indicate conversion of the home into a baking establishment or merely evidence of private baking. Similarly, millstones have been found in buildings where there is some question as to whether the millstones were in use or merely being stored. Therefore, it is quite possible that some of the bakeries at Pompeii were misidentified and, likewise, that there are bakeries we have not yet discovered.
Thankfully, there is very helpful pictorial evidence to supplement the incomplete archaeological information. Pictorial evidence—namely, representations of baking in relief sculpture and frescoes—provides a more complete image of the baking operation, including those perishable parts of the technology that are now lost and the role of the human (or animal) operator. A few of the more important depictions are the funerary relief of Marcus Vergilius Eurysaces in Rome, which includes a frieze depicting the entire baking process; the sarcophagus of P. Nonius Zethus, which includes both a scene of milling and a depiction of tools and baking implements; a fragmented relief from Bologna depicting scenes of milling, loaf forming, and baking; a baking scene from a relief from the Villa Medici; a scene of milling from a relief in the Vatican Museums; two frescoes from Pompeii depicting the sale or distribution of bread from temporary wooden sales stands; and two frescoes from Pompeii depicting the celebration of the Vestalia in honor of Vesta, the patron deity of the bakers. Some of the principal limitations of the pictorial evidence, however, are questions about the accuracy of the representations—one must consider both potential ignorance of the baking process on the part of the artist and the possibility of simplifications or embellishments made for the sake of artistic clarity. The second limitation is that certain subjects tend to be preferred over others—namely, there are a number of depictions of milling and baking but few depictions of the other phases or features of the baking process, such as loaf preparation, kneading, washing the grain, the animal stables, general upkeep and cleaning of the bakery, and many others.

Literary evidence is available from two sources: ancient authors and modern secondary literature. Some of the more useful primary sources are Pliny the Elder, a first century C.E. author who includes a discussion of millstones, bread leavening agents, flour sieves, and Campanian agriculture in *Historia Naturalis*; Cato the Elder, a second century B.C.E. author who discusses farming principles and techniques in his treatise on agriculture, *De Agricultura*; Strabo, a first century B.C.E. geographer who makes some mention of Campania and the area around Pompeii in
Geographica; and some brief references to baking in both Plautus and a poem ascribed to Virgil. In addition to ancient texts, inscriptions on monuments such as the tomb of Marcus Vergilius Eurysaces and graffiti are also available. For example, some graffiti on the walls at Pompeii refer to the pistorii or bakers as a professional group and shed some light on the possibility of a collegium of bakers.

Relatively little modern scholarship exists on the subject of the Pompeian bakeries. Every tourism guide and general book on Pompeii includes a paragraph or a page on the topic, but little has been done to explore the subject more closely. Both P. Zanker’s Pompeii: Public and Private Life (Cambridge 1998) and L. Richardson Jr.’s Pompeii: An Architectural History (Baltimore 1988) are excellent general sources on Pompeii and do include brief treatments of the bakeries. A series of articles by D. P. S. Peacock, “The Roman Millstone Trade: A Petrological Sketch” (World Archaeology, Vol. 12, June 1980) and “The mills of Pompeii” (Antiquity, Vol. 63, 1989) provide a very thorough discussion of the typology and petrology of Pompeian millstones, but do not cover other components of bakeries. R. I. Curtis’s lecture, “Food Technology in the Ancient Urban Context,” from an Archaeological Institute of America symposium (St. Louis 1997) examines the food industry in general at Pompeii and includes some discussion of private baking at Pompeii. W. F. Jashemski touches on the bakeries and the food industry at Pompeii in her book, The Gardens of Pompeii (New Rochelle 1979), but focuses largely on the gardens and horticulture within the city. W. Jongman’s especially useful book, The Economy and Society of Pompeii (Amsterdam 1991), contains a thorough discussion of agriculture and cereals at Pompeii, but little on the bakeries themselves. J. T. Bakker’s The Mill-Bakeries of Ostia (Amsterdam 1999) is an excellent source on the Ostian bakeries but, once again, does not focus on Pompeii. I credit B. J. B. Mayeske and her 1972 Ph.D. dissertation at the University of Maryland, Bakeries, Bakers, and Bread at Pompeii: A Study in Social and Economic History, with the only thorough coverage of the Pompeian bakeries.
Mayeske has proved to be my single most important secondary source and I am very grateful to her for a particularly impressive component of her dissertation: a very thorough description and catalogue of all of the bakeries at Pompeii, gathered from her own notes on site and the original excavation reports. As her title suggests, Mayeske covers three basic subjects (aside from her bakery catalogue): the baking operation and the components of bakeries, the bakers as individuals and as a collective body, and the product itself—a discussion of grain storage and production and different kinds of flours and breads. However, there are some limitations to her study, at least with respect to my honors thesis. For one, the paper is thirty-six years old; much relevant modern scholarship has been done since 1972 and there now exists a considerable amount of material to incorporate into her discussion. As evidence, note that all of the scholarship mentioned above was published after 1972. Secondly, she only very briefly touches upon the physical distribution of the bakeries in Pompeii, the very point that I hope to explore more carefully in this paper.

The inspiration for a discussion of the significance of the physical distribution of the bakeries came from R. Laurence’s book, Roman Pompeii: Space and Society (London 1994). Laurence offers that town planning is “the art of laying out towns with due care for the health and comfort of the inhabitants, for industrial and commercial efficiency, and for reasonable beauty,” a point which I hope to explore with respect to bakeries. Laurence’s book includes a rather thorough analysis of the urban distribution of many features of Pompeii, from workshops to fountains to residential areas, including a short note on bakeries. Incorporating material from other sources, such as those listed above, and including my own thoughts and analysis, I hope to expand upon this brief discussion.

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--Chapter I--

An Introduction

I am sure you have heard something referred to as the best thing since sliced bread. Well, I personally believe that bread was far more exciting before it was sliced.

According to Pliny the Elder, there were no professional bakers at Rome before the war with King Perseus, some 580 years after the foundation of the city (NH XVIII 107). At this point, the task of bread-making fell to the private citizen, particularly to women. In fact, Pliny tells us that the majority of Romans lived on pottage, which they ground with mortar and pestle from far, a hulled, pre-parched wheat. Only those who could afford the luxury of a private cook could produce their own bread. It is from this practice of crushing and grinding wheat that we get the name pistor, which refers to the ancient Roman miller-baker, and which is derived from the word pinsere or pisere, “to beat, pound, or crush.”

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Chapter title image: Sketches done in 1783 at Pompeii and Herculaneum by French architect, P. A. Paris. Note the grain mill and the troquetum (olive press) in the top left corner. See Ecole, 10.

Pliny dates the establishment of the first commercial bakeries in Rome to 171-168 B.C.E.⁴ Improvements in milling technology allowed for this new professional, the miller-baker or pistor, to increase his production of flour and bread to satisfy the growing demand for his product. Specifically, the pistor was relieved of the grueling task of pounding *far* by the introduction of the saddle quern and lever mill for small-scale production and, for larger-scale production, the smaller slave-operated and larger donkey-operated rotary mill. The donkey-driven mill became particularly popular in light of the growing market for commercial flour and bread. Although L. A. Moritz believes that the rotary mill was in use in the Roman world by the fourth century B.C.E.,⁵ it seems to be this later period that witnessed their widespread adoption by the neonatal baking profession. The rotary mill was actually initially used to crush olives, but Cato’s discussion of milling in 160 B.C.E. provides a *terminus ante quem* for their debut in the baking industry.⁶

It is thus that we arrive at the *pistor* of the first centuries B.C.E. and C.E., the professional with whom this paper is concerned. This tradesman was ordinarily responsible for the milling of flour, the baking of bread, and the sale of his product to provide his city with bread for its tables. Alternatively, bakers could also specialize in the production of pastries and cakes. These men, known as *placentarii, crustularii, dulciarii, clibanarii, or librarii,*⁷ did not always grind their own flour and sometimes used smaller mills (slave-operated or otherwise) to satisfy their needs. They did, however, tend to bake and sell their products in their shops. Bakers belonged to a variety of social classes, although the profession was dominated by the middleclass. They included both freeborn and freedmen proprietors from both modest and wealthy spheres, as well as entrepreneurs from the upper class who sought to invest in commercial establishments.

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⁵ Mayeske, 5.
⁷ Mayeske, 50.
For a study that is concerned with the operation and management of a trade that belonged predominantly to the middle class, with the position of this trade within the local economy and its role in local food production, and most importantly with the physical space that this trade occupied within an urban center, there can be few sites as rich in information as Pompeii.

Pompeii is a Roman site in southern Italy that lies in the shadow of the volcano, Mt. Vesuvius, in the Bay of Naples. The ancient city was built on the southern edge of a lava flow from a prehistoric eruption.\(^8\) To the north of the city, the land slowly rises to the modern village of Boscoreale and onward up the slopes of Vesuvius. To the west of the city lay the coastline, now approximately two kilometers away but, at the time, in close proximity to the city gates. To the south and east lies the large plain of the river Sarno. The surrounding Campanian countryside was praised by Strabo for its fertility, a product of the nearby active volcano, as “the most blest of all plains, and round about it lie fruitful hills” (Geo. V 4.3).\(^9\)

Pompeii was originally established as a defensive post. Since it was founded with the sea to the west and a small cliff to the south, all expansion of the city was forced to occur to the north and east, up the slopes of Vesuvius. As a result, the rapidly expanding city took on a rather ellipsoidal city plan, its final east-west axis measuring 1270 m and its final north-south axis 730 m.\(^10\) The original Greek and Etruscan settlement, dating roughly to the sixth to fifth centuries B.C.E.,\(^11\) is located to the west of the city and includes the forum and a series of more irregular streets. As the city expanded in two further stages, this ancient center was maintained, outlined by the via Stabiana

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and the via della Fortuna. The center of this core, the forum, continued to house many of the most important administrative, religious, political, and commercial buildings and spaces.

In the fifth century B.C.E., the Sabellians invaded Campania and occupied many of the local colonies and towns. Rome’s involvement in Campania began in the fourth century B.C.E. and, in 343 B.C.E., the Campanians sought their help to relieve them of the Samnites. The first expansion of the city is believed to date roughly to this period (from the late fourth to the second century B.C.E.)—the period between the Samnite occupation of Campania and the early Roman period—and to consist mostly of uniting two separate sectors of the original city.

The second and most significant expansion of the city may date to the first centuries B.C.E. and C.E. and correspond to the final Roman occupation. The Pompeians were granted Roman citizenship after the Social War of the first century B.C.E. but, as punishment for their involvement in the uprising against Rome, their city was transformed into a Roman veterans’ colony. At least two thousand of Publius Sulla’s veterans and their families were relocated to Pompeii and with them a number of Roman building campaigns. The Roman expansion of the city occurred to the north and east and was laid out on a regular orthogonal grid of streets. Although the grid did not form a perfect rectangle as a consequence of the topography, the streets were oriented roughly north-south and east-west. Insulae, or city blocks, were created and housed a variety of commercial and residential buildings. According to R. Laurence, however, the city does not “express any traits of socio-economic zoning...no single social group was confined to, or desired to live, in a separate area of the city segregated from the rest of society.” Laurence precedes this by explaining that town

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12 Adam, 17.
14 Ibid., 37.
15 Clarke, 210.
16 Ibid., 210.
18 Laurence, 18.
planning reflects the desire to separate the working class from the middle class and residential areas from industrial areas, for example, but that the absence of such socio-economic zoning at Pompeii suggests more of an integrated society.\textsuperscript{19} While he is correct, there still remained some separation of the population, and the elite, in many cases, inhabited larger, more spacious residences at a distance from the crowds and hubbub of the city core (for example, much of Regio VI). The domination of the upper class in city life is described by S. E. Bon and R. Jones, who believe that “their distribution across the urban landscape surrounded by their dependents and political supporters” produced a “mosaic of neighborhoods” and was “an exercise in social control.”\textsuperscript{20}

But what of bakeries at Pompeii? Bread was, in fact, almost a symbol of Pompeii. On the front of the caupona of the Statii (location III.vi.5) was the following message: “Traveler, you enjoy bread at Pompeii, but at Nuceria you drink” (CIL IV 5380).\textsuperscript{21} Cereals were the staple diet of the Campanian population, comprising 70 to 75\% of their caloric intake.\textsuperscript{22} Cereals are generally cheap and can be produced efficiently and in large quantities. For the Campanians there was no shortage of fertile agricultural land and local production could almost always satisfy the needs of the population. Cereals could be prepared in two ways for consumption: porridge and bread. Seeing as, by the late Republic, bread had surpassed porridge as the preferred form\textsuperscript{23} and industrial-scale production had mostly replaced private baking,\textsuperscript{24} Pompeii could sustain a booming baking industry. There are approximately thirty-one excavated bakeries at Pompeii and approximately six of these specialized in pastries.\textsuperscript{25} Bakeries occupy 0.85 hectares (or approximately 1.8\%) of the excavated area at Pompeii.

\begin{enumerate}
\item Laurence, 17-19.
\item Mayeske, 55.
\item Jongman, 77-78.
\item \textit{Ibid}, 82.
\end{enumerate}

\textsuperscript{25} These numbers are approximate. I have seen sources claim from thirty to thirty-three bakeries. Much of the discrepancy is explained by the presence of some private homes with ovens, which may or may not have been
There are a number of reasons for choosing Pompeii as the site for an investigation of bakeries. The city was destroyed in 79 C.E. by an eruption of Vesuvius and buried in volcanic ash and pumice. As a result, the entire city was preserved for posterity, complete with city streets, administrative, religious, political, and entertainment spaces, and the homes of the rich and the poor alike. Pompeii represents one of the only and one of the best examples of a complete Roman town, especially with respect to the lives of the poor and middleclass, whose archaeological traces have often been disregarded in the past. The sixty-seven hectares that lie within its walls, approximately two thirds of which are excavated, make Pompeii the largest archaeological site in Europe.\(^{26}\) Other important sites for the study of bakeries include Herculaneum, another city destroyed by the eruption of Vesuvius in 79 C.E.; Ostia, the port city of Rome; and Morgantina, a Greek settlement in Sicily. Findings from these sites will certainly be of importance to this study. However, no site can compare to Pompeii in terms of the potential for urban analysis or the number and the state of preservation of its bakeries; the sample is both large and diverse. As M. Grahame points out, “Pompeii presents an almost unparalleled opportunity to undertake an extensive case study of buildings in an archaeological context.”\(^{27}\) Not only does Pompeii allow for a complete study of the buildings themselves, but it allows for a discussion of the place of bakeries within the local economy and an evaluation of their urban context, so to speak.

The primary goals of this paper are three-fold. In the following pages, I first hope to discuss the bakeries in isolation—in other words, the operation of the various components of a bakery and the baking process and issues pertaining to the overall management of a baking establishment. In so doing, I will be focusing on and describing one Pompeian bakery in particular. Secondly, I hope to


examine Pompeian food production in general and the position of baking within the local economy. Finally, and most importantly, I will be examining the physical position and distribution of the bakeries on the urban plan of Pompeii, relative to themselves, to other industries and establishments, and to particular regions and neighborhoods. Furthermore, this discussion of urban context will make distinctions between bakeries and pastry shops with different components.
Chapter II

The Pompeian Bakery

The thirty-one bakeries of Pompeii vary tremendously in terms of location, size, state of preservation, and the possible components of a bakery that they contain. While it would be of interest to describe each establishment and, consequently, each and every possible combination of the features typical of bakeries, the purpose of this paper is not to catalogue.\textsuperscript{28} Instead, I will be focusing on one particular bakery, the bakery attributed to N. Popidius Priscus,\textsuperscript{29} in the hopes of illustrating the general layout and operation of a bakery.

The bakery of N. Popidius Priscus is located at VII.i.22, roughly midway between the center of the city and the western city walls and approximately two blocks to the north-east of the forum (see Figure 2.1). The bakery and its adjoining house sit on the corner of the Vicolo Storto, onto which the bakery itself opens, and the Vicolo del Panettiere, onto which the house opens. The bakery was identified as belonging to the Popidii by the discovery of a bronze loaf stamp bearing the family name in the house.\textsuperscript{30}

\textsuperscript{28} Chapter title image: Line drawing of the operation of the ruins of a bakery.
\textsuperscript{29} M. Monnier, The Wonders of Pompeii, (New York: Charles Scribner & Co., 1870), 84.
\textsuperscript{30} For a complete catalogue of the bakeries at Pompeii, see Mayeske, 82-136.
\textsuperscript{30} Nappo, 75.
Entering the bakery from the western entrance on the Vicolo Storto, the most prominent feature—and indeed, it is thus that most people identify bakeries—is the line of six hourglass-shaped millstones made of dark volcanic rock (see Figure 2.2 a for a plan of the bakery). Running away from the entrance, along the southeastern wall, is a straight line of five large mills with an additional miniature mill wedged between the wall and the second and third mill (see Figures 2.2 a and 2.3). The first mill, foremost in the room, has a catillus (the upper, rotating, hourglass-shaped portion) 83 cm in height and 90 cm in diameter and a meta (the lower, fixed, conical portion) 80 cm in height. It rests upon a masonry base that is 43 cm in height and whose rim extends 36 cm beyond the sides of the meta. The second mill stands 102 cm behind the first and has a rather damaged catillus with a restored height of 86 cm and diameter of approximately 80 to 90 cm. It has a meta 79 cm in height and rests upon a masonry base that is 43 cm in height and whose rim extends 38 cm beyond the sides of the meta. The third mill stands 100 cm behind the second and has a catillus 76 cm in height and 80 cm in diameter and a meta 72 cm in height. It rests upon a masonry base that is 40 cm in height and whose rim extends 32 cm beyond the sides of the meta. The initials “FOH” are carved into the upper half of the catillus. It is at this point that the flagstones, which up until now have been paving the milling area, stop. The fourth mill stands 102 cm behind the third, no longer on flagstones but instead on bare earth, and has a rather damaged catillus with a restored height of 76 cm and diameter of approximately 76 cm. It has a meta 63 cm in height and rests upon a masonry base that is 44 cm in height and whose rim extends 32 cm beyond the sides of the meta. The final large mill stands a considerable 280 cm behind the fourth and has a rather damaged catillus approximately 80 cm in height and approximately 70 cm in diameter and a meta 82 cm in height. It does not rest upon a masonry base. The miniature mill is situated between the southeastern wall and the second and third mills. It is approximately 134 cm from the second mill and 78 cm from the third mill. Its catillus measures 40 cm in height and 42 cm in diameter, its meta measures 56 cm in
height, and it does not rest upon a masonry base but rather upon the flagstones that pave the ground beneath it.

Mills

To be more specific, the mills located in the bakery of N. Popidius Priscus were of the Pompeian hourglass type. Such a mill consisted of two principal pieces: the lower *meta* and the upper *catillus* (see Figure 2.4). The base of the *meta* is cylindrical but tapers upward in a sort of bell-shape. It is fixed directly upon the ground or on a raised circular masonry base and does not move during the process of milling. According to Mayeske, the average Pompeian *meta* is approximately 60 cm in height and 76 cm in diameter at the base.\(^{31}\) The *catillus*, on the other hand, rests upon the *meta* and can be rotated. It resembles an hourglass or a double-funnel, such that the lower funnel can rotate around the conical part of the *meta* and the upper funnel can be used as a grain reservoir. The average Pompeian *catillus* measures approximately 70 cm in height and 73 cm in diameter.\(^{32}\) A significant benefit to this shape of millstone is the symmetrical nature of the *catillus*.\(^{33}\) The lower funnel of the *catillus* experiences the most wear because it is directly involved in the grinding of the grain. Therefore, when it begins to wear out, the entire *catillus* can be inverted and the former grain reservoir can become the new grinding surface.

In order to grind the grain, the prepared wheat was poured into the upper funnel. Preparing the wheat could include cleaning it—a process about which little is known but which, in addition to removing soil and some other impurities, was thought to moisten the bran and to make the bran

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\(^{31}\) Mayeske, 8 and 12.


more resistant to the milling action—\(^{34}\)and roasting it to release the seeds from the husk.\(^{35}\) A hopper could be attached above the \textit{catillus} to control the rate at which the grain entered the funnel.\(^{36}\) As the \textit{catillus} turned, grain was channeled through the opening in the base of the upper funnel and into the space between the \textit{catillus} and \textit{meta} where it was crushed by the rotation of the stone. A millkind—essentially, a disc with holes in it—could be placed at the base of the upper funnel from below to control the rate at which grain entered the cavity and to ensure that the \textit{catillus} was held in a position concentric with the lower cavity.\(^ {37}\) Consequently, the space between the \textit{catillus} and \textit{meta} had to be quite precise. If this distance exceeded the thickness of a grain of wheat, there would be too much bran in the flour and, if the distance was too small, the increased pressure could cause the grain to overheat.\(^ {38}\) A wooden or metal container—often a lead sheet—could be fixed to the base of the \textit{meta} or to the masonry base to collect the crushed grain. Masonry bases were also sometimes faced with plaster in order to create a smoother surface for flour collection.\(^ {39}\) A fragmentary relief from Bologna is especially helpful for its detailed depiction of a hopper and mill base (see figure 2.5). In the lower left corner of the relief is an hourglass-shaped mill being turned by a horse or mule. A large hopper, perhaps exaggeratedly so, rests above the \textit{catillus} and extends through the floorboards into the scene above. The animal wears blinders and is harnessed to the top of the \textit{catillus}, where some attempt has been made to convey a wooden crossbeam. A man leads the animal by a rope attached to a club of sorts and walks along the top of the mill base. The base includes a raised lip around the top for the collection of flour. The artist has also carved a series of diagonal lines up the sides of the base, which suggests that either the base is built with wooden boards or the masonry has been covered with plaster.

\(^{34}\) Bakker, 5.
\(^{36}\) Bakker, 6.
\(^{37}\) \textit{Ibid.}, 6.
\(^{38}\) Mayeske, 17-18.
\(^{39}\) Bakker, 6.
\(^{39}\) Mayeske, 11.
There are two square openings or sockets at the waist-level of the catillus in which square horizontal beams can be secured with pegs. These pegs can be further secured by iron bands encircling the narrow part of the catillus. Vertical beams are then attached to these horizontal beams and they are connected again by a horizontal beam above the catillus. The yoke or harness can then be fixed to this frame, allowing for the draft animal to turn the catillus. A stone relief in the Vatican Museums from a sarcophagus found outside of the Porta Giovanni in Rome illustrates this system beautifully (see Figure 2.6). The relief depicts two hourglass-shaped mills on circular bases being turned by work horses. The left side of the relief is broken and the mill is nearly lost. One can see the rear end of the horse proceeding in a counterclockwise direction around the back of the mill. The mill on the right-hand side is more or less complete. A horse wearing blinders is yoked and chained to the uppermost crossbeam and is turning the mill in a counterclockwise direction. On the opposite side of the mill is a man struggling with a vessel that likely contains either grain or flour. A hopper is very clearly depicted above the uppermost crossbeam, feeding into the funnel of the catillus. An oil lamp on a small shelf above their heads suggests that they are working after dark.

Worth noting is the way in which the artist has portrayed the two horses sharing the space between the mills, therefore suggesting that mills were spaced to accommodate horses passing one another. Two reliefs from Ostia depict milling scenes in which bells are attached to these wooden frames. Presumably, the ringing of the bells could assure the baker that the animal was indeed turning the mill and therefore free him from having to constantly supervise the mills. Since Pompeian mills tended to be spaced a mere 46 cm from the wall and often little more than 90 cm from neighboring

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40 Bakker, 5.
41 Mayeske, 15.
43 See caption from the Museo della Civita Romana in Rome.
44 Bakker, 6.
mills, the draft animals tended to be harnessed fairly close to the mill.⁴⁵ Another excellent representation of milling will be discussed later in the section on Marcus Vergilius Eurysaces.⁴⁶

A few metae bear marks where a sort of central spindle may have been placed. This possibility is confirmed by the discovery of an iron spindle on a mill at VI.iii.3/27⁴⁷ and the presence of this central spindle on three ancient representations of milling. One, the sarcophagus of L. Annius Octavius Valerianus, depicts the baking process from the harvest through the production of bread and, in the baking scene, includes a central spindle.⁴⁸ Another, a sketch found in the parradeigma at the foot of the Palatine, shows a donkey harnessed to a mill with a central spindle attached to the meta.⁴⁹ The third example is a relief on the sarcophagus of P. Nonius Zethus (see Figure 2.7), found at Ostia. To the left of the inscription is a small scene with a mule yoked to an hourglass-shaped mill. The mill rests upon a circular base and includes a central spindle, likely fixed to the meta and extending from the top of the catillus and capped with a sort of pyramidal bowl. The mule is yoked to the lowermost crossbeam and is turning the mill in a clockwise direction. The tip of a whip is visible in the upper right corner of the scene. It is possible that such a spindle, when used, may at times have been attached to the meta and at times to the upper crossbeam.⁵⁰

In addition to the above, more typical, mills, various miniature mills have been found at Pompeii. These smaller mills, or pistrellae,⁵¹ are often attributed to cake and pastry shops because of their decreased productivity, although they are also found in regular bakeries, such as the bakery of N. Popidius Priscus (as outlined above). It is difficult to ascertain whether younger or smaller animals were used to operate these mills or human slave labor. Excavations at Morgantina, in Sicily,
have indicated that their small mills were operated by slaves,\textsuperscript{52} so it is certainly possible that slaves were used in Pompeii. B. J. B. Mayeske proposes, however, that slaves may have been preferred for managing other baking operations because they were more expensive than livestock and did not have the strength and endurance of a mule when working a mill.\textsuperscript{53}

Keeping livestock in one’s bakery necessitates a tremendous amount of space. Not only do the mills need to be spaced at a sufficient distance to allow for the mules to walk unhindered—see the above discussion of the stone relief from the Vatican depicting two horses passing one another between two mills (see Figure 2.6)\textsuperscript{54}—but stables must also be incorporated into the building. Milling areas were paved with basalt flagstones, similar to those used to pave the city streets, to withstand the wear and damage, to prevent the mules from plowing treads into the ground, and to provide reliable footing for the working animals.\textsuperscript{55} Similar treatment was given to kneading rooms in bakeries that utilized kneading machines. Not only have stalls been excavated in many bakeries (for example, at I.ii.27 and VI.xiv.34), but water troughs are present in three bakeries (at VI.iii.3/27, VI.xiv.33-31, and IX.iii.10-12).\textsuperscript{56} Horseshoes of varied quality have been excavated at Pompeii, some made of cord and others of metal.\textsuperscript{57} The jawbone of a donkey was located at VI.iii.3/27 and unidentified animal bones were found in the bakery at VII.ii.3/6.\textsuperscript{58}

The mills at Pompeii are what D. P. S. Peacock classified as Types 2 and 3b-d mills in his 1989 typology of Roman millstones (see Figure 2.8).\textsuperscript{59} Morphologically, these millstone types are all very similar and their general appearance and operation was discussed above. The major difference between these mill types is petrological.

\textsuperscript{52} Mayeske, 20.
\textsuperscript{53} Ibid., 170.
\textsuperscript{54} Cf. supra page 21.
\textsuperscript{55} C. Amery and B. Curran, Jr., The Lost World of Pompeii, (Los Angeles: The J. Paul Getty Museum, 2002), 74.
\textsuperscript{56} Bakker, 12.
\textsuperscript{57} Mayeske, 170.
\textsuperscript{58} A. Gianello and E. De Carolis, eds., Pompeii: Life in a Roman Town, (Milan: Electa, 1999), 95.
\textsuperscript{59} Mayeske, 170.
The earliest reference to the Pompeian hourglass mill-type is credited to Cato in 160 B.C.E.\textsuperscript{60} However, archaeological evidence has pointed to an earlier stage in the development of this type—more specifically, a similar mill-type at Morgantina, Sicily, dating to the third century B.C.E.\textsuperscript{64} The morphology of the mill is quite similar, with the chief differences being the size and its asymmetry. It was considerably less efficient both because of its smaller size and the fact that the catillus could not be inverted on account of the upper funnel (or hopper) being smaller than the lower funnel. Peacock describes it as “an early stage in the development of the tradition.”\textsuperscript{62} Is it thus to be concluded that the Pompeian mill is Sicilian in origin? It may be, but not necessarily so, as this early mill type has also been found at other sites in Sicily, such as Megara Hyblea and Akrai. Petrological analysis has indicated that the mills in this sample were not only constructed from local Etna volcanic rock, but also from Sardinian volcanic rock, providing evidence for an active trade in millstones, at least within Italy.\textsuperscript{63}

The ideal material for a millstone is volcanic rock; black lava was especially favored.\textsuperscript{64} The properties of volcanic rock that make it particularly useful are its rough surface—which allows for the grinding of the grain—, its durability and ability to withstand constant wear, and the vesicles and gas holes throughout the rock that give it a cavernous texture and that help to preserve the grinding qualities of the stone as it wears.\textsuperscript{65} Pliny discusses at length the qualities of Italian millstones:

Nowhere are more serviceable millstones to be found than in Italy, for here they are proper stones and not lumps of rock. In certain provinces, however, they are not found at all. Some stones of this kind are quite soft and can be smoothed also with a whetstone, so that from a distance they may be mistaken for serpentine. No other stones are more durable than millstones; for, as with wood, it is characteristic of stones of one sort or another to be unable to stand rain, sun or wintry weather.

\textsuperscript{60} Peacock (1989), 213.
\textsuperscript{61} Ibid., 213.
\textsuperscript{62} Ibid., 213.
\textsuperscript{63} Ibid., 213.
\textsuperscript{64} D. P. S. Peacock, “The Roman Millstone Trade: A Petrological Sketch,” (World Archaeology, Vol. 12, June 1980), 44.
\textsuperscript{65} Ibid., 44.
Some are affected even by the moon, while others acquire a patina in course of time or lose their white colour when treated with oil. Some people call a millstone 'pyrites,' or 'fire-stone,' because there is a great amount of fire in it. (NH XXXVI 136-137)\textsuperscript{66}

To return to the typology of the mills, the main difference between the Type 2 mills and the Types 3b-d mills is the particular volcanic rock from which they are formed. Type 2 mills are formed from a leucite-augite-tephrite volcanic rock that is likely of local Vesuvian origin.\textsuperscript{67} However, there has been some controversy in the past about the nature of the Types 3b-d mills. These mills are of a grey leucitite variety with large conspicuous leucites, now believed to have been quarried in a leucite lava flow near Orvieto.\textsuperscript{68} While they were originally believed to be of local origin, an outcropping approximately three kilometers outside of Orvieto, in central Etruria, has been identified whose rock is identical to that of these millstones used in both Pompeii and Ostia. The rock has a particular petrological ‘fingerprint’ which allows for this almost certain designation. What surprised scholars the most was the extent of the millstone trade network. Mills from this Orvieto quarry have been identified at Luni, Veii, Ostia, Herculaneum, Pompeii, Paestum, Halaesa in Sicily, and even Carthage and El Djem in Tunisia.\textsuperscript{69} The trouble to which the Pompeians must have gone to ship these millstones from Orvieto when they, themselves, had a local source of volcanic rock must reflect the sheer desirability of this Etrurian rock. It is interesting to note that, according to a reference made by Pliny to a lost work of Varro (NH XXXVI 135), the Volscini, who lived but fifteen kilometers from the quarry at Orvieto, are credited with inventing the first rotary mills.

\textsuperscript{67} Peacock (1989), 206.
\textsuperscript{68} See Peacock (1980) and Peacock (1989) for a more detailed discussion of the evidence. I have only provided a brief summary here.
\textsuperscript{69} Peacock (1980), 46.
Peacock suggests that Varro may have been referring to millstone ‘production,’ rather than millstone ‘invention’ and the passage might therefore refer directly to this popular quarry.\textsuperscript{70}

Beyond the line of mills in the bakery of N. Popidius Priscus are a series of back rooms (see Figure 2.2 b and c). In the far north corner of the bakery is a large rectangular room that may, according to Mayeske, have been used as a horreum or an area for the storage of grain—either loose or in sacks (see Figures 2.2. b and 2.9).\textsuperscript{71}

Along the very back northeastern wall of the bakery are the crumbling remains of a staircase that led, at one time, to a second story that is now lost (see Figure 2.2 c). Evidence of the existence of this second story is not limited to the presence of the staircase. For instance, the northwestern wall of the bakery is preserved in many places to the level of the second-story windows. Square openings (i.e. the bottom frames of the windows) are visible along this wall (see Figure 2.10). Additionally, rectangular holes that line the walls at the level of the upper floor may once have held the second-story joists (see Figure 2.11). Since this second story would not have been required as living quarters, what with the wealthy home of the Popidii directly connected to the bakery, the space may have been free to use for either the storage or the laying out and drying of washed grain. Alternatively, the second story may have housed the workers.

\begin{flushleft}
\textbf{Grain Storage}
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The striking absence of horrea, or official grain storage facilities, at Pompeii is certainly worth noting. In contrast, Ostia boasts of a number of horrea, including a large publicly owned storehouse known as the Grandi Horrea whose ground floor alone had the capacity to hold 5,660 to 6,960

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\textsuperscript{70} Peacock (1989), 213.
\textsuperscript{71} Mayeske, 115.
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metric tons of grain (see Figure 2.12 for a distribution of *horrea* at Ostia). The bakeries could arrange to have their grain transported from the depot to their workshop by *saccarii*, porters, and possibly draft animals. The manner in which the center-town bakeries cluster around the Grandi Horrea is indicative of the importance, or at least the convenience, of such a storage facility.

Grain is a “bulky commodity” that spoils easily and is threatened by rodents and insects. Consequently, it is extremely important to have a secure means of storing grain. Granaries tended to be situated high up, with raised floors, and with north-facing windows, which helped to maintain cool temperatures, to ensure proper ventilation, and to protect from dampness. Olive dregs could also be mixed into the mortar used for the floors and walls to protect the grain from insects. At least in the first century C.E., granaries tended to be privately owned but available for both rent and hire.

The absence of *horrea* at Pompeii is striking in light of the number of bakeries. Rather than making use of public storage facilities within the town, it seems that the Pompeian bakers either stored their grain in sacks, bins, or loose heaps on the floors of storage rooms or attic levels in their bakeries or had grain delivered from local agricultural producers outside of the city. *Saccarii*, or porters, whose role was typically that of unloading ships in the harbor, could transport grain from local farms to bakeries within the city. Figure 2.13, a terracotta plaque currently set into a wall to the north of the Forum, depicts two *saccarii* carrying an amphora strung from a pole between them.
By examining the storage patterns for wine and olive oil within Pompeii, some light might be shed on the absence of *horrea* at Pompeii. Mayeske reports that many of the villages around Pompeii had designated large storerooms for wine and olive oil. However, there are no large storerooms for wine and olive oil within the city or within any merchant's house. Rather, the storage facilities tend to be located in suburban villas and in the producers' *cellae vinariae* (large areas required for the production of wine). This storage pattern may be reflected in the bakeries. There may have been no large municipal storage facilities for grain within the city, and so the bulk of the grain needed to produce flour may have been stored in villas or farmhouses with the producer (the farmer), rather than the merchant (the baker). In fact, as stated by Mayeske, it is "unlikely that a state or city controlled storage granary would be present in a small provincial city which had no grain scarcity problem."

There are some theories about potential *horrea* at Pompeii. For instance, there is a rectangular building in the Forum that is labeled as a *horrea* in the excavation reports but was unlikely to have been used for storing grain since no bins or *dolia* were found and there are no interior room partitions. Another nearby enclosed area, flush with the precinct of the Temple of Apollo on the south, has also been identified as a potential *horrea*. However, the fact that it was an unroofed portico casts much doubt on its ability to protect grain from the elements and pests. Finally, a large and luxurious house at VII.xv.1/2 boasted of an underground *horrea*. There are underground storage facilities and the walls are reportedly robust, although no amphorae or *dolia* were discovered, which suggests that the grain was bagged or loose. J. T. Bakker points out that the street to the north of this house is especially wide and may have been used for loading and

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81 Mayeske, 79.
82 Ibid., 79.
83 Ibid., 75.
84 Ibid., 75.
85 Ibid., 76.
86 Ibid., 78-79.
unloading the grain. Mayeske acknowledges the possibility that this house may indeed have had a private *baricum* and suggests that small private granaries, such as this example, may have supplemented—if not satisfied—the city’s need for grain storage space.

Behind the oven and in the far north corner, at the front of the same room that was previously identified as a potential storage area, are the remains of a kneading machine, fashioned from the same dark volcanic rock as the millstones (see Figure 2.2 d). The remains of the kneading machine resemble a tall, deep, cylindrical basin with an inner radius of approximately 60 cm, an outer radius of approximately 73 cm (the thickness of the walls are therefore 13 cm), and a height of 43 cm (see Figure 2.14). Fixed to the base of the cylinder, on the inside of the basin, is a rectangular metal blade 18 cm in length. This metal blade is secured in the middle to the bottom of the basin and would have been able to spin about this axis at a time when it was not so corroded. Finally, there are four square sockets in the sides of the basin, which would once have held various components of the kneading apparatus but are now lost.

The location of this kneading machine raises many questions about the layout of the bakery and begs the question of whether the kneading machine is currently *in situ*. To clarify, the oven is directly in front of this area, but facing the opposite direction (see Figure 2.2 e). There is an oven pass-through—a sort of long shelf that runs along the front of the oven—that connects the mill room (right side of the pass-through—see Figure 2.2 a) through the oven to a smaller room directly in front of the room with the kneading machine (left side of the pass-through—see Figure 2.2 f). Mayeske identifies this small room as a place for the storage of the finished product. Since it is generally believed that bakers would feed uncooked loaves in one side of the pass-through to the

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87 Bakker, 13.
88 Mayeske, 79.
89 Cf. *infra* page 34.
90 Mayeske, 115.
oven and then pass baked loaves out the other side of the pass-through to a separate room, Mayeske’s designation of the small room to the left of the pass-through as a storage area for the finished product suggests that the loaves were molded in the milling area, near the entrance to the opposite side of the pass-through. There are, in fact, the remains of three table supports along the wall by the mills, each approximately 110 cm long, 34 cm wide, and 35 cm high, which may have held tables used for the forming of loaves from dough (see Figure 2.2g). However, one would imagine that, what with the milling and the animals turning around, this would be a fairly crowded and even unsanitary place to be molding loaves of bread. In addition, why would a baker choose to store his finished product in a room hidden from the view of potential customers? Since there is nothing currently in place in this small room to suggest one use or the other and since it is in very close proximity to the kneading machine (and presumed kneading area), I propose instead that it may have been used for the forming and molding of loaves that could be fed directly into the oven through the pass-through. The finished product would then be removed from the right side of the pass-through in the milling area and could be stored and displayed on the tables by the far wall, which are directly next to and in full view of the entrance and passers-by.

Sieving, Mixing, Kneading, and Molding

Two factors determined the quality—or grade—of flour produced in a bakery: the number of times a particular batch of grain was passed through a mill and the sieves that were used to extract the bran after milling. Many bakeries, in fact, produced a wide range of flour grades using sieving technology. The Romans were known to use the Egyptian-type sieves made of reeds, rushes, or papyrus; the Spanish-type sieves made of flax; the Gallic-type sieves made of horsehair; and two

91 Bakker, 6.
types of linen sieves (the *cribra polinaria* and the *cribra excussoria*) mentioned by Pliny (*NH* XVIII 108). Fine sieves, called *pollinaria*, and coarse sieves, called *farinaria*, were generally used both before and after the second grinding to remove bran from the flour.\(^2\)

When the flour had achieved the desired quality, it was combined with a number of other ingredients for the production of dough. For example, large quantities of both water and salt were certainly added. Pliny reports that eggs, milk, and butter could also be used: “Some use eggs or milk in kneading the dough, while even butter has been used by races enjoying peace, when attention can be devoted to the varieties of pastry-making” (*NH* XVIII 105).\(^4\) It was also important to add a leavening agent of some kind and there were a variety of options: Pliny mentions the use of millet and wine, dried bran steeped in white wine, water and barley, and flour of bitter vetch (*NH* XVIII 102-103). Pliny continues with a passage about leavening agents:

> At the present time leaven is made out of the flour itself, which is kneaded before salt is added to it and is then boiled down into a kind of porridge and left till it begins to go sour. Generally however they do not heat it up at all, but only use the dough kept over from the day before; manifestly it is natural for sourness to make the dough ferment, and likewise that people who live on fermented bread have weaker bodies, inasmuch as in old days outstanding wholesomeness was ascribed to wheat the heavier it was. (*NH* XVIII 104)\(^5\)

When the dough was prepared, it was kneaded either by hand or in a hand- or animal-operated kneading machine. Figure 2.15, a stone relief from Pompeii, shows a man either mixing or hand-kneading dough, bent over a deep cylindrical basin, among other scenes of baking and bread sales.\(^6\) The more industrial alternative, kneading machines, are fairly deep, cylindrical reservoirs

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\(^2\) The Gallic provinces invented the kind of bolter made of horse-hair, while Spain made sieves and meal-sifters of flax, and Egypt of papyrus and rush.” (*NH* XVIII 108)

\(^3\) See Mayeske, 22, for the rest of the discussion on sieves.

\(^4\) Bakker, 6.


made from volcanic rock (see Figure 2.16, a cross-section of a kneading machine). Rotating blades—as many as two or three, according to A. Mau—\footnote{A. Mau, \textit{Pompeii: Its Life and Art}, Trans. F. W. Kelsey, (New York: The Macmillan Company, 1899), 392.} are attached to a vertical spindle fixed to the bottom of the basin and stationary blades (or, alternatively, fixed wooden teeth) are attached through holes in the sides of the basin. Pushing against a horizontal crossbeam would rotate the spindle and the dough would be kneaded by the opposing actions of the stationary and rotating blades.\footnote{Description in Mayeski, 7.}

Once the dough was properly kneaded, it was formed and molded on tables and left to rise. At times, it was also stamped with the baker’s name, as is suggested for the Popidii bakery by the discovery of the bronze stamp within the house.\footnote{R. Étienne, \textit{La vie quotidienne à Pompei,} (Monaco: Hachette, 1966), 158.} The fragmentary relief from Bologna that was examined in the section on milling also includes a scene of the forming of loaves (see the upper right-hand corner of Figure 2.5). Two bare-chested men, both now missing their heads, lean over a work table forming circular loaves out of dough. A man walking by in the background carries what look like the finished loaves of bread. The loaves he is carrying resemble the most common form of Pompeian bread—the circular, eight-wedge loaf.

A helpful representation of sieving, kneading, and loaf formation will be discussed later in the section on Marcus Vergilius Eurysaces.\footnote{Cf. infra pages 52-54.}

Numerous examples of carbonized loaves have been discovered in baking ovens throughout the city, most notably eighty-one loaves discovered in the oven of the bakery of Modestus at VII.1.36 (see Figure 2.17).\footnote{Nappo, 75.} Other evidence for bread and cake molding are a number of baking and pastry tins that have been discovered at Pompei, as well as pictorial representations of these molds. For example, Figure 2.18 represents a first century C.E. bronze baking pan, 4 cm in height and 32.5 cm
in diameter, that was found in a residence at Pompeii (1.xi.17).\textsuperscript{102} The pan has a shallow circular body and two opposing semicircular handles. Another example of a baking mold—this time, a pastry tin—is a large, bronze, circular pan with a scalloped, shell-shaped design to which a head with characteristics of the priests of Isis has been soldered (see Figure 2.19).

A particularly popular shape for pastries was the shell, and three such tins were recovered from VII.i.x.29 at Pompeii (see sketches in Figure 2.20). The first has a Gorgoneion relief on the bottom and has two handles. Another has a curving handle that ends in a griffin’s head.\textsuperscript{103} Three other interesting pastry tins discovered at Pompeii adopt the forms of a pig, a dressed hare, and a ham (see sketches of the dressed hare and pig in Figure 2.21).\textsuperscript{104} Baking and pastry tins have been represented on a number of reliefs. For example, Figure 2.22 is a stone relief depicting a Pompeian bottega and oven. The scene illustrates various baking processes, including weighing of grain or bread and mixing of dough. Most notably, however, are a series of baking pans hanging on the wall in the upper right corner, many of which include the ridges of the popular shell shape.\textsuperscript{105} Another example is a relief on the Ostian sarcophagus of P. Nonius Zethus, as previously discussed in the section on milling (see Figure 2.23). To the right of the inscription is a small scene showing a series of baking tools hanging on the wall on hooks and resting on shelves, including what looks like a large sieve, various baking tins, and various mixing, kneading, or water vessels. There is also a wicker basket sitting on the ground beneath the shelves, possibly used for the storing of finished loaves.

Having already described the oven pass-through in such detail, let me now return to the oven itself and put the above discussion in better context. As you enter the bakery of N. Popidius

\textsuperscript{102} Ciarallo (1999), 186.
\textsuperscript{103} Mayske, 52.
\textsuperscript{104} \textit{Ibid.}, 52.
\textsuperscript{105} Avvisati, 91.
Priscus from the Vicolo Storto, there is a large room to the north with a slightly elevated floor. In this small room, facing the entrance, is the opening to a large beehive oven (see Figures 2.2 ε and 2.24). The oven tower—that is, the platform on which the oven sits, the oven itself, and the chimney tower in front of and above it—is built of concrete and rubble, faced with red brick. Rectangular slabs of volcanic rock frame the oven opening, which is approximately 46 cm across by 47 cm high. This roughly square opening gives access to a large hemispherical or “beehive” oven with a floor of volcanic rock and a dome faced with brick (see Figure 2.25). The platform on which the oven sits extends approximately 66 cm from the oven opening. This lip forms a long shelf known as the pass-through and is topped with slabs of volcanic rock. The pass-through runs along in front of the oven and connects to the two adjoining rooms—the storage or kneading room to the left and the mill room to the right (see Figure 2.26). A large block of concrete, roughly the size of the oven opening, currently sits on the pass-through and may be either a piece of rubble from the collapse of part of the tower or the actual slab that was used to cover the oven opening during baking. Beneath the pass-through, cut into the brick-faced oven platform, is a rectangular opening 67 cm across by 57 cm high that was likely used for storing fuel or for holding the ashes raked out of the oven.

The oven and oven platform stand behind a large brick-faced wall with an arched opening. The arch, through which one can access the oven, pass-through, and fuel storage area, is approximately 166 cm across by 155 cm high. The space between this wall and the oven platform—the space above the pass-through—may have served as the primary chimney or vent, seeing as there is no opening within the oven itself. There is a small window in this front wall, to the upper right of the arched opening at approximately shoulder height, which accesses the space above the pass-through (see Figure 2.2 δ). This opening does not appear to serve any ventilation role and is at an inconvenient height for accessing the pass-through. Perhaps this window was used to hold an oil
lamp when the baker was working after dark. A lamp placed in this window would light up both the oven area and the pass-through.

**Ovens**

The most common oven at Pompeii is the hemispherical ‘beehive’ structure seen in the bakery of N. Popidius Priscus. The ovens were constructed of brick or of brick-faced rubble masonry and mortared with a mixture of lime and sand or clay hardened by heat.\textsuperscript{106} The oven was typically encased in a smoke chamber, which better retained heat and therefore made the oven more efficient. The smoke chamber was usually bricked to the ceiling and smoke could escape through openings in the ceiling—as I suggested for the bakery of N. Popidius Priscus—or openings connected to a chimney. Alternatively, in the absence of a smoke chamber, the oven could be covered with a thick insulating layer of sand. While the chimney is usually located in front of or behind the beehive, some variation is seen. For example, the oven in the bakery at VI.iii.6 has an interesting chimney system composed of three flues (see Figure 2.27).\textsuperscript{107}

The various features of the oven in the bakery of N. Popidius Priscus are very standard and, for the sake of concision, will not be re-described—that is, oven platform; the volcanic stone slabs framing the oven opening, which contribute both strength and increased resistance to shovel blows; the frontal wall with a square or arched opening; the pass-through connecting to one or two adjoining rooms (Mayeske counted fourteen pass-throughs in ovens at Pompeii\textsuperscript{108}); the stone, concrete, or metal slab used to block the oven opening; and the fuel pit. For a diagram of the parts of the oven, see Figure 2.28.

\textsuperscript{106} Mayeske, 23-24.
\textsuperscript{107} For the above description of a typical Pompeian oven, see Mayeske 23-25.
\textsuperscript{108} Mayeske, 174.
The first step in the baking of bread is the burning of fuel within the oven space. Fuel options included *caulina* (small pieces of kindling), *cremica* (dry brushwood), the bark of the flax plant, and charcoal. The ashes were then raked out of the oven and thrown in a fuel pit. The molded loaves, first moistened with water, were quickly placed inside the hot oven and sealed inside by a large stone, concrete, or metal slab.

Even though ancient depictions tell us little about the oven itself that we do not already know from the especially well-preserved archaeological evidence, they are still very helpful for visualizing the role of the human operator in the baking process. For example, the fragmentary relief from Bologna that was examined in both the milling and kneading sections also includes a baking scene (see the upper left-hand corner of Figure 2.5). A tunic-clad man stands by an oven, made or faced with bricks (as indicated by incised lines on the oven), with a long chimney tapering upward and a wide arched oven opening. A wedged loaf of bread is visible inside the oven, resting on a sort of tray. The man is holding a long club-like object in his right arm—possibly an implement for reaching into the oven (for bread, fuel, etc). A square, stone relief from the Villa Medici (see Figure 2.29) shows another scene of baking. An oven stands at the left side of the relief—a tall rectangular plinth with a curved top, likely meant to suggest a beehive oven without a smoke chamber. Along the left side of the oven, incised lines depict ashlar masonry or large brick construction. A large rectangular space is cut out of the oven from two-fifths to four-fifths of the way up and contains an arched oven opening. Two small holes pierce the top of the relief and may have been used for fixing the relief to a larger monument or wall. However, the third hole, a larger hole at the base of the relief, might represent a fuel storage space below the oven. The *furnacator* (the man tending the oven) is clad in a simple waist-cloth with a nude torso—likely because of the heat.

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109 Mayeske, 26.
110 Bakker, 7.
111 Mayeske, 24.
of the oven—and feeds a six-segmented circular loaf of bread into the oven opening with a square paddle.

As previously discussed, the three table supports near the Vicolo Storto entrance to the bakery of N. Popidius Priscus may have once supported tables used for displaying the finished loaves of bread (see Figures 2.2 g and 2.30). However, aside from these tables, no sales area has been identified at this bakery. S. Nappo suggests that the loaves of bread may have supplied local shops and *tabernae*.\(^\text{112}\) Alternatively, the baker may have set up a temporary stand elsewhere for the sale of his bread.

**Sales**

There were three principal of ways for a baker to sell his bread. The primary way was to sell bread from a front sales area at the bakery itself. These sales areas are usually marked by the presence of an L-shaped counter (see Figure 2.31), often faced with colorful marble slabs. Also characteristic of these front sales areas are tables, bins or *dolia*, and shelves for displaying the bread.\(^\text{113}\) Mayeske reports that nineteen of the baking establishments at Pompeii made use of a sales area.\(^\text{114}\) However, one limitation in our ability to identify sales areas is that some bakeries may have had wooden sales counters, which are now lost. A stone relief previously discussed in the section on kneading depicts the sale of bread from a bakery (see Figure 2.15). On the right-hand side of the

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\(^{112}\) Nappo, 75.

\(^{113}\) Mayeske, 168.

relief, a man in a full-length tunic or more formal toga sells bread from a counter. It is clear that this sales counter is within a bakery because other men are preparing bread behind him.

Two other ways in which bakers sold their product were by directly supplying *tabernae* and other shops—in which case, regular shipments of bread are delivered without any need for a sales area at the bakery—and by setting up temporary wooden sales stands elsewhere in the city (for example, in the forum on a market day). These temporary stands could be managed by a representative from the bakery itself or by an independent merchant who purchased the bread wholesale from the bakery.

A wall painting found in the *tablinum* of VII.iii.30, 49 cm by 58 cm and dating to the second half of the first century C.E., depicts either the free distribution of bread by a municipal magistrate or the sale of bread by a baker or merchant at a temporary wooden stand (see Figure 2.32). The stand features a high set of wooden shelves in the rear with a large, wooden, waist-high, U-shaped counter in front. A salesman, clad in formal toga, stands or sits behind the counter and hands a ten-wedged, circular loaf of bread to one of three customers (two men and a boy). The frontal U-shaped counter is piled high with eighteen round loaves of golden bread and more identical loaves are stacked on the shelves behind the merchant. To the right of the merchant is a wicker basket filled with pastries or cakes.

Another fresco from the villa of Julia Felix at II.iv.3 depicts a forum scene with a young merchant displaying bread to two customers on a temporary wooden stand (see a sketch of the painting in Figure 2.33). The small wooden table holds two small baskets containing loaves or

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115 Avvisati, 175.
116 Ciarallo (1999), 135.
117 Mayeske, 47.
118 Ibid., 47.
119 Ibid., 48.
120 Ibid., 48.
pastry and two piles of small rolls. A large basket on the ground seems to hold the merchant’s main supply of bread.

Now that I have described the major, more obvious features of the bakery of N. Popidius Priscus, let us turn to some of its more minor components. For example, in the space behind the oven, between the mills and the kneading area, is a rectangular portico, approximately 262 cm by 267 cm and with wall thickness of approximately 35 cm, supported by pilasters (see Figures 2.2i and 2.34). One corner of this portico has been bricked off to form what appears to be a large square basin for water.\textsuperscript{121} Despite being fairly common in other bakeries, there are none of the small, portable, water basins of volcanic rock currently \textit{in situ} in the bakery of N. Popidius Priscus. It is possible, however, that they were removed at some point or that the water vessels were made from a perishable material. There also do not appear to be any cisterns or wells on the property. There are, however, the remains of a small latrine along the back southeastern wall of the bakery (see Figure 2.2f).

Given the absence of a cistern or \textit{impluvium} in the bakery, the best candidates for a water source are the two public fountains located at the ends of the Vicolo Storto—at the intersection of the Vicolo Storto and the Via degli Augustali and at the intersection of the Vicolo Storto and the Via della Fortuna—despite the fact that P. Zanker places the bakery slightly outside of these fountain service ranges.\textsuperscript{122} Alternatively, the wealthy home of the Popidii attached to the bakery may have had its own cistern or private pipeline from the aqueduct.\textsuperscript{123}

\textsuperscript{121} Mayeske, 115.
\textsuperscript{122} Zanker, 120.
\textsuperscript{123} While the bakery at VII.i.22 was open to the public and I was able to study its layout and components, I was not able to gain access to the home of the Popidii.
Water: Its Supply and Its Use

The original demand for water at Pompeii was met by cisterns and wells. Rainwater could be collected through openings in the roof, called *ampluvia*, into large basins in the floors of atria, called *impluvia*, and channeled into underground cisterns or storage tanks. Alternatively, rainwater could be channeled from the eaves on the roof into the cistern. The cisterns tended to be long, deep rectangular basins, lined with hydraulic cement and protected against leaking by a special molding where the cistern walls met the cistern floor.\textsuperscript{124}

Wells at Pompeii had to be sunk through the lava spur beneath the city to the Sarno Valley water table below. This groundwater could be as far below the city as twenty or thirty meters—two or three times as deep as at the nearby city of Herculaneum.\textsuperscript{125} Since sinking a well was by no means an easy or inexpensive feat, wells tended to be public or shared by a few households.\textsuperscript{126}

During the emperor Augustus' reign (27 B.C.E. to 14 C.E.), an aqueduct was constructed to supply all of Campania with water from Lake Serino, ending at the large reservoir of the Piscina Mirabili at Baia.\textsuperscript{127} A branch of this aqueduct was diverted to Pompeii and Nola and the main reservoir, or *castellum*, at Pompeii was located near the Vesuvian gate at the northern limits of the city.\textsuperscript{128} From here, three large lead pipes carried water to different neighborhoods of Pompeii. The


\textsuperscript{125} A depth of twenty meters is reported in:

\textsuperscript{126} An depth of one hundred feet (approximately thirty meters) is reported in:

\textsuperscript{127} Richardson, 51-53.

\textsuperscript{128} Adam, 19.
wealthy could pay to have private pipelines tap into these conduits and supply their homes with running water.\textsuperscript{129}

What was likely considered amongst the masses to be the principal benefit of the new aqueduct line was the construction of at least forty\textsuperscript{130} public fountains throughout the city (see Figure 2.35). These fountains consisted of a square or rectangular basin, usually of volcanic rock but, when privately-sponsored, of travertine or marble, provided with a small spout.\textsuperscript{131} They are usually located at street junctions and tend not to overlap with sites of known deep wells. When possible, they appear to be located near street shrines.\textsuperscript{132} The fountains were distributed in such a way that the majority of Pompeians lived within eighty meters\textsuperscript{133} or two blocks\textsuperscript{134} of a fountain and could use this fountain for both drinking water and water needed for domestic chores. The fountains were designed to overflow, thereby constantly renewing the water pooled in the basin (since animals were also drinking from the fountains and the water did not remain clean for very long) and flushing out the filthy city streets. This runoff drained into underground sewage conduits from gutters and drain-holes in the streets, which eventually emptied into the river or sea.

There were many uses for water within a bakery. For one, water was needed for washing grain and then later, in large supply, for the forming of dough from flour. Water was also needed during the baking process, both for moistening the loaves and for cooling down overheated baking implements. For this reason, water vessels are often found next to the oven.

Another major use for water is cleaning and sanitation. In addition to the general mess creating by the bread-making process, there is additional filth created by the ashes from the oven,

\textsuperscript{129} Zanker, 118-120.
\textsuperscript{130} Ibid., 120.
\textsuperscript{131} Ibid., 120.
\textsuperscript{132} Laurence, 46.
\textsuperscript{133} Ibid., 50.
\textsuperscript{134} Richardson, 59.
the dirt and manure from the work animals, and both human biological and domestic waste. Especially since these workshops were preparing food, it was essential that they remained sanitary.

Many bakeries—nine in all, according to Mayeske—had their own latrines. In the first century C.E., latrines ranged in quality from cess pits to toilets flushed by water brought by hand or rainwater from the roof to toilets that continually flushed in wealthier homes with running water from a private aqueduct pipe.¹³⁵ Most latrines drained into cess pools, but some wealthier ones were connected directly to the municipal sewers.¹³⁶

Domestic waste and water used to clean the bakery could either be dumped into the latrine or flushed into the city streets. In the streets, this waste would combine with the overflow from nearby fountains and be washed down gutters into drain-holes that fed into the sewer systems. The sidewalks were raised and stepping stones crossed the street at regular intervals to prevent pedestrians from having to walk in the waste on the streets. There were even channels along the lips of the raised sidewalks that allowed any water on the sidewalk to drain into the street (see Figure 2.36).

Although it seems plausible that bakers used the above method to clean their bakeries, Plautus proposes an alternative method in the Captivi. That is, Plautus suggests that bakers kept scavenger pigs who cleaned much of the waste from the floor. In the play, Ergasius threatens “the bakers, that feed swine, that fatten their pigs upon refuse bran, through the stench of which no one can pass by a baker’s shop; if I see the pig of any one of them in the public way, I’ll beat the bran out of the masters’ themselves with my fists” (Captivi IV.2.806-810).¹³⁷

¹³⁵ Jansen, 145.
¹³⁶ Richardson, 61.
Security

As with many shops, the front entrance to a bakery was not often completely sealed by a doorway in order to allow passing customers a full view of the interior of the shop and sales area. It was therefore important to have a means of securing this space when the baker closed up shop for the night. Generally, this was accomplished by sliding large wooden planks into grooves in the doorway and lintel, which blocked the space not already filled by a door. The Vicolo Storto entrance to the bakery of N. Popidius Priscus shows the grooves and circular indentations—for the pivot from which the actual door was hung—indicative of this security method (see Figure 2.37).

The home of N. Popidius Priscus was the most luxurious of any baker at Pompeii and consisted of a large atrium-peristyle house that communicated with the rear wall of the bakery through the atrium.  

Living Spaces

Living quarters were incorporated into approximately seventeen, or 57%, of the bakeries at Pompeii, occupied either by workmen or the bakers themselves. However, what is meant by living quarters varies tremendously from bakery to bakery. For one, the presence of a mezzanine level or a second story will often suggest that the baker or some of the workmen lived above the shop. Bakeries can also be found connected to private homes—in which case, the private home serves as the living space—or located directly within a home that has been converted into a workshop. In the

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latter case, a few rooms are often maintained as a living space while some of the larger reception
rooms—notably the atrium and the peristyle—are transformed into workrooms or shops. Of the
seventeen bakeries with living quarters, six are connected to large private homes and seven are
located within converted homes. Two other bakeries are situated within converted homes but do
not have distinct living quarters.

The phenomenon of the transformation of large residences into commercial establishments
during the last decades of Pompeii has engendered some debate. A. Maiuri describes a bakery at
VI.iii.3/27 in his excavation reports from Pompeii, illustrating such a transformation:

> It is the case of an old habitation later transformed into a bakery; it preserves its
original character only in the west wing, where the upper floor with the living
quarters was borne upon four robust brick pilasters rising from the corners of the
impluvium. In the east wing, the garden was transformed into a pistrinum, with mills,
an oven, the horreum for the storage of cereals, a stable for the animals employed to
turn the mills and, finally, a shop for the sale of bread.\(^{140}\)

Although only seven bakeries are located within converted homes, they represent only a fraction of
the total number of homes taken over by small industries, including but not limited to the baking,
wool, and garum industries. An earlier theory, proposed by Maiuri, was that the significant damage
caued to these homes by the earthquake of 62 C.E. forced their previous owners to sell or rent the
spaces at low prices and to move out of the city. Craftsmen and merchants—many of whom had
also lost workshops to the earthquake—seized the opportunity to purchase or rent some of this
newly available and affordable central real estate. Many of these homes were therefore converted
into commercial spaces or smaller residential units.\(^{141}\) This theory is now criticized, there being little
evidence for such an exodus of elite from Pompeii. It is also difficult to determine exactly when
these home conversions took place and while they appear roughly contemporaneous with the


earthquake, they are not necessarily the consequence of the earthquake. Finally, W. O. Moeller points out that the lower and middle class would have suffered from the damage caused by the earthquake to a much greater extent than the elite—who no doubt were diversified in investments—and the elite would consequently have been in a better position to re-establish themselves. What is now more popularly accepted is the theory that the elite began to take an interest in investing in commercial enterprise. Rather than abandoning their residences to existing craftsmen, as proposed by Maiuri, they deliberately converted portions of their existing property—or new property they may have purchased after the earthquake—into workshops. As outlined by A. Cooley, “it is much more likely (…) that such exploitation of urban property was a deliberate strategy adopted by the elite, who created for themselves a mixed portfolio of economic interests, avoiding in this way any risks inherent in relying on revenue derived exclusively from agriculture and land-owning.” While this latter theory is generally more popular, I see no reason why it should not be plausible that the large-scale conversion of residential space into commercial space after the earthquake may have been due to a combination of the two theories. That is, it may be due to the coincidence of some degree of newly available and affordable central real estate, craftsmen and merchants searching for new work spaces, and the wealthy families of Pompeii seeking to invest in commercial establishments.

In light of the preceding discussion of the conversion of domestic spaces into commercial spaces, one is left to wonder about the bakers themselves. Were they wealthy aristocrats, investing in large commercial establishments, or humble middle-class craftsmen? The Popidii, who owned the bakery at VII.ii.22 and the wealthy home to which it connects, certainly offer an example of the former. Not only did they operate one of the largest bakeries at Pompeii (and no doubt one of the

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144 Ibid., 28.
wealthiest) but Mayeske speculates, on the basis of their proximity, that they may have also controlled the bakery shops at Liv.12 and Liv.13 or at least had some measure of influence. T. Frank also refers to a bar-room and a series of rooms (perhaps shops) that communicated with the house through doorways. Finally, three amphorae inscribed with the Popidii name suggest that the family's economic interest extended beyond their bakeries and included, to some degree, the city grain supply.

The Bakers

As previously discussed in the introduction, the baking profession included members from all spheres of society. Participation in the industry included craftsmen with a range of economic situations, freedmen, and wealthy investors. The baking operation of a wealthy freedman, Marcus Vergilius Euryaces, will be discussed below. The latter group, wealthy and prominent families from Pompeii investing in one or a series of baking establishments, is represented not only by the Popidii family, but also by the Terentii family. The Terentii operated a large baking enterprise, consisting of a large house and bakery complex at VII.ii.3/6 and an additional bakery across the street at IX.iii.10-12. Their ownership was identified thanks to a life-sized portrait of a man and a woman in the atrium at VII.ii.6, believed to represent Terentius Neo, the brother of the baker, T. Terentius Proculus. The first bakery included a number of small shops onto which it backed but with which it did not actually connect. The bakery across the street also included a large corner

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145 Mayeske, 191-192.
146 Frank, 228.
147 Mayeske, 178.
148 Cf. infra page 11.
149 Cf. infra pages 52-54.
150 This house was a remodeled house, including both commercial and residential areas. See Mayeske, 182-183.
Mayeske, 190.
shop with an L-shaped sales counter. Between the two establishments, the Terentii operated multiple shops and a total of two ovens and nine mills.  

The bakers formed a sort of professional community and shared to some degree not only commercial interests but political and religious beliefs. To be more specific, I am referring to the existence of an ancient guild, a *collegium* of bakers. This is not to be confused with the modern sense of the word, for the *collegium* was in no way a union for bakers. Rather, the *collegium* was a social body, a body of professionals who could collectively support political candidates or honor particular religious holidays. Evidence for the existence of these *collegia*, which seem to have been fairly common in many trades, stems largely from inscriptions and graffiti referring to organized groups of professionals. An excellent example, although not pertaining to bakers, is the dedication inscription in the Eumachia building in the Pompeian forum, which refers to the *fullones* (cloth fullers), as a collective body: “*Eumachiae L(uci) f(iliae) sacra(cui) pub(licae) fullones.*” Specific to bakers are three election notices at Pompeii in which *pistores* or *dibamarii* collectively support particular political candidates. In addition, a notice on the outside of the *campona* of L. Betutius Placidus at I.viii.7/8, “*pistores cum vicinis*,” raises questions about the possibility of a meeting space or guildhall on the second story of this building.  

While there is only limited evidence for the collective support of political candidates by bakers, there is more evidence for their shared patron deity and similar religious practices. The patron deity of the Pompeian bakers was Vesta, the Roman goddess of the hearth. With the exception of two, all of the private sacred paintings of Vesta at Pompeii were found in the homes or shops of bakers, indicating Vesta’s special position amongst the bakers. The other two were found

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152 Mayeske, 183.
154 Mayeske, 144.
in homes adjacent to bakery shops without living quarters, suggesting that they may in fact have belonged to the bakers as well.\(^{156}\) In her representations, which tend to be *lararium* paintings, Vesta appears veiled, crowned, sometimes enthroned, and almost always with a donkey,\(^{157}\) which is rather fitting for the bakers.

The principal holiday during which the bakers would have worshipped and honored Vesta was the *Vestalia*. This feast is depicted in two paintings from Pompeii. The first (see Figure 2.38) is a lost fresco from the *macellum*, in which small *putti* represent the bakers. Five *putti* and two garlanded donkeys relax at the foot of a large hourglass-shaped mill. Two goblets on a tray recall the feast-like nature of the celebration. To the right of the scene, Cupid and Psyche oversee the festivities.\(^{158}\) The other representation of the *Vestalia* is a rather damaged fresco from the *tridinium* of the House of the Vettii, in which more *putti* recline with drinking cups around a table with garlanded donkeys in the background.\(^{159}\)

The process by which the bakers came to adopt Vesta as their patron goddess is not entirely known, but it seems to have evolved from an earlier worship of the goddess Fornax at a time when hand-ground *far* was the preferred means of preparing grain.\(^{160}\) The bakery at VI.iii.3/27 still includes her in a *lararium* painting. Fornax, the oven goddess worshipped at the *Fornacalia*, received less attention as the baking industry became more sophisticated and turned to larger-scale flour production with animal-driven mills. Mayeske suggests that “because of her connection with agricultural growth and the hearth, the bakers transferred their attention to Vesta. Probably the nature of the Vestals’ duties—preparation of the *mola salsa*—recalled in a mysterious way the efforts of the miller-bakers.”\(^{161}\) The connection between Vesta and the donkey so celebrated and advertised

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156 Mayeske, 164.
157 Ibid., 161.
158 Ibid., 163.
159 Ibid., 163-164.
160 Ibid., 156-157.
161 Ibid., 161.
by the bakers originates in a story in Ovid (Fasti 6.335-344), in which Vesta is warned by the braying of Silenus' donkey of the approach of the ill-intentioned Priapus.\textsuperscript{162}

The 	extit{lararia}, or household shrines, of the bakeries at Pompeii represent other figures than Vesta, although Vesta is certainly a common figure. These 	extit{lararia}, found in seventeen bakeries, are typically arched or rectangular niches in the wall, often with shelves for offerings and sacred paintings. The paintings include, but are not limited to, representations of serpents, birds, garlands, altars, the Lares, Genii, and a number of deities (including Vesta and her donkey, Fornax, Venus Pompeiana, Cupid, Sarnus, Bacchus, Mercury, Semele, Isis-Fortuna, and Vulcan).\textsuperscript{163}

One final point in the discussion of the religion and superstition of the bakers at Pompeii is their use of the phallus as an apotropaic symbol. A representation of a phallus, usually sculpted, was routinely placed over the oven of the bakery to ward off all evil and misfortune.\textsuperscript{164} Figure 2.39 shows a phallic relief from a Pompeian bakery with the inscription, "\textit{hic habitat felicitas}" or "here dwells happiness." A second example (see Figure 2.40) shows a phallus \textit{in antis} between two columns in a small temple or niche.

\textbf{Other Kinds of Baking: Pastry Shops and Private Baking}

A brief mention should be made of the non-conventional baking establishments at Pompeii—that is, the pastry shops and private baking.

There were six known pastry shops at Pompeii, although some scholars list as many as ten; it is not always easy to distinguish between pastry shops and regular bakeries since the facilities are often very similar. They are often characterized by the absence of mills or the presence of solely

\textsuperscript{162} Mayeske, 162.
\textsuperscript{163} See the catalogue of \textit{lararia} in Mayeske, 144-156.
\textsuperscript{164} Jashemski, 188-189.
slave-driven or small animal-driven mills. These smaller mills would suffice because their demand for flour was significantly less than that of a baker and they may even have purchased flour from other bakeries rather than make space and budget available for a milling establishment of their own. Large mills were found in one pastry shop at VII.xii.11, but they were likely no longer in use at the time of the eruption since they were being stored in the fasces.\textsuperscript{165}

The other identifying feature of a pastry shop is the smaller pastry oven. Pastries and cakes could be baked in small brick ovens, which were very similar in design to the larger baking ovens but differed in that they sometimes contained fuel areas beneath the baking compartment that allowed for a fire to be maintained throughout the baking.\textsuperscript{166} Small, portable ovens called elibani could also be used to bake or to keep food warm.\textsuperscript{167} These tended to be made from terracotta, bronze, or iron and contained a lower fuel chamber, walls through which the heat could pass to warm the baking chamber, and a vent at the top of the vault.

The actual product produced in pastry shops was a range of pastries and cakes, consumed for both dining and religious purposes. A number of pastry molds, some of which were discussed above in the section on sieving, mixing, kneading, and molding, provide evidence for their shapes and designs.\textsuperscript{168} Various kinds of sacrificial cakes were offered as sacrifices to the gods and included libum, a cake made from cheese, flour, and eggs (see Cato, \textit{Agr}. 75.1) and placenta, a cake made from flour, groats, cheese, and honey (see Cato, \textit{Agr}. 76.1). Pastries and cakes that were intended as food could be served in triclinia at the shops—as seen at VII.iv.29 and VII.xii.13—or in a more conventional way from a sales counter.\textsuperscript{169}

\textsuperscript{165} Mayeske, 172.
\textsuperscript{166} \textit{Ibid.}, 25.
\textsuperscript{167} Étienne, 158.
\textsuperscript{168} Mayeske, 25-26.
\textsuperscript{169} Cf. supra pages 32-33.
\textsuperscript{169} Mayeske, 176.
The following passage is from a poem traditionally ascribed to Virgil that describes the process of hand-turning a grain mill—no doubt a grueling task and yet one performed by those who wished to produce their own flour and bread in their homes.

...the left hand is stretched out for assistance; the right for work. The latter continually rotates and quickly moves the disk in circles (the ground grain runs down the stone from the swift below), occasionally the left hand takes over from her tired sister and alternates by turns. (*Virgil, Moretum* 25-29)\(^\text{170}\)

In a private setting, grain could be crushed to form flour using mortars and pestles, hand querns, and small mills. Figure 2.41 shows a small, cylindrical, portable milling device made of volcanic rock that was operated by turning a handle attached to the *catillus* and that was fairly common in Pompeian households.\(^\text{171}\) A few hand-turned cylindrical mills, 45 to 64 cm in diameter, have also been found in five private homes and villas at Pompeii.\(^\text{172}\) Figure 2.42 shows one such hand-mill from a house at Livi 15.\(^\text{173}\) Thus, it seems that some households chose to purchase grain and to grind their own flour. Nevertheless, evidence for private ovens is quite scarce.\(^\text{174}\) Where they are found, they tend to be small and located in wealthy homes that could afford to maintain cooks. Two miniature ovens from the Villa dei Misteri at Pompeii are shown on the plan in Figure 2.43 at the positions marked by the letter *a*. The larger oven was used for bread, whereas the smaller oven was for pastries.\(^\text{175}\) Households that could not afford their own oven could bring their flour to a professional baker. Pliny confirms the suspicion that private baking was usually considered a luxury in a brief passage about a Plautus play: "it was in his day usual for bread to be baked for more luxurious people by cooks, and only those who ground spelt were called ‘grinders’; nor used people

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\(^{171}\) Castaldo (1999), 136. 
\(^{172}\) Curtis (1997). 
\(^{174}\) Curtis (1997). 
\(^{175}\) Carrington, 107.
to have cooks on their regular staff of servants, but they hired them from the provision market\textsuperscript{176} (NH XVIII 108).

**Marcus Vergilius Eurysaces—A Synthesis**

Much of the information contained in the above chapter regarding the basic operation and management of a bakery is summarized in the scenes found on the funerary relief of Marcus Vergilius Eurysaces, a freedman and wealthy baker at Rome who commissioned a rather spectacular tomb for his deceased wife on which his baking exploits were depicted (see Figure 2.44). This tomb provides a better image of the complete baking process, tying together much of what was discussed above.

The tomb was erected in ca. 30 B.C.E. and though it housed the ashes of his wife, Atistia, it served primarily as an ostentatious reminder of Eurysaces’ professional accomplishments and rise in society from slavery.\textsuperscript{177} Here we have an example of the freed slave participating in the baking community, in contrast to some of the more modest freeborn craftsmen and wealthy aristocrats discussed above. The style of the narrative friezes is worth noting. This is an example of ‘plebeian’ art, in which the meaning and the clarity of the scenes transcends the need to portray the figures realistically and with attention to proper proportions or individualized features. The scenes are very linear, with little recession into space or attempts at perspective, and they include only the elements that are absolutely necessary to convey the sense of the narrative. The narrative, not the aesthetics, is paramount. It was common practice for freedmen such as Eurysaces to advertise their professions on their tombs. These men and women were proud of their self-sufficiency, their

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\textsuperscript{176} Pliny (1950).

citizenship, and their post-manumission success and, therefore, chose to define themselves through their occupation—hence the importance of the narrative.

The tomb’s inscription runs along a horizontal register that wraps around the center of the monument (see Figure 2.44). It reads, “est hoc monumentum Marcei Vergilius Eurytacis pistoris, redemptoris, apparat,” or “This is the tomb of Marcus Vergilius Eurytacis, baker, contractor, he serves.”178 Above this inscription, encircling the top of the monument, is an Ionic entablature consisting of a narrow frieze crowned by a dentilated, projecting cornice. The frieze depicts the successive phases of the baking of bread and celebrates Eurytacis’ bakery and its use of the latest technology.179 The south side begins with an image of the sale of bread (see Figure 2.45). A figure stands behind a low table with a loaf in his hand, while another figure collects something (presumably payment) from a togate man and a child. This scene may actually be a continuation of the frieze on the west side, marking the end of the narrative. That is, the scene immediately following the sale actually represents the beginning of the narrative. This subsequent scene depicts the grinding and sieving of flour—the beginning of the baking process. Two men in tunics struggle with what appear to be heavy sacks or bowls of either flour or grain on a low table. They are followed by two flour mills pulled by mules with attendants. Next, two men stand behind a counter while a third man sits upon a stool. Finally, a togate supervisor (distinguishable from the workers by his official toga) oversees a man bending over a low platform who may be sieving flour.180

The eastern face of the tomb and frieze is missing, but the narrative frieze continues on the north side (see Figure 2.46). Only the right side of the frieze, depicting the kneading of dough and the baking of bread, is extant. On the far left of this preserved portion, a bare-chested man uses a long-handled shovel to slide bread in or out of a beehive-shaped oven. He is followed by eight bare-

179 Zanker, 15.
chest the men clustered around two tables. The men at the first table are busy shaping loaves of bread while the men at the second table listen as a togate supervisor addresses them from between the tables. The bare chests of the men on this side of the frieze may be explained by their proximity to the hot oven.\textsuperscript{181} On the far right side of the frieze, a man mixes and kneads dough with the help of a mule-drawn kneading machine.\textsuperscript{182}

The final phase of baking is depicted on the west side (see Figure 2.47). On the left, a man in a tunic stands behind two baskets of round loaves while another man piles the loaves onto a large wooden tripod scale. A togate magistrate stands behind the baskets with a tablet or parchment in his left hand. The role of this magistrate was to supervise the weighing of the loaves and to ensure that Eurysaces did not cheat the public. Eurysaces includes this figure as proof to posterity that the quality of his business and his bread was uncompromised.\textsuperscript{183} On the other side of the scale, two men unload woven baskets of bread while two other men receive the baskets. Since this side of the frieze represents the finished product and the final measures of the baking process, it follows logically that the scene of the sale of bread situated around the corner, at the beginning of the southern frieze, acts as the proper end of the narrative.

The theme of the bakery is further pursued in the form of Atistia’s cinerary urn. The urn is shaped as a bread basket or \textit{panarium} and the inner inscription states that the cremated remains of Atistia are buried \textit{in hoc panario} or “in this breadbasket.”\textsuperscript{184}

\textsuperscript{181} Kleiner, 107.
\textsuperscript{182} Mau, 392.
\textsuperscript{183} Kleiner, 109.
\textsuperscript{184} \textit{Ibid.}, 107.
While it is all very interesting to describe the features and operation of the various components of bakeries, the bakeries did not exist in isolation. It is impossible to fully understand and appreciate their position within the overall townscape of Pompeii without some discussion of the local economy and the niche they occupied within this economy and within the food production industry at large.

The Economy of Pompeii

The city of Pompeii operated on a system in which small-scale local production satisfied the needs of the city’s ten to twenty thousand inhabitants.\textsuperscript{185} Goods were not produced on a large scale intended for trade and foreign markets, although there certainly is evidence for some trade of Pompeian products. R. MacMullen estimates that the local market extended for about a fifteen mile

\textsuperscript{185} According to M. I. Finley, the population was approximately 20,000 at the time of the eruption. J. T. Bakker estimates that the population was approximately 10,000.

E. C. C. Corti, \textit{The Destruction and Resurrection of Pompeii and Herculaneum}, (London: Routledge & Kegan Paul, 1951), Figure 11.

M. I. Finley, \textit{The Ancient Economy}, (Berkeley and Los Angeles: University of California Press, 1999), 139.

Bakker, 13.

Boston, 59.
radius from the city and accounted for some three quarters of the value of exchange throughout the economy as a whole.\textsuperscript{186} Since Pompeii benefited from the renowned fertility of the Campanian countryside, had excellent river connections with the towns of the Sarno valley, and served as the harbor for the entire region south and east of Vesuvius, it seems very likely that there was some local trade between Pompeii and the nearby Campanian towns and luxury villas. Laurence offers that the Campanian towns (including Capua, Cumae, Neapolis, and Puteoli) may have formed a single socio-economic unit.\textsuperscript{187} Additionally, the local seaside villas would have furnished a steady market for surplus produce, tools and equipment, and building materials.\textsuperscript{188}

The evidence to date for large-scale trade at Pompeii is minimal, or at least the direct involvement of Pompeian merchants in large-scale trade. Some Pompeian products were traded over considerable distances, but this tended to be orchestrated by independent traders (negotiators) rather than the Pompeian merchants.\textsuperscript{189} Pompeian Red Ware ceramics have a wide distribution pattern in the western Roman Empire, suggesting that Pompeii-based products could travel considerable distances. For example, the importance of Pompeian wine at Rome has been confirmed by the discovery of stratified finds of amphorae at Ostia (the port city of Rome) consisting largely of Pompeian vessels.\textsuperscript{190}

The units of local production within Pompeii were the many small workshops scattered throughout the city, which Laurence defines as production centers normally associated with a single specialized product and concerned with production on a full-time basis throughout the year (as opposed to household production).\textsuperscript{191} He notes that they typically produce a product that is not widely available, that they make use of specialized equipment of the sort not normally seen in

\begin{itemize}
\item \textsuperscript{187} Laurence, 53.
\item \textsuperscript{188} Boston, 59.
\item \textsuperscript{189} Laurence, 54.
\item \textsuperscript{190} \textit{Ibid.}, 54.
\item \textsuperscript{191} \textit{Ibid.}, 55.
\end{itemize}
domestic buildings, that they often occupy converted atrium-style houses, and that they tend to be clustered in particular areas or streets of the city associated with their particular industry.\footnote{192} I might add that the bakeries, as a collective body, certainly adhere to these four trends. The specialized products and equipment as well as the use of former residential buildings were previously discussed in Chapter II. The location of the bakeries will be discussed in Chapter IV. The shops and workshops of Pompeii occupy a combined area of 2.2 hectares, or approximately 5.1\% of the total excavated area of Pompeii,\footnote{193} and include bakeries, \textit{garum} shops, the various shops of the wool industry, metalworking shops, \textit{thermopolia}, \textit{popinae} and \textit{cauponae}, and many others.

The urban workshops of Pompeii could sell their wares in three different ways: many workshops would have had their own permanent sales areas (as seen in a number of bakeries\footnote{194}), while others would have rented boutiques or erected temporary sales stands in or near the forum. Those who opted for one of the latter two options could either sell their product themselves or sell their product to independent merchants who operated permanent or temporary shops.

The \textit{macellum}, a structure dating originally to the second half of the second century B.C.E. but later remodeled under Augustus,\footnote{195} was the central food market at Pompeii (see Figure 3.1). The \textit{macellum} was located at the northeast corner of the forum, which was arguably the most important commercial space in Pompeii, and consisted of a series of large rentable shops and a porticus where stalls could be erected. In total, the \textit{macellum} housed approximately thirty large-scale shops and twice as many smaller-scale shops.\footnote{196} Among the many merchants who dealt in the \textit{macellum}, the fishmongers and butchers were especially prominent. Of particular note is the central pavilion,
which is believed to have been the fish market thanks to the discovery of quantities of fish scales in the drains leading away from it. The meat market occupied the southernmost of the three halls opening off the east end of the *macellum* court.\textsuperscript{197} Not only have fish scales been discovered on site, but the charred remains of figs, nuts, prunes, grapes, lentils, and bread, as well as pastry molds, have been discovered in some of the northern market stalls. Hence, other merchants at the *macellum* included the fruit and vegetable dealers—*pomarii, lupinarii*, and *alarii*\textsuperscript{198}—and bakers. Additional evidence for the presence of bakers and pastry-makers at the *macellum* includes an inscription along the outside wall of one of the southern shops (VII.1.x.42): TREBIUM AED OFV CLIBANARI ROG, which indicates the presence of *clibanarii*, as well as the fresco depicting the celebration of the *Vestalia* (see Figure 2.38) previously discussed in Chapter II,\textsuperscript{199} which was located on a panel near the north entrance.\textsuperscript{200} Other discoveries at the *macellum* include various implements indicative of commercial activity, such as coins, bronze vessels, lamps, the handle of a knife, and small scales and balances.\textsuperscript{201}

In addition to permanent boutiques, temporary wooden sales stands were a common feature of the forum. Merchants certainly hoped to take advantage of the large crowds of people gathering in or passing through the forum, the city's center of political, commercial, and religious life. Both of the frescoes depicting the sale or distribution of bread discussed in Chapter II (see Figures 2.32 and 2.33)\textsuperscript{202} provide evidence for these temporary stands. It is impossible to tell whether these two vendors represent men from the bakery that produced the bread or independent merchants, known as *circitores*,\textsuperscript{203} who purchased the bread wholesale from a bakery. *Libarii* or *placentorii* were similar vendors who sold pastries from temporary stands. Two *libarii* inscribed their names—Pudens and

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\item\textsuperscript{197} Richardson, 201.
\item\textsuperscript{198} *Ibid.*, 201.
\item\textsuperscript{199} Cf. \textit{supra} page 48.
\item\textsuperscript{200} Mayeske, 187.
\item\textsuperscript{201} de Ruyt, 148.
\item\textsuperscript{202} Cf. \textit{supra} pages 38-39.
\item\textsuperscript{203} Mayeske, 185.
\end{itemize}
\end{flushleft}
Vercunnus—and occupation on the wall of the Temple of Venus, a temple approximately one block to the southwest of the forum. Four bronze statuettes of caricaturized *plebeiani*, approximately 23 cm high, were also discovered in the House of the Ephebe (I.vii.1-12). For those workshops located outside of the city, taking advantage of the urban Pompeian clientele required traveling to the forum on market days or *nundinae*. In the Roman world, *nundinae* typically occurred every eight or nine days, but the timing of the *nundinae* of Campania was more irregular given the economic interaction between various Campanian cities, each with different calendars. The *nundinae* benefited the urban and rural populations alike; they offered an opportunity for rural workshops and farmers to sell their product within the city at a time and in a place where throngs of shoppers would be gathering, but they also allowed urban merchants to take advantage of the crowds by setting up their own temporary stands. The presence of the rural merchants in the city also brought business to a number of urban shops and inns.

The Pompeian economy was marked by a pronounced change around the time of the earthquake of 62 C.E., a change illustrated by the large-scale conversion of many wealthy residences into commercial establishments as previously discussed in Chapter II. I have already outlined the two existing theories for this transformation: Maiuri's earlier theory that damage caused by the earthquake forced many elite to move out of the city and to rent or sell their property at low prices, and the more recent and currently more popular theory about a growing interest among the elite in investing in commercial enterprise.

It is this latter theory that interests me now—that is, the interest of the elite in commerce. This investment of the upper class in production and commerce extends beyond the ownership or

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204 Mayeske, 186.
207 MacMullen, 339.
208 Cf. supra pages 44-45.
operation of workshops within the city and includes the management of large villa estates in the
country. Archaeological remains of villas prove that they were not only luxurious country homes,
but also estates invested in the production of various goods, with an especial inclination towards
wine, olive oil, and other such cash crops. For example, a villa at Boscoreale (see the labeled plan
in Figure 3.2) revealed both the equipment and space for the production of wine, olive oil, and
bread, including wine presses and vats, a barn, a threshing floor, an oil press, an olive crushing room,
and a bakery. The Villa dei Misteri at Pompeii (see the labeled plan in Figure 2.43), previously
mentioned in the context of private baking, contained a wine press, a wine cellar, and both bread
and pastry ovens. In fact, of the forty-three villas excavated in the environs of Pompeii, seven to ten
were involved in the production of oil, twenty-six to twenty-nine in the production of wine, and
almost all of them possessed their own small bread ovens if not their own threshing floors,
granaries, and mills. While much of a villa’s production would have been used to satisfy the needs
of the villa’s owner and staff, surplus could certainly be sold for profit. This longstanding elite
investment in commerce seems only to strengthen the theory of their interest in urban workshops
and casts further doubt on the earlier theory of the elite abandonment of Pompeii.

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208 For a complete description of the archaeology of the Pompeian villa, see Jongman, 112-120.
209 Boston, 59.
210 Cf. supra page 51.
211 Mayeske, 71-72.
Food Production at Pompeii—Bakeries in Context

An Introduction: Diet and Agriculture

A grocery list was discovered in the restaurant of Fabius Memor and Fabius Celer at IX. vii. 24-25, listing the supplies the establishment needed for a period of nine days.\textsuperscript{212} Such lists, with evidence for consumption rather than production, yield important information about diet and the requirements of daily life at Pompeii. The grocery list included the following items: cheese, oil, onions, wine, wine for the women, wine for the housekeeper, cooking pans, small fish, and incense. In addition, various grades of bread are noted eight times, as well as bread specifically marked for slave consumption. The dietary staple of the Roman world was grain or, more specifically, wheat and barley. As W. Jongman notes, famine is invariably depicted as a shortage of cereals.\textsuperscript{213} Other important components of the Roman (and Pompeian) diet include olives and olive oil, from which an individual obtained much of his daily fat but which cost two to three times more per calorie than wheat;\textsuperscript{214} wine, some fruits and vegetables, cheese, and meat. The most common sources of meat were fish, either whole or in the form of a fish sauce called \textit{garum}, and pork. Fish were fairly easily come by at Pompeii, the sea being so close as to encroach on the city gates, and pigs\textsuperscript{215} were relatively cheap to raise since they could be fed leftovers and housed in poor conditions.

The luxury of inhabiting Campania was the tremendous fertility of the land and the resulting productivity of local agriculture. Pompeii was relatively self-sufficient with respect to food

\textit{Mayeske}, 42-43.

\textsuperscript{213} Jongman, 78.

\textsuperscript{214} Jongman, 79.

\textsuperscript{215} \textit{Ibid.}, 79.
production. Pliny describes the Campanian soil as such that facilitated easy drainage and had good water retention in lower layers. His glorifying description is worth noting:

There beneath cloud-capped mountains lies a plain extending in all for about 40 miles on the level. The ground of this plain, to begin by stating the nature of the soil, being dusty on the surface but spongy underneath and also porous like pumice, what is a fault in mountain country turns into an advantage, as the earth allows the frequent rainfall to percolate and passes it through, and so as to facilitate cultivation has refused to become soaked or swampy, while at the same time it does not give back the moisture it receives by any springs, but warms it up inside itself to a moderate temperature and retains it as a kind of juice. The land is in crop all the year round, being sown once with Italian millet and twice with emmer wheat; and yet in spring the fields having had an interval of rest produce a rose with a sweeter scent than the garden rose, so far is the earth never tired of giving birth; hence there is a common saying that the Campanians produce more scent than other people do oil. But as the Campanian plain surpasses all the lands of the world... (NH XVIII 109-111)\(^\text{216}\)

Thus, Pliny claims that the land was in crop all year round, sown once with Italian millet and twice with emmer wheat. Alternatively, Strabo reports that some of the plains were seeded twice with spelt, a third time with millet, and a fourth time with vegetables:

A proof of the fruitfulness of the country is that it produces the finest grain—I mean the wheat from which groats are made, which is superior, not only to every kind of rice, but also to almost every kind of grain-food. It is reported that, in the course of one year, some of the plains are seeded twice with spelt, the third time with millet, and others still the fourth time with vegetables. And indeed it is from here that the Romans obtain their best wine. (Geö. V 4.3)\(^\text{217}\)

In addition to cereals (barley, emmer wheat, millet), the remains of carbonized seeds, shoots, and nuts, as well as the cavities left by roots, have provided evidence for the following products: grapes, olive trees, filberts, walnuts, almonds, bitter vetch, figs, pears, pomegranates, peas, lentils, and broad

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\(^{216}\) Pliny (1950).

\(^{217}\) Strabo.
beans.\textsuperscript{218} Figure 3.3 shows carbonized remains of bread, wheat, figs, and nuts discovered at Pompeii.

It seems that the land was divided primarily between cereals and viticulture, two crops for which Campania was particularly famous (see Strabo quotation above) and that competed for the available agricultural space. Pliny describes such a competition: “Then comes the favoured country of Campania; in this valley begin those vine-clad hills with their glorious wine and wassail, famous all the world over, and (as old writers have said) the scene of the severest competition between Father Liber and Ceres” (\textit{NH} III 60).\textsuperscript{219} The resulting division was that viticulture became concentrated largely on the slopes of the hills and Vesuvius, while cereals dominated the plain itself.\textsuperscript{220}

The most common, simplest method of farming consisted of furrows and ridges of raised earth, approximately 15 cm high and spaced 120 to 150 cm apart.\textsuperscript{221} These ridges would then be seeded with single or double rows of leafy plants. This method was used for vegetables, the winter cycle of perennial crops, grains, and vines. Some of the agricultural equipment that has been unearthed at the houses and villas of Pompeii includes spades, hoes with triangular or square blades of various sizes, hatchets, rakes with four or six teeth, scythes, sickles, pruning knives, picks, and pitchforks.

Root cavity analysis has helped archaeologists to identify the location of a number of ornamental and commercial gardens, horticultural plots, and vineyards within the city. Ornamental gardens occupy 5.4 to 8\% of the excavated area of Pompeii, while large food-producing commercial gardens occupy 9.7\%.\textsuperscript{222} While a long discussion of Pompeian gardens is beyond the scope of this

\textsuperscript{218} Curtis (1997).
\textsuperscript{220} Jongman, 104.
\textsuperscript{221} For this information on farming methods and equipment, see Ciarallo (1999), 89.
\textsuperscript{222} Laurence reports that ornamental gardens occupy 5.4\%, whereas K. Greene reports 8\%. They agree that commercial gardens occupy 9.7\%. Laurence, 67.
paper—a number of them will be mentioned in upcoming sections—I can provide one illustrative example of this trend. A residence known as the House of the Ship Europa (I.xv.3), consisting of two connected houses with a large open area in back (31 m by 55 m), boasts of a substantial garden with a variety of intercultivated plants and trees. Figure 3.4 is a plan of the garden with lower-case letters indicating plant species and capital letters indicating crops. Each black dot represents the position and size of a root cavity. K. Greene believes that this garden’s capacity would have exceeded the needs of the family and that they may have sold their surplus produce.

Grain

In 343 B.C.E., the Romans accepted the formal submission of the Campanians largely due to the cereal wealth of the region and the potential that it had as a source of grain for Rome. Grain from Campania was, indeed, periodically shipped to Rome to alleviate particular spells of famine. In fact, even into the fourth century C.E., Campania was still known as the cellarium ruranti Romae. Cereal production, although faced with some competition from viticulture and other such cash crops favored by the owners of wealthy villas, dominated the booming agricultural industry of Campania.

Various locally-produced grains included rye, a good bread grain that became popular in later times; millet, which was considered an inferior bread wheat but was still used; and barley, which was usually eaten in the form of porridge or kneaded patties. However, wheat was preferred for the

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223. Greene, 96.
224. Ibid., 97.
227. Mayeske, 30.
production of well-aerated bread because of its quantity and quality of gluten. There existed three principal varieties of wheat, all of which belong to the genus *Triticum*: einkorn wheat, emmer wheat, and spelt. Einkorn wheat was known as the original wild wheat, *Triticum monococcum*, characterized by its poor quality grains and poor yield. Emmer wheat included *Triticum dicoccum*, a hulled variety popularly known as the original Roman *far*, as well as other naked sub-species that gained in popularity because of difficulties in freeing the *far* grains from their husks, such as *Triticum durum* (macaroni wheat) and *Triticum turgidum* (rivet or poulard wheat). The favorite bread-making wheat was, nonetheless, *Triticum vulgare*, a naked variety of spelt and the ancestor of modern wheat. While Campania also grew high quality emmer wheat, its prized cereal crop was this *Triticum vulgare*, which thrived in the rich coastal plains that were seldom—if ever—waterlogged or pestilent.²³⁰ *Triticum vulgare* was particularly popular for two main reasons. For one, it is a naked sub-species of spelt, meaning that its glumes are easily separated from its caryopses.²³¹ Husked wheat grain cannot be freed from its husks without roasting, a process which unfortunately destroys the gluten proteins that are necessary for the production of well-aerated bread. Hence, not only does naked wheat simplify threshing and the preparation of grain for milling but it also allows for the production of higher quality flours and more aerated bread. The second attraction of *Triticum vulgare* is quite simple—when put through a series of millings and sievings, the grain produces one of the highest quality flours, *similago*. The other comparable flour is *silo*, produced from a wheat that shares its name.²³¹

In the Roman world, whiter flour was considered better flour. The whiteness or quality of flour was directly related to the quantity of the dark and fibrous bran remaining from the caryopses.

²²⁸ Rickman, 6.
²³⁰ Ciarallo (2000), 53.
²³¹ Mayske, 39.

For references to *similago*, see Pliny (NH XVIII 82, 89) and Cato (Agr. 75).
For references to *silo*, see Pliny (NH XVIII 61) and Cato (Agr. 35.1).
The bran content was minimized by repeated milling and sieving and the use of higher quality grains. *Triticum* wheat could produce four grades of flour: *similago* and *pollen*, the finer flours; secundarium, a second-rate flour with more bran; and *furures*, whose name was often analogous to bran and considered unusable. The *silago* wheat mentioned above produced three flours: *siligo*, a fine flour comparable to *similago*, cibarium, a second-rate flour comparable to *secundarium*, and *furures*.

The layout of the bakery and the various means by which bakers sold their product, while relevant to a discussion of the place of bakeries within the economy and within the larger food production system, have already been discussed in detail in Chapter II. However, I have not given their production levels sufficient treatment.

While there would have been tremendous variation from year to year, Jongman calculates that the cereal industry of Pompeii would have produced a net annual weight (production minus the seeds needed for the following year) of 500 kg per hectare, or a total harvest of approximately 7,500 metric tons of grain.\(^{233}\) He estimates that the average person consumed 200 kg of grain per year and, therefore, that the cereal industry of Pompeii could feed 37,500 people. This number seems a little high, especially given that the sources I have consulted have estimated the population of Pompeii at between ten and twenty thousand.\(^{234}\) It is possible that Jongman’s estimate of average consumption is low; Bakker reports that Romans entitled to the grain dole received five *modii* per month, or approximately 43.5 liters or 33.5 kg of grain.\(^{235}\) This comes to approximately 400 kg per year, as opposed to the 200 kg reported by Jongman. The population estimate for Pompeii would then rise to 18,750 according to Jongman’s calculations, which seems more consistent. While it seems

\(^{232}\) For a reference to *pollen*, see Pliny (NH XXII 127).
\(^{233}\) Jongman, 135.
\(^{234}\) Bakker estimates the population to have been 10,000, whereas Finley reports 20,000.
\(^{235}\) See Bakker, 13 and Finley, 139.
plausible that excess grain may have been shipped to Rome, very little was in fact exported, as will be discussed below.\textsuperscript{236}

Back at the bakery, 8.2 to 8.5 kg of bread could be produced per modius of grain. Bakker performed a series of calculations to determine the production of an average bakery and the number of Pompeians whom the average bakery supplied under the assumptions that only twenty-one bakeries were definitive mill-bakeries and that the population was ten thousand.\textsuperscript{237} With a total of slightly more than one hundred and ten mills,\textsuperscript{238} each mill would have served approximately ninety individuals (or one hundred and seventy, according to our newly calculated population of 18,750), and the average bakery would have served 270 to 360 individuals. The average animal-powered mill can grind from ten to twenty-five kilograms of grain per hour. If the average Pompeian required five modii of grain per month, each millstone would have been required to grind approximately ninety kilograms of grain per day, which would take from three and a half to nine hours.\textsuperscript{239}

Despite its wealth of grain, Pompeii did not usually export its produce. From time to time, Campania would come to Rome's aid during periods of famine, but in general, the overland transport of heavy goods such as grain was prohibitively expensive. Rome greatly preferred to obtain its grain from Africa and other provinces by sea. As G. Vitelli so concisely states, "Italian grain was priced right out of the Roman market."\textsuperscript{240} Rather than exporting their grain, it seems that Campania enjoyed a lasting self-sufficiency. Jongman explains that "local agricultural production roughly equals local consumption, both in quantity and in composition. The amount of import and export must have been limited, and probably largely concerned adjustments to fluctuations in output.

\textsuperscript{236} Cf. infra pages 67-68.
\textsuperscript{237} Bakker, 13-14.
\textsuperscript{238} This estimation anticipates the number of mills still undiscovered in the unexcavated regions of the city.
\textsuperscript{239} Bakker, 13-14.
from one year to the next.\textsuperscript{3241} Given the scarcity of *burea* within the city, most of this grain would likely have been stored in the vicinity of its rural production sites, as has been previously and will be further discussed.\textsuperscript{342}

I must credit the following query about bread production levels at Pompeii to Margareta Staub Gierow and Thomas Staub, two Pompeian archaeologists from Sweden with whom I had an impromptu dinner in Pompeii. Although they were unsure of the exact figures at the time, they raised an interesting point regarding the ratio of bakeries to population at Pompeii. They noted that this ratio was strikingly higher than that of either Herculaneum or Ostia, the other two cities for which there is enough information about bakeries to make such a comparison. I decided to investigate this dinner-time discussion with respect to Pompeii and Ostia.

The following figures are all derived from Bakker’s book, *The Mill-Bakeries of Ostia*, in the interest of being as consistent as possible. Bakker sets the population of Pompeii at the time of its destruction to 10,000. He reports that the excavations have revealed twenty-one definitive mill-bakeries with a total of seventy-five mills. Since only two-thirds of the city have been excavated, he estimates that there may have been a total of thirty bakeries and one hundred and ten mills. On the other hand, Ostia’s population was approximately 40,000 in the second century C.E. and Bakker estimates that the six to eight bakeries and sixty to sixty-five mills that have been discovered at present correspond to a total of twenty bakeries and 178 mills in the second century C.E.

The following person-to-mill and person-to-bakery ratios are as follows: for Pompeii, there were approximately 91 people per mill and 333 people per bakery; for Ostia, there were approximately 225 people per mill and 2,000 people per bakery. Even if Bakker is incorrect about the population of Pompeii and it was in fact twice as high, then the production figures for Pompeii

\textsuperscript{241} Jongman, 202.
\textsuperscript{342} Cf. *supra* pages 26-29.
\textsuperscript{241} Cf. *infra* pages 71 and 75.
still fail to meet those of Ostia. While these numbers are by no means precise, considering that I have not taken into account the size of the mills at these establishments nor does my data correspond to the same time period for each city, there is nevertheless a considerable difference that begs some explanation.

My initial reaction to these figures was that there must have been some sort of export—either of grain or bread—from Pompeii to account for the high number of bakeries in the city. However, it seems instead that the bakeries of Ostia operated at a more industrial level and were capable of producing far more flour and bread than the Pompeian bakeries, thereby necessitating fewer workshops. For one, the Ostian millstones are generally larger than the Pompeian ones; the average diameter and height of the catilli are 0.80 m and 0.80 m, as opposed to the Pompeian dimensions of 0.70 m and 0.70 m, and the average diameter and height of the metria are 0.95 m and 1.15 m, as opposed to the Pompeian dimensions of 0.75 m and 0.60 m.243 The millstones at Ostia also tend to be spaced at greater distances from one another. Larger and stronger animals may have operated these mills, or perhaps more mills tended to be in operation at once. The flour collection areas might also have been larger, which would account for the increased spacing. It is difficult to verify this fact because the Ostian millstones, unlike the Pompeian millstones, did not tend to have masonry bases but rather made use of wooden flour receptacles that are now lost.244 Finally, the Ostian millstones may have been in operation for a longer duration of the day. Recall that Bakker estimated that the Pompeian bakeries operated for three and a half to nine hours per day.245 Perhaps the Ostian millstones were in operation for longer than nine hours, possibly requiring more workmen and draft animals? In short, the more industrial Ostian bakeries and millstones were capable of far greater production than those at Pompeii.

243 Bakker, 110.
244 Ibid., 110.
245 Cf. supra page 67.
Grapes and Wine

Wine production was particularly popular both for smaller farmers and wealthy villa owners, as well as in small horticultural plots and vineyards within the city, due to its relative profitability. Vines required particularly attentive care and a high level of investment relative to cereals and olives,\textsuperscript{246} but as Cato points out in \textit{De Agricultura}, they were the most profitable crop in antiquity: “If you ask me what is the best kind of farm, I should say: a hundred \textit{inuera} of land, comprising all sorts of soils, and in a good situation; a vineyard comes first if it produces bountifully wine of a good quality” (\textit{Agr.} 1.7).\textsuperscript{247} Pompeian wine was also widely exported, with Rome being a major customer, as previously discussed in this chapter.\textsuperscript{248} Edicts such as that of Domitian in 92 C.E.,\textsuperscript{249} while not directly referring to Pompeian food production, were frequently passed with the aim of limiting the expansion of vineyards at the expense of cereals and offer some indication of the tremendous popularity and profitability of viticulture.

The ventilated and well-exposed slopes of Vesuvius were especially well-suited for the growing of grapes. On the slopes, the vines were cultivated in rows and on frameworks. In the more humid plains, vines were supported on poplar and elm trees in order to facilitate the maturation of the grapes.\textsuperscript{250}

Analysis of root cavities has allowed for the identification of a number of horticultural plots and vineyards within the city. At private homes, varieties of eating grapes were grown on pergolas, many of which shaded \textit{triclinia} or lined the perimeters or pathways of peristyles. An open area

\textsuperscript{248} Cf. \textit{supra} pages 56 and 62.
\textsuperscript{249} This edict prohibited the expansion of Italian vineyards and ordered the destruction of half the vineyards in the provinces. One of many legislations restricting viticulture. See Duncan-Jones, 35. Ciarallo (2000), 60.
immediately north of the amphitheater, named by early excavators as the forum boarium, is now thought to have been a commercial vineyard.\textsuperscript{251} The vines were grown in organized rows, each plant approximately four meters from its neighbors and supported on a wooden stake. Some olive and fruit trees were also planted between the second and third rows of vines. One corner of the vineyard, next to the owner’s home, housed a wine-pressing room with ten large, sunken dolia used for the fermentation of the grapes.

As seen in the commercial vineyard north of the amphitheater, establishments involved in the production of wine required spaces for both storage and fermentation. Typically, subterranean areas equipped with vats and sunken dolia could provide the necessary cool space for the storage of not only grapes, but of olive oil and grain. Reference was made to these cellars as cellae vinariae (for wine) and oleariae (for olive oil). These rooms, identified by the presence of sunken storage and fermentation dolia, equipment for the production of wine and olive oil (for example, presses), and various agricultural implements\textsuperscript{252} provide archaeological evidence for the identification of wine and food production at villas and other establishments.

Additional archaeological evidence for wine production includes root cavity analysis, storage amphorae, and pictorial representations of wine making. For example, the discovery of three large amphorae at the House of the Vettii (VI.xv.1), labeled with respect to date and both the cella vinaria and jar from which their contents were taken, reveal the operation of some form of large-scale wine merchandising.\textsuperscript{253} This evidence is strengthened by a fresco in the house depicting nine putti performing a number of tasks related to wine production, including gathering grapes from a pergola, transporting grapes with the help of a goat, and pressing the grapes (see Figure 3.5).

\textsuperscript{251} Greene, 95-96.
\textsuperscript{252} Jongman, 112-120.
\textsuperscript{253} Mayeske, 79.
In short, wine production at Pompeii was a profitable enterprise in which wealthy villa proprietors, local farmers, and city residents alike participated. Unlike many industries at Pompeii, Pompeian wine was widely exported and in considerable demand at Rome.\textsuperscript{254} Grapes were cultivated primarily on the hills and slopes of Vesuvius, but also on the Campanian plains, within the city in small horticultural plots and commercial vineyards, and casually along pergolas in the peristyles of residences.

Olives

Olives and olive oil were an extremely important component of the Pompeian diet, being a chief source of daily fat. They were consumed as oil, as whole olives sweetened with brine, or dried, crushed, and flavored with herbs.\textsuperscript{255} Olives also had a number of non-dietary uses. For example, olive amurca (dregs—a liquid byproduct of pressing) was mixed into the floor and wall mortar of granaries to protect the grain from insects. Cato instructs that “to keep weevils and mice from injuring grain, make a slime of amurca with a little chaff added, leaving it quite thin and working thoroughly. Cover the whole granary with the thick slime, and then add a coat of amurca over the whole. After it has dried, store cooled grain there, and the weevils will not injure it” (\textit{Agr.} 92).\textsuperscript{256} The residue from the oil press was also burned in lamps and olive wood was used in cabinet-making. Finally, immature green olives could be pressed to produce an oil used as the base for unguents and perfumes.\textsuperscript{257}

Olive trees are fairly resilient and require little attentive care aside from careful pruning.

They prefer calcareous soil and were consequently a favorite crop in the Lattari Mountains in the

\textsuperscript{254} Cf. \textit{supra} pages 56, 62, and 70.
\textsuperscript{255} Ciarallo (2000), 57.
\textsuperscript{256} Cato.
\textsuperscript{257} Ciarallo (2000), 57.
Vesuvian region, as confirmed by the many finds of oil presses and oil production sites. Due to their size and the extent of their root systems, they tended to be spaced at a fair distance from each other, allowing for farmers to intersperse their trees with other crops. Most commonly, rows of olive trees were interspersed with grape vines, cereals, and legumes.

For the most part, olive pressing took place in the countryside surrounding Pompeii. While frescoes from the House of the Vettii offer some evidence of olive pressing operations within the city, R. I. Curtis points out that this evidence refers to the production of oils destined for perfumes and unguents and says nothing about the production of food oil. Perhaps one explanation of this phenomenon is the cost of an olive press; these machines are believed to have been rather expensive and reserved almost exclusively for the kind of high-volume production that took place at villas and similar large-scale rural production sites.

Cato cites Pompeii and Nola as the best places to purchase both olive presses and millstones (Agri: 135.2). There were many varieties of olive presses, including the *trapezium* (roller-mill), the wedge press, and the lever-and-windlass press commonly used for pressing grapes. The *trapezium*, for example, consisted of a lava trough (*mortarium*) with a central pillar (*millarium*), which supported a horizontal axle (*cupo*) with a plano-convex stone (*orb*) at each end (see the reconstruction of a *trapezium* in Figure 3.6). When turned by hand, the stones could be raised or lowered to avoid crushing the olive pits. The oil was then separated from the *amarra* and stored and transported in amphorae. While rooms used for oil pressing and storage tended to face south, they were still kept away from the heat, and storage areas were commonly found underground (note the *oleariae* mentioned in the section on grapes and wine). Heat causes oil to thicken and to become rancid and bitter.

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258 Ciarallo, 57.
259 Curtis (1997).
260 ibid.
261 Ciarallo (2000), 57.
Garum

Given the readiness with which fresh fish spoils and the importance of fish as a source of fat and protein in the Pompeian diet, it was extremely common to consume fish in the form of a salted fish sauce known as garum. Garum was produced by the fermentation of whole small fish and the viscera, tails, and heads of larger fish in salt for as long as three months. The sauce contained vitamins, nitrogen, and amino acids and was used both in medicines and as a condiment for the salting and seasoning of meat, fowl, vegetables, fruit, and other fish.²⁶²

Pliny extols the quality of Pompeian garum, which included four different varieties—garum, liquamen, alca, and muria (NH XXXI 94, 95-97).²⁶³ Over two-hundred one-handled terracotta vessels (urnei) have actually been found throughout Pompeii and Herculaneum, labeled as containing one of the four fish sauces. Thus, it seems as if Pompeii operated a very successful garum industry.

However, no archaeological evidence of a fish saltery at Pompeii (such as salting basins) exists to this day. Similarly, only one garum shop (at I. xi. 8) has been definitively identified. This shop was identified on the basis of the presence of sunken dolia, a fish washing basin by a gutter, and amphorae containing the desiccated remains of fish sauce.²⁶⁴

Two theories have been presented to explain the lack of a fish saltery at Pompeii. On the one hand, the Pompeians may have imported fish sauce in its crude form, possibly from Spain.²⁶⁵ On the other hand, the fish salteries may have been located outside of the city, along the coast at the city’s port facility on the river Sarno, in close proximity to the source of the fish. Regardless of the manner in which the garum workshops received the crude sauce, it seems clear that no salting occurred within the city and that the garum workshops functioned in the role of a middleman; they

²⁶³ Curtis (1997).
²⁶⁵ Curtis (1984), 74.
received the raw *garum* from outside of the city and then refined and bottled the product within the shop. Some *garum* may have been sold on the premises. However, the only known *garum* shop at Pompeii did not have a sales area and large quantities of *garum* were certainly sold in the fish markets—such as the *macellum*, whose drains contained quantities of fish scales—and exported.

*Conclusions: Bakeries in Context*

The baking industry shares a number of common features with the wine and olive oil industries. The majority of the crops were grown, cultivated, and stored outside of the city. The cool, subterranean *cellae vinariae* and *olerariae* may actually have been used for the storage of grain at times, which would help to explain the general lack of proper *horma* at Pompeii. Like the baking industry, the presence of specialized wine or oil production machinery is seldom seen in private homes, with the exception of wealthy residences and villas. This is likely due to both the cost of the machinery, the cost of hiring someone to operate the machinery, and the space required for such a workshop, however small. One would also need connections within the agricultural community in order to obtain the crops and raw resources needed for private wine, oil, or bread production.

However, there are also a number of differences between the wine and olive oil industries (which operated in a very similar fashion) and the baking industry. For one, while the elite invested in all three of the industries, the majority of wine and oil production facilities are located in rural villas and workshops, whereas bakeries are largely concentrated within the city. This is likely due to the daily demand for bread within the city, as well as the increased perishability of the bread relative to wine and oil, which can be stored for much longer without spoiling. For much the same reason, the wine industry was able to participate in both small-scale trade within Campania and large-scale

266 Cf. supra pages 26-29, 67-68, and 71.
trade throughout the Mediterranean, an activity in which the bakeries could seldom (if ever) participate. Finally, in contrast to the baking industry, small commercial vineyards and grape cultivation at private homes did occur within the city.

The bakeries share a considerable amount in common with the *garum* industry. For example, both industries were organized around *collegia*, evidence of the bakers' involvement was discussed in Chapter II\textsuperscript{267} and evidence for the participation of *garum* producers comes from an election notice in the vicinity of the Triangular Forum.\textsuperscript{268} Secondly, there are many parallels between their production strategies. Both industries made use of urban workshops for the production of their final products. However, these workshops served in some respect as middlemen; they received their raw material—grain for bakers and crude fish sauce for *garum* producers—from outside of the city—the agricultural plains for bakers and the fish salteries along the Sarno or Spain for the *garum* producers—and then had the option of employing independent merchants to sell the product. In short, both industries produced their raw material in close proximity to its source, rather than within the city, and then completed the production in urban workshops with greater commercial advantages. However, like the wine industry, the preservability of *garum* allowed for its participation in large-scale trade, which was much less practical for the bakeries.

\textsuperscript{267} Cf. *infra* page 47.
\textsuperscript{268} Curtis (1984), 59.
The organization of urban space—that is, the physical distribution of a city's various components, including the residential, the commercial, and the administrative—is a social product. This statement applies regardless of whether a city was planned in advance. The relative locations of structures reflect their interactions with one another. D. L. Clarke points out that "the distribution of man over space is not haphazard (...) Man locates by the social activities he creates and sustains through culture." 269 Similarly, Laurence states that "by studying urban space in Pompeii, we are examining the social relationships and social choices of Pompeian society in space." 270 Zanker refers to this concept as a townscape, a term that I will borrow throughout this chapter. He defines a townscape as "the outward appearance of a city in the most comprehensive sense, meaning not so much the architecture of single buildings as their function within the total context of public space (...) the town as a concrete instance of inhabited space." 271
This chapter will investigate the position of the bakeries in the Pompeian townscape. I hope that it will shed some light on the logic behind their physical distribution and thereby explain some of their more important needs and interactions.\textsuperscript{272}

**The Layout of Pompeii**

As already described in Chapter I, the city of Pompeii is ellipsoidal in plan, its east-west axis measuring 1270 m and its north-south axis 730 m.\textsuperscript{273} One explanatory theory, as accepted by Clarke, is that the city adopted this shape as it expanded to the north and east from the original Greek and Etruscan settlement located in the southwest corner of the city. This ancient core dates roughly to the sixth to fifth centuries B.C.E.\textsuperscript{274} and includes the forum, a series of more irregular streets, and the Triangular Forum (see Figure 4.1 for a map of the three possible expansion phases of the city). The first expansion of the city may date roughly to the late fourth to the second century B.C.E.—the period between the Samnite occupation of Campania and the early Roman period—and consist largely of uniting two separate sectors of the original city.\textsuperscript{275} The second and most significant expansion may then date to the first centuries B.C.E. and C.E. and correspond to the final Roman occupation.\textsuperscript{276}

As evident in Figure 4.1, the first two phases of the city are characterized by more irregular streets organized around the central forum. It was not until the final Roman expansion, estimated to have occurred from 80 B.C.E. onward, that a stricter orthogonal grid system with perpendicular streets enclosing square or rectangular \textit{insulae} was employed. The first ring of new \textit{insulae} ranges

\textsuperscript{272} Please note that, in my analysis of the distribution of the bakeries, I do not make distinctions between bakeries of different sizes. Further analysis could certainly be done by breaking down the bakeries by size and applying this new variable to the many analyses included in this paper.

\textsuperscript{273} Clarke, 210.

\textsuperscript{275} Ibid., 210.

\textsuperscript{276} Ibid., 210.
from curved to rhomboidal in shape and would have thus squared off the city and allowed for a grid system to be introduced. The subsequent *insulae* are more rectilinear. The Via di Stabia was established as the primary *cardo* or the main north-south artery and two streets, the Via di Nola and the Via dell'Abbondanza, were extended to form the primary *decumani* or major east-west arteries. These streets are not perfectly aligned with the compass points, however, likely due to an attempt to align them with the forum, organized around a northwest to southeast axis. The remaining streets and *insulae* were established running parallel to either the primary *cardo* or primary *decumani*, forming the more regular grid pattern characteristic of Regiones I to VI and IX.

While I will now attempt to outline the basic distribution patterns of the residential and commercial districts of the city, it is worth noting that Pompeii shows little evidence for such socioeconomic zoning. As A. Wallace-Hadrill explains, Pompeii was “a confused jumble of shops, workshops, crafts, horticultural plots, and houses across the whole city, with no real attempt at segregation or concentration...the overwhelming pattern is of a mixed distribution of the various types of commercial and artisanal activity, whether bakers, fullers, taverns and inns, or even...brothels in among the residential areas of the city.”

While the majority of the city was to some degree residential, some basic distinctions can be made between the residential areas of different economic brackets. For instance, many of the poorer residences—likely no more than simple wooden frameworks—were located within the older part of the city, particularly to the east of the forum. In addition, merchants could often live in lofts or mezzanines (*pergulae*) above their shops, many of which were located to either side of the entryways (*fauces*) of wealthy residences in the city-center. These wealthy residences situated along the more important commercial thoroughfares and in the principal commercial districts rank among

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278 Zanker, 42.
the grandest of the homes in the city.\textsuperscript{279} However, the region most dominated by wealthy, palatial homes is likely Regio VI. This region was built up in the second to first century B.C.E. when wealthy Oscan patricians sought to emulate the Hellenistic fashion of the time and could take advantage of the large, rectangular \textit{insulae} of Regio VI to construct palatial homes.\textsuperscript{280} Take, for example, the luxurious House of the Faun, which occupied an entire \textit{insula}. While the homes in this region were not typically on that scale, they generally ranged from one eighth to one half of an \textit{insula} and rivaled the House of the Faun in quality of construction and decoration.\textsuperscript{281}

The presence of commercial activity is felt throughout all of these residential regions and, indeed, throughout the entire city. Shops are particularly concentrated along the major arteries and at major intersections, as well as in areas of high density building around important urban features, such as the forum, the baths, the theaters,\textsuperscript{282} and the city gates where travelers would enter the city.\textsuperscript{283} However, as Clarke explains in \textit{Spatial Archaeology}, "the fact that many shops were also distributed in markedly residential areas does indicate that values other than economic were considered."\textsuperscript{284} In other words, while the principal commercial areas are no doubt those with the greatest economic advantages, other factors, such as the availability of workshop space or the proximity to raw resources, can be equally or of greater importance. This point will be discussed further in the upcoming examination of the bakeries.

As testimony to the intermingling of residential and commercial land use at Pompeii, a significant number of the residences housed some form of commercial activity. In fact, according to a study by Wallace-Hadrill, only 31\% of the houses at Pompeii were "immune" from the penetration

\textsuperscript{279} Zanker, 41-42.
\textsuperscript{280} \textit{Ibid.}, 32-34.
\textsuperscript{281} \textit{Ibid.}, 41.
\textsuperscript{282} Clarke, 208.
\textsuperscript{283} \textit{Ibid.}, 216.
\textsuperscript{284} \textit{Ibid.}, 208.
of the commercial. He suggests that this number might actually be an overestimation, considering that the existing archaeological evidence cannot possibly account for all commercial activity in the city. Wallace-Hadrill’s study included a breakdown of residences with commercial usage by size. Figure 4.2 is an illustration of Wallace-Hadrill’s ‘quartile system,’ in which he breaks down a sample of 122 houses into four size categories: Quartile 1 (10-45 m², average 1.4 rooms), Quartile 2 (50-170 m², average 4.7 rooms), Quartile 3 (175-345 m², average 8.4 rooms), and Quartile 4 (350-3,000 m², average 16.4 rooms). As illustrated in his graph, Wallace-Hadrill notes that shops (tabernae) are located in all four quartiles. However, the smallest homes with commercial activity are almost entirely shops. The opposite trend exists for horticultural plots—they are almost exclusively in the top quartile of the homes, likely as a result of space requirements (138 m² is the average size for a horticultural plot). Officinali or workshops (including bakeries, fullonicae, etc) fall in between the two trends; they tend to require a moderate amount of space (the average size is 76 m²) and are consequently located in the medium-large homes. The proportion of houses with no commercial activity is fairly high and equal for the top three quartiles but very low for homes in the lowest quartile.

The Distribution of the Bakeries

Bakery to Bakery

Figure 4.3 illustrates the distribution of bakeries at Pompeii, including both pastry shops and conventional bakeries. As measured from the map, the average distance from a bakery to its nearest

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285 Wallace-Hadrill, 137.
286 Ibid., 137.
287 Ibid., 137.
neighboring bakery is 46.99 m. The closest two bakeries are only 9.68 m apart and the bakery that is furthest from its nearest neighbor is 183.87 m away.

The bakeries seem to be distributed throughout the city with a greater concentration in the center of the city, in the vicinity of the forum, in the northeast corner of Regio VII, in the southwest corner of Regio IX, and in the theater district. There also appear to be more bakeries in the western side of the city. While it is impossible to tell for certain considering that large sections of the eastern side of the city remain unexcavated, the lack of bakeries in the outer reaches of Regiones I, II, and IV seems to confirm the observation. In general, the bakeries are clustered in a large band around the forum area; there are almost no bakeries in the original core and very few bakeries in the outer reaches of the city. There is also slightly increased concentration of bakeries along certain major thoroughfares, including the Via degli Augustali, Via di Stabia/Via di Vesuvio, Vicolo di Mercurio, and Via delle Terme/Via della Fortuna/Via di Nola, which is likely due to the increased traffic (and therefore, commercial advantage) of major arteries, as well as the facilitated transport of grain from outside of the city.

Pastry Shop to Pastry Shop

There are only six bakeries definitively identified as pastry shops.\textsuperscript{288} Figure 4.4 illustrates their distribution. As measured from the map, the average distance from a pastry shop to its nearest neighboring pastry shop is 47.31 m, which is strikingly similar to the average distance between bakeries in general (46.99 m). The closest two pastry shops are only 9.68 m apart and the pastry shop that is furthest from its nearest neighbor is 93.55 m away. Recall that pastry shops are included

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\textsuperscript{288} Given their small sample size, some of the trends established for pastry shops become speculative. I acknowledge that, at times, differences between groups (between subsets of pastry shops or between pastry shops and bakeries in general) may not be statistically significant. Further statistical verification of the trends is needed.
in the earlier general bakeries category. This analysis compares pastry shops as a subset of bakeries (rather than a separate entity) to the larger bakery category.

Four of the six pastry shops are clustered in that main commercial area in the northeast corner of Regio VII. The other two are located in Regio VI in fair proximity to the forum. The pastry shops are not as evenly distributed as the bakeries; there are no pastry shops located in the further reaches of the city and there is much greater clustering in the general forum area. This trend can be explained by the pastry shop’s smaller workspace requirements. Since pastry shops do not tend to operate the same number or size of mills typical of proper bakeries (in fact, some are completely without mills) and since they often have smaller baking ovens, they require far less space than bakeries. Hence, while many bakeries are located at a distance from the main commercial center where space is cheaper and more readily available, there is very little incentive for a pastry shop to do so. It is far more important to them to set up shop in an area of greater commercial advantage.

*Bakeries to Pastry Shops—A Comparison of Components*

<table>
<thead>
<tr>
<th>Component</th>
<th>Total # for all bakeries</th>
<th>% of bakeries</th>
<th>Total # for all pastry shops</th>
<th>% of pastry shops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales area</td>
<td>24</td>
<td>80</td>
<td>5</td>
<td>83.33</td>
</tr>
<tr>
<td>Living quarters</td>
<td>17</td>
<td>56.67</td>
<td>3</td>
<td>50</td>
</tr>
<tr>
<td>Mills</td>
<td>21</td>
<td>70</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Stables</td>
<td>18</td>
<td>60</td>
<td>2</td>
<td>33.33</td>
</tr>
<tr>
<td>Lattines</td>
<td>9</td>
<td>30</td>
<td>3</td>
<td>50</td>
</tr>
<tr>
<td>Shrines</td>
<td>17</td>
<td>56.67</td>
<td>2</td>
<td>33.33</td>
</tr>
</tbody>
</table>
Table 1 reports the number of bakeries and the number of pastry shops that include various features (sales areas, living quarters, mills, stables, latrines, and shrines) and the overall percentages to which these figures correspond.

Sales areas are found in 80% of the bakeries and in 83.33% of the pastry shops. While these figures are very similar and there may be no real statistical difference, the percentage for pastry shops seems slightly higher. This is most likely due to the fact that pastry shops are more commonly located in principal commercial areas and therefore, it follows that they are more likely to contain sales areas.

56.67% of bakeries have living quarters, whereas 50% of the pastry shops have living quarters. These figures are quite similar but are slightly lower for the pastry shops. This is, again, likely due to the pastry shops' greater general proximity to the forum. With less available space and more expensive real estate in this region, the pastry shops are less likely to make room for living quarters. Nevertheless, it is quite possible that upper lofts, as would likely be favored by small shops in crowded commercial areas, may have been lost. These calculations for living quarters may, consequently, be incorrect.

70% of the bakeries have mills, whereas not one of the pastry shops has mills. This is directly related to the function of the two establishments: pastry shops did not go through the same volumes of flour and tended to have either smaller slave-operated mills or no mills at all. Pastry shops may have purchased much of the flour that they needed to make their pastries. Also, we must take into consideration that an absence of mills (alternatively, the presence of a small oven or small mills) is often used to identify a particular bakery as a pastry shop.

Stables are located in 60% of the bakeries and only in 33.33% of the pastry shops. This trend is related to the trend seen in mills; pastry shops did not tend to operate the large animal-powered mills seen in the bakeries and, consequently, would have little need for a stable. One then
might wonder why 33.33% of the pastry shops had stables if none of them had any traditional mills.

These stables may have been used to house a single animal needed to power a smaller mill or to house animals used for the carting of supplies or flour to the pastry shop or the transportation of the finished product to a temporary sales stand. In other words, the presence of a stable does not necessarily mean that animals were being used to turn large mills.

30% of the bakeries and 50% of the pastry shops had latrines.

56.67% of the bakeries and 33.33% of the pastry shops had shrines or lararia of some kind.

Bakeries to Fountains and Fountain Ranges

Figure 4.5 illustrates the distribution of the bakeries relative to the distribution of the public fountains. The blue regions encircling the fountains represent the fountain supply ranges, or the districts in close enough proximity to have convenient access to the fountain, as calculated by Zanker. 289 Recall that the public fountains served as primary water sources for those bakeries—indeed, the vast majority—that did not have their own private aqueduct pipelines. 290

The average distance between a bakery and its nearest fountain is 37.31 m. The bakery closest to a fountain is only 6.45 m away and the bakery that has to travel the furthest to reach a fountain is 93.55 m away.

The fountains are spread fairly evenly throughout the city.

Nine bakeries or 30% of the bakeries do not fall within a fountain range. However, seven of these bakeries fall within a few meters of a nearby fountain range and, therefore, their exclusion from a fountain range may actually be due to inaccuracies in my map. For instance, each dot represents a bakery but does not, in some cases, cover the complete area of the bakery. Hence,

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289 Zanker, 120.
290 Cf. supra pages 40-42.
whereas a dot may not fall within the fountain range, this is not to say that the bakery itself does not fall within it.

Seventeen bakeries (56.67\%) fall within a single fountain range.

Four bakeries (13.33\%) were lucky enough to fall within two fountain ranges.

The above breakdown of the number of fountain ranges per bakery emphasizes the importance of a local water source to a bakery and, perhaps, the relatively low rate of complete dependence on private aqueduct pipelines or alternative sources of water such as wells and cisterns. It also suggests that a single nearby fountain was sufficient for proper operation of the bakery.

On the other hand, when analyzing the number of bakeries per fountain range, we get the following results:

Twenty-six fountain ranges do not include a bakery. Three ranges include one bakery. Five ranges include two bakeries. Finally, four ranges include three bakeries. For ranges with bakeries, the average number of bakeries per range is 2.08. This data suggests that bakeries tend to cluster around particular fountain ranges. This confirms the previous observation about the clustering of bakeries in particular key locations, as opposed to the even distribution of bakeries throughout the city.

I was curious whether there was any correlation between the bakeries that do not fall within a fountain range (and therefore, may have an alternative water source) and the wealth of the baker. This question came to mind because alternative water sources at Pompeii were largely limited to groundwater wells, which were difficult to sink given that the city is situated atop a spur of lava; rainwater cisterns, which would probably not provide sufficient water for the operation of a bakery; and private aqueduct pipelines, which were fairly expensive.

Upon investigation, I noticed that four of the nine bakeries (44.4\%) that do not fall within a fountain range are either located in converted homes or are connected to separate homes (two
converted and two connected), factors that might be considered as indications of higher relative wealth. Unfortunately, this 44.4% is actually lower than the overall average of 60% seen in the larger bakery pool. In other words, either this is not a useful indicator of wealth, or there does not appear to be any particular correlation between being situated outside of a fountain service range and wealth. Perhaps these bakeries were simply ill-situated or were fortunate enough to have access to sufficient cistern or well water. Perhaps the baker already owned his house and the position of this house, without regard to the proximity of local water sources, determined the location of his bakery. Alternatively, this may be due to an underestimation of the extent of a fountain range at Pompeii.

*Pastry Shops to Fountains and Fountain Ranges*

The average distance from a pastry shop to its nearest fountain is 31.18 m, which is slightly less than the average distance of 37.31 m for bakeries. The pastry shop nearest a fountain is only 12.90 m away (6.45 m for bakeries) and the pastry shop furthest from its nearest fountain is 54.83 m away (93.55 m for bakeries). Figure 4.6 illustrates this distribution.

Only one of the pastry shops (16.67%, versus 30% for bakeries) is not located within a fountain range, although it is so close that its exclusion from the range could simply be due to errors in mapping. Four of the pastry shops (66.67%, versus 56.67% for bakeries) are located within a single fountain service range (one of which is quite close to being included in a second range). Finally, the last pastry shop (16.67%, versus 13.33% for bakeries) is situated within the overlap region of two fountain ranges (and is quite close to falling within a third range as well).

Like bakeries, the majority of the pastry shops fall within a single fountain range. While a few pastry shops and bakeries fall within two fountain ranges, there are not really any definitive examples of a baking establishment of any kind falling within three fountain ranges. A greater
percentage of the bakeries do not fall within a fountain range, perhaps suggesting that the owners of the bakeries were generally more willing to travel further for water than the owners of pastry shops due to factors of greater importance to the bakers, such as the availability of workspace or proximity to the source of grain. Alternatively, the proximity of pastry shops to fountains may be simply a consequence of their concentration within the center of town, the location with the greatest number of fountains. In other words, this trend may have nothing to do with a difference in the importance or use of water in bakeries and pastry shops.

**Bakeries to Other Workshops**

Comparing the location of bakeries to the locations of other workshops in the city is important for identifying commercial districts. One would expect many parallels in their distributions.

Figure 4.7 illustrates the distribution of the wool-working workshops (including officinae lanificulariae, officinae tinctoriae, tectriniae, and fudlincae) relative to the bakeries and shows that they share the same general primary and secondary regions of concentration. These regions might consequently be identified as primary and secondary commercial areas. For both, the main concentration is in the city center, to the northeast of the forum, and in the northeast quadrant of Regio VII. Secondary regions include the eastern quadrant of Regio VI, the southern quadrant of Regio V, and the northwest quadrant of Regio I. There are almost no workshops of either kind in Regiones II, IV, VIII, and to the south and west of the forum in Regio VII.

There is not really a great deal of overlap between the locations of the bakeries and metalworking shops (see Figure 4.8). There are no metal workshops in the main commercial area shared by both wool-working shops and bakeries. Instead, there are a few metal workshops in the
northwest quadrant of Regio VII along the Via delle Terme/Via della Fortuna and in the northwest quadrant of Regio I along the Via dell'Abbondanza. In regions not generally occupied by bakeries and wool workshops, we find one metal workshop in the northeast corner of Regio I, one metal workshop to the southwest of the forum in Regio VII, and two metal workshops near the theaters in Regio VIII.

Figure 4.9 illustrates the distribution of the bakeries relative to the locations of all known workshops at Pompeii, including workshops other than those of the wool and metal industries (for example, *garum* shops). As expected, there is a general concentration of workshops and bakeries in what appears to be a primary commercial district near the forum. This region occupies much of the northeast corner of Regio VII and spills in the southwest corner of Regio IX. It is defined by the Via dell'Abbondanza, Via della Fortuna/Via di Nola, Via del Foro, and Vicolo di Tesmo. Additional secondary commercial areas include much of Regio VI (excluding the more northern reaches of the region, along the city walls) and the northwest corner of Regio I, with some commercial buildings in the remaining areas of Regio I and in Regio V.

Areas generally lacking in both workshops and bakeries include the area of Regio VII south and west of the forum, much of Regio VIII, and Regio II.

*Pastry Shops to Other Workshops*

Very similar results are seen here (see Figure 4.10) as seen when comparing the locations of the bakeries and other workshops. Four of the six pastry shops are located in the primary commercial center in the northeast corner of Regio VII. The other two pastry shops are found in a secondary commercial region in Regio VI where some of the general workshop spillover also occurs.
These two pastry shops are in close proximity to four metalworking shops and a wool industry workshop.

Bakeries to Caupona and Popinae

Studying the relative positions of the bakeries and caupona and popinae (inns or taverns) is important as a means of evaluating the extent to which caupona and popinae were centers of the bakers. Popinae were relatively small establishments set up for the sale of food and drink. While similar to popinae, caupona were slightly larger and often included accommodation for guests and travelers. While some caupona and popinae operated their own small ovens, others would certainly obtain their bread from local bakeries. The locations of the caupona and popinae also serve as indicators of the socioeconomic quality of particular areas, along with the brothels, which will be discussed shortly.201 These establishments were not considered to be the most proper or respectable of haunts. They were often seen as centers of popular entertainment, drinking, gossip, gambling, and prostitution, and were thus associated with the poor and the vulgar. As T. Kleberg explains in his book, Hôtels, restaurants et cabarets dans l'antiquité romaine, c'est d'abord et presque exclusivement pour la population simple et pauvre que des locaux de ce genre avaient de l'importance, et certainement une grande importance. En ce qui concerne Pompéi, il est fort vraisemblable que les conditions misérables d'habitation de cette couche de la population (leurs petites chambres louées ne leur donnaient guère la possibilité d'avoir un fourneau pour chauffer l'eau et préparer la nourriture) l'ont obligée à recourir dans une large mesure à ces établissements publics.202

201 Cf. infra pages 91-92.
202 T. Kleberg, Hôtels, restaurants et cabarets dans l'antiquité romaine, (Uppsala: Alquist & Wiksells, 1957), 53. This passage translates roughly as: “it was primarily and almost exclusively for the simple and poor population that locations of this sort had any importance, and certainly a great importance. With respect to Pompeii, it is very likely that this layer of the population's miserable living conditions (their small rented rooms did not allow for the possibility of an oven to heat water and to prepare food) forced them to turn to a large degree to these public establishments.”
The *cauponae* seem to occupy two main regions: the central region where the highest concentration of bakeries also occurs (northeast of Regio VII and southwest of Regio IX), and the areas surrounding the various city gates (see Figure 4.11). The *popinae*, on the other hand, are fairly evenly spread throughout the city and therefore serve little analytical use (see Figure 4.12).

The locations of the *cauponae* and the bakeries clearly overlap, at least in terms of the area of highest concentration, in the center of the city. However, there is almost no correlation between the *cauponae* located near the city gates (those targeting travelers entering the city) and the bakeries. As noted before, the central area seems to be a poorer, more commercial area with a higher population density and the greatest concentration of shops and workshops. Therefore, the overlap is not necessarily due to any important client-business relationship between the *cauponae* and the bakeries; rather, it seems that they share this central location simply because of the commercial benefits it imparts to both independently. The fact that there is little correlation between the gate-*cauponae* and the bakeries suggests that the *cauponae* were not significant enough clients to influence the locations of the bakeries.

*Pastry Shops to Cauponae and Popinae*

This analysis did not reveal any additional information. Refer to the above discussion of the bakeries relative to the *cauponae* and *popinae*.

*Bakeries to Brothels*

The brothels are located in the area with the highest concentration of bakeries (see Figure 4.13). As expected, this particular area is largely the northeast corner of Regio VII, but also includes
to some degree the central/western region of Regio IX. The highest concentration of brothels is in
the region defined by the Via degli Augustali, Vicolo del Lupanare, Via dell’Abbondanza, and the
Vicolo di Eumachia.

As previously discussed, these findings confirm that this central forum area was an
important commercial area and an area of lower overall socioeconomic status. Both the bakeries
and brothels (and all other shops) have the same target: the high volumes of paying customers.
Given the relative locations of both the cauponae and brothels, it seems that the bakeries were not
particularly concerned about setting up shop in regions of lesser respectability. As it is, the wealthier
citizens were probably not their chief customers—consider that the elite would send servants to
make necessary purchases in town and also that they were the most likely to own private ovens. The
bakeries’ main clients were likely the average citizens of Pompeii who did not care especially if their
local bakery shared a lot with a brothel or capona.

Nevertheless, keep in mind that the bakeries are distributed throughout many regions of
varying socioeconomic status. There are by no means exclusively located in these less respectable
regions—take, for instance, the bakeries located amongst the wealthier private residences of Regio
VI. Hence, it seems that while bakeries were often found in areas of lower socioeconomic status,
they themselves were not necessarily considered unrespectable and could be equally at home in
wealthier, more respectable communities.

*Pastry Shops to Brothels*

All relevant findings were already discussed in the above discussion of bakeries relative to
brothels.
Bakeries by Doorway Density

The density of doorways along particular streets can be used as an indicator of population density. Figure 4.14 illustrates the distribution of the bakeries relative to the doorway densities of particular regions. The four categories for doorway density include doorways located every 0 to 5 m, every 6 to 10 m, every 11 to 15 m, and further than every 15 m.

Seventeen and a half bakeries are located along streets with doorways every 0 to 5 m, which corresponds to 58.33% of the bakeries. The calculation of half-bakeries is done to accommodate those bakeries located on the corner of two streets with different doorway densities. Four bakeries are located along streets with doorways every 6 to 10 m, which corresponds to 13.33% of the bakeries. There are seven and a half bakeries (25%) along streets with doorways located every 11 to 15 m. Finally, there is only one bakery (3.33%) located on a street with doorways further than 15 m apart.

If doorway density can be seen as any indication of the wealth of a particular area, then it seems that bakeries tend to be located in more highly populated, poorer regions of the city, as already discussed above. There may still have been larger homes behind the shops, but the high concentration of doorways indicates either a predominance of small homes or a large number of shops opening up onto the street. Many merchants would also be living in lofts above their shops. Hence, doorway density can generally be considered as proportional to the population density and commercial value of a region and inversely proportional to the socioeconomic status of the region.
Table 2: Distribution of Bakery Components Relative to Doorway Density

<table>
<thead>
<tr>
<th>Doorway Density Region</th>
<th>Sales Area</th>
<th></th>
<th></th>
<th>Living Quarters</th>
<th></th>
<th></th>
<th></th>
<th>Mills</th>
<th></th>
<th></th>
<th></th>
<th>Stables</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td># of</td>
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<td></td>
<td># of</td>
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<tr>
<td></td>
<td>bakeries</td>
<td>%</td>
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<td>bakeries</td>
<td>%</td>
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<td>bakeries</td>
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<td>bakeries</td>
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<td>in region</td>
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<td>in region</td>
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<td>in region</td>
<td>of</td>
<td></td>
<td>in region</td>
<td>of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-5 m (17.5 bakeries)</td>
<td>15.5</td>
<td>88.57</td>
<td>10</td>
<td>57.14</td>
<td>10.5</td>
<td>60</td>
<td>10.5</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-10 m (4 bakeries)</td>
<td>3.5</td>
<td>87.5</td>
<td>2</td>
<td>50</td>
<td>3.5</td>
<td>87.5</td>
<td>1</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11-15 m (7.5 bakeries)</td>
<td>4</td>
<td>53.33</td>
<td>5</td>
<td>66.67</td>
<td>6</td>
<td>80</td>
<td>5.5</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;15 m (1 bakery)</td>
<td>1</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>100</td>
<td>1</td>
<td>100</td>
<td></td>
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</tr>
</tbody>
</table>

Table 2 is a tally of the number of bakeries with particular components located in each doorway density region. Since the count alone would be useless—there being a different total number of bakeries in each region—I have converted these figures into percentages. For example, rather than simply stating the number of bakeries with sales areas in each region, I have calculated the percentage of the bakeries in each region that have sales areas. The trends revealed by these figures are outlined in bold and shaded in grey.

Leaving out the >15 m section (which has a total of only one bakery and cannot therefore be a reliable data set), a clear decrease is seen in the percentage of bakeries having sales areas as doorway density decreases (88.57% to 87.5% to 53.33%) (see Figure 4.15). This indicates that those bakeries located in regions of lower doorway density are less likely to have sales counters, suggesting that these bakeries chose their location for its availability of workshop space rather than its commercial potential. Given their separation from the more densely populated commercial areas, they would have been aware that sales would be lower and may have made alternate arrangements, such as setting up a temporary bread stand at the forum or operating through an independent merchant, and thereby eliminated their need for a permanent sales counter on site. Alternatively,
they may have worked primarily with professional clientele; for instance, they may have supplied local *popinae* and *cauponae* with bread.

On the other hand, those bakeries who are paying the price for setting up shop in the more densely populated commercial areas (cost of land, lack of space for mills and stables) are doing so for the commercial value of the area and will be more likely to take full advantage of the commercial potential by setting up a prominent sales counter for sales.

This issue all boils down to a question of priorities—a location with space for milling or commercial value? Someone who sells their bread at a temporary stand in the center of town or who supplies outside merchants with bread does not need to have his bakery in the center of town, nor does he necessarily need a sales counter. Nevertheless, it seems that a sales counter is still a popular and useful asset, since more than half of the bakeries in the areas of lower doorway density still have them.

Two other related visible trends are a general increase in the percentage of bakeries who operate mills (see Figure 4.16) and stables (see Figure 4.17) as the doorway density decreases (for mills: 60% to 87.5% to 80% to 100%; for stables: 60% to 73.33% to 100%). As explained above, this is probably due to the increasing affordability and availability of workshop space as doorway density decreases.

*Pastry Shops by Region*

It is impossible to do a comparable study of distribution with pastry shops. There are only six pastry shops and, when they are further divided into three of four regional groups, there is no longer enough data to perform any sort of meaningful analysis.
Bakeries by Expansion Phase of the City

The following discussion assumes the theory outlined by Clarke for the three expansion phases of the city of Pompeii. There are no bakeries in the oldest region of the city, which dates to the sixth to fifth centuries B.C.E. and was occupied predominantly by the Greeks and Etruscans. Contributing factors are certainly the number of public buildings and spaces, such as the forum, the forum buildings, temples, the triangular forum, etc, as well as the cost of the real estates in the very heart of the city. The exclusion of the bakeries from this older core may also be due in part to the fire hazard they created with their clouds of explosive grain dust and flour dust. Five bakeries are located in the area corresponding to the second phase of the city, which dates to the late fourth to second centuries B.C.E. and was occupied by the Samnites and then the Roman Federation. The remaining twenty-five bakeries are located in the area corresponding to the latest phase of the city, dating to the first centuries B.C.E. and C.E. and corresponding to city’s existence as a Roman colony. Figure 4.18 illustrates the distribution of the bakeries relative to the possible expansion phases of the city and Table 3 provides a breakdown by component of the number of bakeries in each expansion phase.

293  Cf. supra pages 12-14 and 78-79.
TABLE 3: DISTRIBUTION OF BAKERY COMPONENTS RELATIVE TO EXPANSION PHASE

<table>
<thead>
<tr>
<th>Expansion Phase Region</th>
<th>Sales Area</th>
<th>Living Quarters</th>
<th>Mills</th>
<th>Stables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># of</td>
<td>% of</td>
<td># of</td>
<td>% of</td>
</tr>
<tr>
<td></td>
<td>bakeries</td>
<td>total</td>
<td>bakery</td>
<td>total</td>
</tr>
<tr>
<td></td>
<td>in region</td>
<td></td>
<td>in region</td>
<td></td>
</tr>
<tr>
<td>I (0 bakeries)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>II (5 bakeries)</td>
<td>4</td>
<td>80</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>III (25 bakeries)</td>
<td>20</td>
<td>80</td>
<td>15</td>
<td>60</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Expansion Phase Region</th>
<th>Latrines</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># of</td>
</tr>
<tr>
<td></td>
<td>bakeries</td>
</tr>
<tr>
<td></td>
<td>in region</td>
</tr>
<tr>
<td>I (0 bakeries)</td>
<td>0</td>
</tr>
<tr>
<td>II (5 bakeries)</td>
<td>1</td>
</tr>
<tr>
<td>III (25 bakeries)</td>
<td>8</td>
</tr>
</tbody>
</table>

As the city gradually expanded to the north and east, as illustrated by the three proposed successive phases of expansion, the cheapest property would have been that which was furthest from the original core and closest to the expansion front. This might explain, to some degree, the absence of bakeries in the original core of the city; by the time commercial bakeries were established (Pliny dates their introduction to the second century B.C.E.‎[298]), the property in the original core may have been far too expensive and difficult to come by. Occupying spaces in more distant/newer phases of the city may have allowed for cheaper and greater availability of space, as well as the added benefit of being nearer to the roads leading out to the rural farms that supplied the grain.

Four trends are visible in Table 3 and they are all related to the increasing availability of space in later expansion phases of the city. For example, only 40% of the bakeries in Phase II have

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298 Cf. supra pages 10-11.
living quarters, whereas 60% of the bakeries in Phase III have living quarters (see Figure 4.19). Similarly, only 20% of the bakeries in Phase II have mills, whereas 80% of the bakeries in Phase III have mills (see Figure 4.20). Only 40% of the bakeries in Phase II have stables, whereas 64% of the bakeries in Phase III have stables (see Figure 4.21). Finally, one can even see a very slight increase in the use of latrines in the later phases of the city—20% of bakeries in Phase II have latrines, whereas 32% of the bakeries in Phase III have latrines (see Figure 4.22). Latrines do take up some space and they also require the installation of some basic plumbing (flushing systems, or at least compost tanks), which may have been easier to accomplish in newer parts of the city.

Bakeries by Forum Proximity

I sorted the bakeries into four groups by proximity to the forum, creating the categories such that the bakeries were as evenly divided as possible to allow for effective cross-group comparisons. Six bakeries are located within 1 to 100 m of the forum, ten bakeries within 101 to 200 m of the forum, nine bakeries within 201 to 300 m of the forum, and the remaining five bakeries 301 m or further from the forum. Figure 4.23 illustrates the distribution. The average distance from the forum is 211.18 m.
### Table 4: Distribution of Bakery Components by Forum Proximity

<table>
<thead>
<tr>
<th>Forum Proximity Region</th>
<th>Sales Area</th>
<th>Living Quarters</th>
<th>Mills</th>
<th>Stables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># of bakeries in region</td>
<td>% of total</td>
<td># of bakeries in region</td>
<td>% of total</td>
</tr>
<tr>
<td>1-100 m (6 bakeries)</td>
<td>4</td>
<td>66.67%</td>
<td>3</td>
<td>50%</td>
</tr>
<tr>
<td>101-200 m (10 bakeries)</td>
<td>7</td>
<td>70%</td>
<td>7</td>
<td>70%</td>
</tr>
<tr>
<td>201-300 m (9 bakeries)</td>
<td>9</td>
<td>100%</td>
<td>5</td>
<td>55.56%</td>
</tr>
<tr>
<td>301 m+ (5 bakeries)</td>
<td>4</td>
<td>80%</td>
<td>2</td>
<td>40%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Forum Proximity Region</th>
<th>Latrines</th>
<th># of bakeries in region</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-100 m (6 bakeries)</td>
<td>1</td>
<td>16.67%</td>
<td></td>
</tr>
<tr>
<td>101-200 m (10 bakeries)</td>
<td>3</td>
<td>30%</td>
<td></td>
</tr>
<tr>
<td>201-300 m (9 bakeries)</td>
<td>3</td>
<td>33.33%</td>
<td></td>
</tr>
<tr>
<td>301 m+ (5 bakeries)</td>
<td>2</td>
<td>40%</td>
<td></td>
</tr>
</tbody>
</table>

Given the above discussions of bakeries by doorway density and expansion phases of the city, there are a number of trends that I would expect to notice when breaking down bakeries by component with respect to forum proximity (see Table 4). The forum would have been a center of public life and commercial life. Proximity to the forum would certainly increase the commercial value of a property, both in terms of proximity to other markets and being in the middle of the center of daily public life. I would expect bakeries located near the forum to be taking advantage of their position by having prominent sales counters and sales areas. However, I would also expect
that properties located in close proximity to the forum would have less space for spacious commodities such as living quarters, milling areas, stables, and latrines.

Unlike the data for doorway densities and expansion phase, the same trend in the presence of sales areas is not seen here (see Figure 4.24). A possible explanation is that one cannot assume that proximity to the forum always equals commercial potential. For example, examining the category of bakeries located 1 to 100 m from the forum, notice that two of the six bakeries do not have sales areas. However, these two bakeries are not located in the main commercial area. They are certainly close to the forum, but they are located on secondary streets. The first (VI.vi.4/5) is at the corner of two streets, one of which has a low doorway density of 11 to 15 m. The other (VIII.vi.9/10/1) is also at the corner of two streets, one of which has a relatively low doorway density of 6 to 10 m. In contrast, the primary commercial areas identified earlier consist predominantly of 0 to 5 m streets. The same phenomenon is seen with the second category of bakeries by forum proximity. Of the three of the ten bakeries located 101 to 200 m from the forum that do not have sales counters, one is located within a primary commercial area, but the other two open up onto low doorway density streets.

As expected, a similar trend in the distribution of bakeries with milling areas (see Figure 4.25), stables (see Figure 4.26), and latrines (see Figure 4.27) is seen when examining the bakeries by forum proximity as was seen for both doorway densities and expansion phases. As forum proximity decreases, the incidence of milling areas (33.33% to 60% to 100%), stables (0% to 70% to 77.78% to 80%), and latrines (16.67% to 30% to 33.33% to 40%) increases (see Table 3).
As a complement to the discussion of bakeries by forum proximity, I was hoping to analyze the distribution of the bakeries by city gate proximity. It would seem that being in close proximity to the source of grain would be an advantage for a bakery. However, when I divided the bakeries into four categories, very few meaningful trends were noticeable. Eight bakeries are located within 76 to 125 m of their nearest gate, five within 126 to 175 m, nine within 176 to 225 m, and eight are located more than 226 m from their nearest city gate (see Figure 4.28). Table 5 illustrates their breakdown by component with respect to gate proximity.

<table>
<thead>
<tr>
<th>Gate Proximity Region</th>
<th>Sales Area</th>
<th></th>
<th>Living Quarters</th>
<th></th>
<th>Mills</th>
<th></th>
<th>Stables</th>
<th></th>
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<td># of</td>
<td>% of</td>
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<tr>
<td></td>
<td>bakeries</td>
<td>total</td>
<td>bakeries</td>
<td>total</td>
<td>bakeries</td>
<td>total</td>
<td>bakeries</td>
<td>total</td>
</tr>
<tr>
<td>76-125 m</td>
<td>6</td>
<td>75</td>
<td>5</td>
<td>62.5</td>
<td>6</td>
<td>75</td>
<td>5</td>
<td>62.5</td>
</tr>
<tr>
<td>(8 bakeries)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>126-175 m</td>
<td>4</td>
<td>80</td>
<td>2</td>
<td>40</td>
<td>4</td>
<td>80</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>(5 bakeries)</td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>176-225 m</td>
<td>7</td>
<td>77.78</td>
<td>6</td>
<td>66.67</td>
<td>7</td>
<td>77.78</td>
<td>5</td>
<td>55.56</td>
</tr>
<tr>
<td>(9 bakeries)</td>
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<td></td>
</tr>
<tr>
<td>226 m +</td>
<td>7</td>
<td>87.5</td>
<td>4</td>
<td>50</td>
<td>4</td>
<td>50</td>
<td>6</td>
<td>75</td>
</tr>
<tr>
<td>(8 bakeries)</td>
<td></td>
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There is a gradual increase in the percentage of bakeries with sales counters (75% to 80% to 77.78% to 87.5%) as one moves further from the gates and consequently, closer to the city center (see Figure 4.29). There is also a gradual decrease in the percentage of bakeries with milling areas (75% to 80% to 77.78% to 50%) as one moves further from the gates (see Figure 4.30). These trends have been explained in many of the above discussions. However, gate proximity does not serve as a particularly useful measure—not as many trends are visible and those trends that are
visible are less clear—because it takes into account a number of different city gates that are located at varying distances from the city center. Keep in mind that Pompeii is an ellipsoid with an off-center commercial core. In addition, the fact that no bakeries are clustered in close proximity to the gates (none within 75 m of the gates) suggests that these were not especially important bakery locations.

*Bakeries in Converted Residences or Connected to Residences*

Figure 4.31 illustrates the distribution of both the bakeries connected to residences and the bakeries located in converted residences throughout the city of Pompeii. I have combined these two data sets because they are both evidence of the same trend: if we accept the theory that the large-scale conversion of residences into commercial spaces in the second half of the first century C.E. was caused by a growing interest among the elite in investing in commercial enterprise, then both the conversion of entire residences or portions of residences into workshops and the buying up of adjacent properties in order to establish workshops connected to residences are evidence of this phenomenon.

The two principal areas in which these bakeries are concentrated are Regio VI and the commercial area in Regio VII. In fact, if you include the bakery at V.i.14-16 (which is across the street from Regio VI), seven of the nine bakeries in Regio VI fall within these categories. Again, six such bakeries are located in Regio VII out of a total of nine bakeries. The concentration of bakeries that are either connected to residences or located in converted residences in both Regio VI and Regio VII certainly suggests that these were two regions particularly affected by the elite investment in commerce. This is by no means surprising—Regio VI is known for its large, wealthy, second

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* Cf. *supra* pages 44-45.
century B.C.E. residences. Not only were many elite already inhabiting this region, but the spacious homes with their large peristyles, gardens, and atria would be prime targets for the conversion of living space into commercial space. Similarly, Regio VII would be an obvious candidate location for elite hoping to purchase or establish workshops because it was such an important commercial center. There were also a number of wealthy homes already located in this region, hidden behind frontal shops and long fances.

Bakeries with Living Quarters

Figure 4.32 illustrates the distribution of bakeries with living quarters throughout the city. These bakeries are clustered mainly in the commercial area of Regio VII and the wealthy residential area of Regio VI, much of which directly corresponds to bakeries connected to residences and located in converted residences, as discussed above.

As previously examined in the four sections on bakeries by region, there are no visible trends with respect to the percentage of bakeries having living quarters by doorway density or gate proximity. There is, however, a positive correlation between the percentage of bakeries having living quarters and successive expansion phases of the city. While there are no bakeries at all in the first phase of the city, the figures for the second and third expansion phase rise from 40% to 60%, likely as a function of availability of space. Figure 4.33 is a graph modeling this trend.

As illustrated in Figure 4.33, there does appear to be a trend in the percentage of bakeries having living quarters by forum proximity that was not discussed previously. It seems that, within close range of the forum (1 to 100 m), few bakeries (50%) have living quarters, likely because of the cost and limited availability of space in that region. However, the frequency of living quarters does not increase steadily as one moves further from the forum. Rather, the peak frequency for living
quarters (70%) occurs for those bakeries located between 101 and 200 m from the forum. As one gets further from the forum, the incidence of living quarters once more decreases to 55.56% for bakeries located 201 to 300 m away and to 40% for bakeries located further than 301 m. The only possible explanation for this trend that comes to mind is that bakeries located at a fair distance from the forum are thus located because of a desire for workshop space or proximity to grain sources. However, the baker himself may have no interest in living so far from the main hub of commerce and public life.

In examining the city expansion phases, it appeared as if the probability of a bakery having living quarters increased as one moved further from the city’s original core and the forum. The forum proximity trend would seem to oppose this observation. However, forum proximity is a much more precise measure and is therefore probably more correct; consider that the third expansion phase of the city is quite large and actually encompasses categories 2 through 4 from the forum proximity calculations. The average percentage of bakeries having living quarters for forum proximity categories 2 through 4 is higher than the percentage for category 1, which explains this discrepancy.

_Bakeries with Sales Areas_

Figure 4.34 represents the distribution of the bakeries with sales areas throughout the city. Figure 4.35 is a graph illustrating the three significant regional trends examined in the above discussions. Note, as previously discussed, that no visible trend is seen with respect to city expansion phases. As expected, the frequency of sales areas increases with increased distance from the gates (from 75% to 80% to 77.78% to 87.5%) and with increased doorway density (from 53.33% to 87.5% to 88.57%) (roughly corresponding to increased proximity to principal commercial areas).
Finally, the above discussion on forum proximity offers an explanation for the unusual find that sales area incidence decreases with increased proximity to the forum (from 100% to 70% to 66.67%) and can be summarized as forum proximity not necessarily indicating proximity to commercial areas. Doorway density is a much better measure of proximity to main commercial areas.

*Bakeries with Stables*

The graph in Figure 4.36 illustrates the three regional trends previously examined with respect to bakeries with stables. As discussed above, there is a general increase in the percentage of bakeries having space for stables as one moves through successive expansion phases (from 40% to 60%) and as doorway density decreases (from 60% to 73.33% to 100%). Forum proximity not only suggests that stables are more frequent amongst bakeries further from the forum, but it indicates a sharp increase in the incidence of stables as soon as one moves out of the immediate vicinity of the forum (from 0% to 70% to 77.78% to 80%). The gate proximity does not provide a clear trend in this case.

Figure 4.37 represents the distribution of the bakeries with stables throughout the city. I would imagine that there should be a general tendency for bakeries with stables to be located along principal arteries leading into the city from gates. Consider that food and straw for the animals would have to be shipped into the bakeries and manure would have to be carted out. In addition, a baker who owns his own animals might manage a lot of his own grain transportation from rural farms. Thus, bakeries with stables would likely require enough space outside their bakeries to harness up, load, and unload a cart, and they would certainly desire a convenient and direct route in or out of the city. Such major gate-bound arteries include the Via di Nola, along which three bakeries with stables are located, the Via di Stabia, along which five bakeries with stables are located, and the Via
dell’Abbondanza, along which one bakery with a stable is located. If we also include the Via degli Augustali, a prominent cross-street leading to the forum (although not gate-bound), there are another five bakeries with stables. With these criteria, there are only four bakeries with stables unaccounted for. Therefore, fourteen of the eighteen bakeries with stables (77.78%) are located along or immediately off of major arteries. This compares to the 70% of the total bakeries that are located along these streets. If we do not include the Via degli Augustali, since it is not gate-bound, these number still favor the bakeries with stables: 50% of the bakeries with stables are located along major gate-bound arteries, while only 40% of the total bakeries are thus located.

Therefore, regardless of whether or not we count the Via degli Augustali, bakeries with stables have a higher than normal incidence of being located on major streets. Again, this is likely because of their interests in having their bakery open onto a wide street and in being conveniently located for the shipment of grain and resources for their animals.

_Bakeries with Latrines_

Figure 4.38 is a graph illustrating the two meaningful regional trends discussed above with respect to bakeries with latrines. As discussed above, the incidence of latrines tends to be higher as one moves further from the forum (from 16.67% to 30% to 33.33% to 40%) and with successive expansion phases of the city (from 20% to 32%). This is likely due to a greater ease in installing latrines with either flushing systems or cess pits in newer (relative to the construction of the aqueduct system feeding Pompeii) and possibly more spacious structures.

It is interesting to note that bakeries with latrines are generally located no nearer to fountains than the average bakery (see Figure 4.39 for the distribution of bakeries with latrines relative to the location of city fountains and fountain ranges). This is likely because latrines did not dramatically
increase a bakery's water requirements, which were already high. Of the nine bakeries with latrines, five are located within a single fountain range and the other four are not located within a fountain range at all. However, if we include fountain ranges that are within ten meters distance from the bakery, the numbers become: one bakery (11.11%) located within three fountain ranges, four bakeries (44.44%) located within two fountain ranges, three bakeries (33.33%) located within a single fountain range, and only one bakery (11.11%) with a latrine that is not located within a fountain range. These numbers are very similar to those for the overall bakery pool when the same approximation with respect to nearby fountain ranges is made. For bakeries in general, 6.67% (versus 11.11%) are located in or near three fountain ranges, 40% (versus 44.44%) are located in or near two fountain ranges, 46.67% (versus 33.33%) are located in or near a single fountain range, and only 6.67% (versus 11.11%) are not located within a fountain range. Therefore, while the bakeries with latrines do appear to be ever so slightly nearer to fountains, the difference is minimal.

"The analysis of the use of space to reveal the dynamics of ancient urban society has underpinned recent research. These increasingly sophisticated studies have made significant advances in our understanding and posed new sets of questions,"296 or so say Bon and Jones in their book, Sequence and Space in Pompeii. I can only hope that my detailed breakdown and analysis of the locations and distributions of both the bakeries in general and the pastry shops of Pompeii have accomplished this goal to some degree. Analyzing and discussing the bakeries in isolation, as examined in Chapter II, can certainly tell us a lot about the operation and management of a baking establishment but little about the participation of these businesses in the greater society. Examining

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296 Bon, 4.
the role of bakeries in local food production, as discussed in Chapter III, reveals more about the position of the bakery in the larger society and economy but tells us little about the individual operation, requirements, and priorities of a bakery; it focuses largely on the scale of the production and the distribution of the product. I like to think that spatial analysis—analyzing the significance and logic behind the location and distribution of the bakeries throughout the city—acts as an effective synthesis. It reveals information about the requirements and priorities of a bakery with respect to daily operation through, for example, the analysis of the location of water sources, the proximity to grain sources, the availability and desire for workshop space for milling and stables, and the presence of living quarters. It also examines the economic position of the bakery in analyzing the position of the bakeries relative to other workshops and commercial establishments and the priorities of the bakeries in locating near or far from primary commercial centers. Finally, spatial analysis also examines the social position of the bakers by analyzing the distribution of the bakeries relative to regions of particular socioeconomic status and by providing evidence for various social trends, such as the conversion of residential space into commercial space and the elite investment in commerce. Thus do we attempt to reconstruct and understand the lives and businesses of the men who once proudly wrote “hic habitat felicitas” and “Marci Vergili Eurysaces, pistoris, redemptoris, appareat” in reference to their professions.

237  “Here dwells happiness” and “Marcus Vergilius Eurysaces, baker, contractor, he serves.”
References


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