

Makers and Their Marks:
The Ancient Function and Modern Usefulness of Stamps on Glass and Ceramics

By

Jonathan David Prior
B.A., University of Regina, 2007

A Thesis Submitted in Partial Fulfillment of the
Requirements for the Degree of

MASTER OF ARTS

In the Department of Greek and Roman Studies

© Jonathan Prior, 2010
University of Victoria

All rights reserved. This thesis may not be reproduced in whole or in part, by photocopy or other means, without permission of the author.

Supervisory Committee

Makers and Their Marks:
The Ancient Function and Modern Usefulness of Stamps on Glass and Ceramics

By

Jonathan David Prior
B.A., University of Regina, 2007

Supervisory Committee

Dr. John P. Oleson, (Department of Greek and Roman Studies)
Supervisor

Dr. R. Brendan Burke, (Department of Greek and Roman Studies)
Departmental Member

Supervisory Committee

Dr. John P. Oleson, (Department of Greek and Roman Studies)
Supervisor

Dr. R. Brendan Burke, (Department of Greek and Roman Studies)
Departmental Member

Abstract

This thesis examines the marking of Roman glass and ceramic vessels with stamps in the period from the first century B.C. through the second century A.D. The thesis establishes the context for the study of such makers' marks by first examining the early history of Roman glass, the changes brought on by the introduction of glassblowing, and the organization and working conditions of the industry. Next, the thesis examines the roles played by stamps on glass in the ancient world. Then the organization and conditions of the ceramics industry are examined, and the same questions are posed regarding the roles of stamps and what they can tell us. These stamps show us how the two industries were organized and reveal that Roman makers' marks served not only as proto-brand identifiers and artists' signatures, but also as tools for industrial organization.

Table of Contents

Title page	
Supervisory Committee.....	ii
Abstract.....	iii
Table of Contents.....	iv
Acknowledgments.....	v
Introduction.....	1
Chapter 1.....	9
Chapter 2.....	36
Chapter 3.....	55
Conclusions.....	76
Bibliography.....	83
Appendix 1.....	89
Appendix 2.....	92

Acknowledgements

I would like to thank my supervisor Dr. John Oleson for his support and guidance, as well as the rest of the Greek and Roman Studies Department faculty and staff, each of whom was willing to provide advice and guidance. I owe special thanks to Dr. Brendan Burke for being my second committee member, for allowing me to see many ancient remains first-hand by way of his Greek study tour, and for inviting me to survey with him for two seasons in Boeotia.

To my fellow graduate students Peter, Angie, Becky, Lauren, Mary, Jessica, Lindsey, Katie, and Kristin, and to members of the Greek and Roman Studies Course Union I want to extend my gratitude for their support, assistance, and commiseration. I also must thank them for helping me get out of the office on occasion to have some semblance of a social life in spite of my hectic workload.

Thank you to the University of Victoria for two years of financial assistance, which allowed me to live in Victoria and focus on my studies without the burden of full or part-time work off campus, and without which I would not have been able to travel for research and fieldwork.

Also, thanks to my parents and other family members unwavering support even when they were uncertain as to what I was actually working on, or why anyone would bother with it.

Introduction

In today's society brand names hold great power. People choose products based on a name and pay extra for products that have popular brand names. Brands have, in many cases, become much more than the names of manufacturers and advertisements for their work. Brand names are carefully selected for the impact they are intended to have on consumers. They are researched and developed to create, or capitalize on, certain cultural associations. Brand names are status symbols, and they are often selling points over and above the actual quality of an item. In his book *Sell the Brand First*, Dan Stiff relates how people of his father's generation used to test the density and sturdiness of the wood on a piece of furniture before buying it, whereas now, as the brands become even more prominent, people look at the brand first and use it to judge the quality of the product (Stiff 2006: 5). David Aaker and Erich Joachimsthaler have determined that a brand's identity is made up of some combination of up to 12 categories: product scope, product attributes, quality/value, use experience, users, country of origin, organizational attributes, local versus global organization, brand personality, customer/brand relationship, visual imagery/metaphors, and brand heritage (Aaker 2000: 43). Names have the power to raise all of these kinds of associations in people's minds, and any time there are goods being produced for trade in a free market, this fact can make or break a producer's business.

Brand names are not a new phenomenon. Manufacturers have sought to advertise their wares, and distinguish themselves from the competition since well before industrialization, but brands have much greater power and are much more complex today due to globalization and the pervasiveness of the modern media. Major brands have become world famous, not just well-known in their local markets, and in some cases the founders of brands have become celebrities

for their crafts. This celebrity is made possible by a modern society that extols business success and capital gain. Such values, however, have not always been celebrated.

In ancient Rome craftsmen were among the lower strata of society. There was a prejudice against manual labour, apart from agriculture, in the upper echelons of society and 'proper' gentlemen did not make their living through commerce. Rome also lacked the rapid, global media machine on which big brands thrive today, but in spite of the social and logistical limitations people were 'branding' their work with makers' marks.

Given the social stigma against manual labour, commerce, and crafts, and given the limitations on reaching wide audiences through media outlets as brands do today, one might reasonably wonder why Roman workers started 'branding' their products in large numbers. Ceramics and glassware, the two materials on which this thesis focuses, were the most commonly stamped materials. These makers' marks should not be evaluated simply as artists' signatures. There was a long tradition of vase painters signing their work in Greece, going back at least to Sophilos in the early sixth century B.C. (Pedley 2007: 193-196). If one takes the time to look at the range of Roman stamps, the explanation that they are artists' signatures quickly proves to be insufficient. Even relatively plain, utilitarian ware was being marked. These items were not fancy, and they would not bring fame. They were priced by size or weight rather than by any aesthetic value, or value added by any special properties. It appears far more likely that these signatures, or makers' marks, began more as marks of pride in craftsmanship, and an attempt by craftsmen to advertise their work to those who would need their product. After all, the most important feature of a brand is that it creates exposure for the product and makes people remember the producer.

Details and mental associations are not always the key to successful branding. People will

not always remember where they know a brand name from, what separates that product from others, or even what it is, but what really matters is that they are exposed to the brand. Studies have shown that even in the case of brands that are nonsense words, that have no meaning behind them, the majority of consumers will chose a product with a name they have heard before. In consumer studies, familiar brands always have an edge. A blind taste test of two types of peanut butter shows that one brand was found to be inferior in taste 70% of the time. That type of peanut butter was then put in the container of a recognizable brand, and in a separate test, in which the responders could see the containers the “inferior” tasting brand was indicated as better tasting than the unnamed brand 73% of the time (Aaker 1996: 10-11).

The CEO of Sunkist Growers, who said, neatly sums up the power of a known name: “An orange...is an orange...is an orange. Unless, of course, that orange happens to be Sunkist, a name eighty percent of consumers know and trust” (Aaker 1996: 1).

Ancient makers’ marks likely also served some organizational functions. This thesis will examine the advertising, and organizational roles of makers’ marks in order to better understand what the reasons were behind the stamping of Roman products, what roles stamps served in antiquity, and how the stamps are useful to modern scholars.

I intend to show that Roman makers’ marks, despite lacking some of the prestige and marketing power of modern brand names, were multi-functional, serving many purposes in antiquity, including some of the same roles as modern brand names. The stamps now also serve many roles for archaeologists and historians attempting to understand ancient Roman industry today. Makers’ marks were proto-brand names used to advertise, suggest quality, demonstrate pride in craftsmanship, distinguish among the goods of various producers, mark ownership, and facilitate organization within workshops or local industries. In spite of social prejudices,

craftsmen did recognize the importance of their work and the importance of being known, in spite of their lower social status. They proudly stated their names and affiliations, and left clues as to the organization and numbers of employees in their workshops. As a result, makers' marks can tell us who it was who produced glass and pottery in the Roman world, what their social status was, and what their relationships were to others in the same industry.

The time period chosen for this discussion of Roman makers' marks is roughly limited to the period from the mid-first century B.C. through the second century A.D. This time period was selected because of the proliferation of makers' marks on glass and ceramics in this period, and contemporary advances in these industries.

One category of earthenware that exemplifies the proliferation of stamps in the period covered here is *terra sigillata*. *Terra sigillata* was a widespread commodity in the late Republic and early Empire. Everywhere *terra sigillata* can be found, one can also find potter's marks. The marks were at their pinnacle in the first century A.D., at which point the vast majority of wares were stamped. For example, the town of Arretium was known throughout much of the Empire for its high quality red-gloss *terra sigillata*, and estimates show that up to ninety percent of Arretine vessels were stamped with the producer's signature (Fülle 1997: 117).

Glass was also regularly being stamped in the centuries considered in this thesis. Glass was frequently blown into moulds during the period of the late first century B.C. through the second century A.D. The use of moulds allowed for the easy replication of a single signature on an entire run of a vessel type. The multi-part moulds for storage jars, for instance, often had utilized a single stamped base-plate that replicated the same signature or symbol on every vessel being made. The use of these stamped moulds caught on rapidly, and the base is still the most common location for a stamp on glassware today.

Technological advances, particularly those in the glass industry, are another reason for the time period selected for this thesis. There were changes in pottery making, but many of them were simply improvements on existing techniques, or new styles that imitated forms of glass and metal vessels. Glass, however, was a material that was on the rise. Glassmaking had been known for close to three thousand years before the first century B.C. (Newton and Davidson 1989: 19), but glass had only been present in Rome as imported luxury items, usually in the form of small trinkets or decorations (Beretta 2004: 5-6). The invention of glassblowing in the first century B.C. and subsequent improvements in the technique allowed the glass industry to flourish, and glass became a common product throughout the entire Roman Empire. The period saw the rise of an almost entirely new industry that rivaled in importance the production of ceramic and metal vessels. Glassblowing allowed for glass to be cheaply and rapidly manufactured in an almost limitless variety of shapes. Those who knew the secrets to producing this versatile material were proud of their work and signed much of it whether it was decorative or purely utilitarian.

Advances were able to spread rapidly because of the unity of the new Empire and the subsequent spread of wide-ranging trade networks. Augustus' victories in the Civil Wars initiated a degree of peace and stability, allowing for unprecedented levels of trade and exchange of ideas. Long distance trade and the migration of Easterners to Italy, either as slaves or free workers, allowed for technology and ideas to be shared rapidly over long distances. New workshops were set up all over the Empire to meet growing demands for new products. The rapid increase of producers in glass and ceramics no doubt necessitated ways of differentiating goods and created competition. An increase in the marking of wares in this period certainly was influenced by the new economic climate and the need to advertise and be recognized.

This thesis is organized into three chapters, discussing aspects of the glass or ceramics

industry and highlighting the purposes and significance of makers' marks. The first chapter, "Early Roman Glass," outlines the industry and shows how revolutionary the glass industry actually was. The novelty and mysterious nature of glass caught the interest of Roman writers and ancient philosophers. Glass was striking, but it could be produced cheaply, and some glassware was affordable even to members of the lowest levels of society. The excitement over the new introduction of glassware and its rapid spread led to a desire for recognition by its producers: at least among other craftsmen and the common people.

Since Roman glass and glassmaking techniques are also relatively poorly known compared with ceramics, an understanding of the industry is important if one is to interpret properly the importance of makers' marks. For example, in contrast to ceramic manufacture, where communal kilns were the norm, each glassblower required his own furnace. The first chapter introduces the topic by outlining the spread of glass in Rome, the history of glass and Roman understanding of glass. The chapter discusses the social status of glassworkers, the size of workshops, and how glass was made. The chapter also discusses the limitations of our understanding of Roman glass and the problems of identifying evidence for the industry aside from glass itself.

The second chapter, "Glass Makers and Their Marks," delves into the issues of who glassworkers actually were, what they were marking, what the purpose of their marks was, and how they are useful today. The chapter discusses methods of interpreting marks based on form, location, and formulae, and uses these interpretations to try to determine the roles of the signatories in relation to the product and their social statuses. The chapter concludes with a short discussion of Ennion, the most famous Roman mould-blower of the first century whose works have been found across the breadth of the Empire and illustrate the extent of trade as well as the

movement of Eastern styles and techniques into the heart of the Roman Empire.

The third chapter, "Ceramics and Stamps," combines the functions of chapters one and two for the ceramics industry. There was no need for a completely separate chapter to discuss the organization of the ceramics industry. Pottery manufacturing techniques and styles of pottery are well covered in modern scholarship and the workers were of the same social levels as those in the glass industry. Ceramics production was not new in Rome during the period covered here and did not experience a sudden sharp rise in popularity on the scale that glass experienced due to its novelty and versatility. Any unique social information about people in the ceramics industry is closely tied to the interpretation of the stamps and is discussed along with types of stamps. Any discussion of the organization of the ceramics industry or of workshop size is also closely tied to the discussion of makers' marks and should not be separated into a different chapter. Chapter three discusses multiple possibilities for stamps purposes along with the strengths and weaknesses of each suggestion, and shows how stamps can, and in some cases, certainly did serve more than one of the purposes suggested. The chapter also explains how ceramic stamps are integral tools for understanding the pottery industry, how it operated, and how it was organized.

This thesis attempts to show the importance of the simple marks left by craftsmen, which have often been overlooked in studies of glass and ceramics in favor of an art-historical approach that looks at various artistic styles throughout time, or regional differences. Studies look at individual pieces, such as 'The Portland Vase,' or groups of works, and tell us what the pieces can say about the social and political environments of the times and what the imagery represents. If the studies discuss production at all, the discussion concerns the techniques that were used (Painter and Whitehouse 1991: 33-45). The practice of stamping products shows the emergence

of a self-conscious class of craftsmen, which did not share the prejudices of the Roman elite against the *banauisic* arts, and which began the long tradition of product branding that dominates the economic world to this day by celebrating its achievements and recording the identities of its members both for the markets in which products were sold and for future generations. The following chapters will show the humble origins of mass produced maker's marks and will provide a glimpse of their significance to history.

Chapter One: Early Roman Glass.

But there was once a workman who made a glass cup that was unbreakable. So he was given an audience of the Emperor with his invention; he made Caesar give it back to him and then threw it on the floor. Caesar was as frightened as could be. But the man picked up his cup from the ground: it was dented like a bronze bowl; then he took a little hammer out of his pocket and made the cup quite sound again without any trouble. After doing this he thought he had himself seated on the throne of Jupiter, especially when Caesar said to him: 'Does anyone else know how to blow glass like this?' Just see what happened. He said not, and then Caesar had him beheaded. Why? Because if his invention were generally known we should treat gold like dirt

(Petronius *Sat.* 51. Loeb trans. Michael Heseltine 1913)

Glass is a material that has fascinated people since its discovery. Pliny the Elder wrote, *neque est alia nunc sequacior materia* “there is no other material today that is more pliable” (Pliny *Nat. Hist.* 36.198). Molten glass can be stretched, expanded, or compressed, and it can be formed into almost any shape through blowing. If glass happens to fall off the blowpipe while still hot it will not break, but can be reheated and the piece can be finished as planned (Stern 2004: 77-78). Glass has been useful for the advancement of science, and it has been imbued with supernatural powers because of its appearance and versatility. The unique traits of glass have often led to fantastic stories such as the one in the preamble to this chapter, which has been told by numerous ancient authors and must have been something of an urban legend. Glass is the substance with which I begin my thesis, because it was this substance that set many of the parameters for my research. Glass is the only material discussed in this thesis to make its debut into Roman society after the city was well established, and after Rome had begun to assert its dominance over the whole Mediterranean world. Ceramics and metals had been at the heart of economic development since before the founding of Rome, but glass was introduced centuries into Rome’s history and quickly became more widely used in the Roman Imperial period than at any other period up to the nineteenth century (Newton and Davidson 1989: 24). Before its

introduction to Rome, glassmaking technology had been relatively stagnant. Under Roman hegemony, new advances were made that allowed glass to achieve previously unattainable shapes and to serve a wide variety of new purposes.

Glass should have a prominent place in a discussion of marks left by artisans because it has the distinction of being the first synthetic material ever developed by humans, and because the people who signed their wares were pioneers in new glass technologies. There are related materials such as faïence that could rival glass for this title since they appeared earlier and required lower furnace temperatures, but as Moorey points out they do not achieve a full melt and complete fusion. Faïence is a “composite material consisting of a sintered quartz body and a glaze.” The body is still quartz bound together by the fusion of small amounts of alkali. The two materials never become one, as occurs in a proper glass melt, which forms a homogeneous non-crystalline structure (Moorey 1994: 167, 189). The making of glass is a true transmutation of its parts into a new material that cannot be separated. Glass is also one of the most versatile substances in human history: People have used glass for artworks, for luxury items, and for a nearly limitless list of useful goods.

Despite having existed in the East for some two millennia before its introduction to Rome, glass-making technology had been fairly stagnant. Under the Roman Empire, glass rapidly advanced and reached new heights. The glass industry suddenly became a major player in Rome’s craft economy, which led to concerns about its impact on other goods, as in the passage that introduces this chapter.

Before plunging into the issue of the role of makers’ marks and the people behind the glass industry (to be treated in the next chapter), it is important to look at how glass was used and understood before it came to the Roman world. I will explore how the Romans changed the craft

from a small, localized art, to a thriving industry worthy of a variety of signatures and 'brands' that expressed pride in workmanship, or advertised a product. The roles of these makers' marks are not always clear and are often a matter of debate among scholars studying Roman craft production, but their presence indicates that the people working with glass in the Roman Empire found it worthy of recognition and wanted their workmanship to be remembered.

The very first glass items were shaped from natural volcanic glasses such as obsidian and date back to the Paleolithic period, but the range of uses was fairly limited. Items mostly included flaked blades and arrowheads (Newton and Davidson 1989: 18). Once humans learned to manufacture glass, the variety of uses increased tremendously. It is not certain exactly where or when the ability to produce glass was discovered, but evidence suggests that it was most likely somewhere in the eastern Mediterranean prior to 3000 B.C. (Newton and Davidson 1989: 19). This region and time of origin is based largely on the archaeological record of glass finds, but there is also some literary evidence for semi-legendary origins of the discovery of glass. Pliny the Elder wrote of a place at the mouth of the river Belus¹ at which the melting of sand into glass was discovered. Pliny claimed that natron traders from Egypt had landed on the beach and scattered to prepare a meal. Since there were no stones that could support their cauldrons they took lumps of soda from their cargo to use them. When the fires were lit these lumps melted and mixed with the sand producing glass (Pliny: *Nat. Hist.* 36.65). Though this story was written long after the invention of man-made glass and has no means of verification, the general location may well be accurate. The beach at the mouth of the river Belus was a major source of the raw materials used in glass making for many centuries despite being less than half a mile long (Beretta 2004: 1). Josephus commented on the use of sand from this beach, saying that even

1 The Belus is associated with the River Na'aman in Modern day Israel by Newton and

though large numbers of ships continuously came to take away sand, the amounts of sand never diminished. He claimed that this was because the wind regularly carried common sand into the hollow, in which he believed it became vitreous (*Jewish War* 2. 189-191). This example is just one of many that shows how glass was a mystery to the ancients and that they did not fully understand how it was formed.

Plato defined glass as a compound of earth and water, with less water than earth (Plato *Tim.* 61.b.), and Aristotle argued that it was composed of water because it, along with metals like gold, silver, bronze, tin, lead, and some unnamed types of stone, can be melted by heat (Aristotle *Mete.* 4.389a). The ancient philosophers did not realize that glass was not simply a mixture, but rather that it was a true transmutation of materials. Even the makers and workers of glass who knew the secrets of producing glass did not understand the chemical process (Stern 2008: 521). Even today, glass can only be defined generically because chemical combinations of glass are far from homogeneous. One can define glass as a compound of silica, a melting agent such as soda or potassium, a stabilizer such as lime oxide, and colourants, most of which are metal oxides. The ratios however can vary greatly. The silica content can be anywhere from fifty to seventy-five percent (Beretta 2004: 4-5). To make glass of pure silica takes higher temperatures than were possible with ancient technology, so an alkali (soda, natron, or potash) was added to lower the melting temperature. This unfortunately made it water soluble, so lime had to be added to stabilize it. The addition of lime was likely not always understood as an additional part of the mixture, because the lime was often found in the plant ashes used for the alkali, or in the silica sand in the form of crushed sea shells (Stern 2008: 521). Ancient glass was usually over fifty percent silica, and in the Roman period it usually contained fifteen to twenty percent Na₂O and

Davidson 1989: 19 but other sources position it in Syria. (Beretta 2004: 1).

about ten percent CaO (Stern 2008: 522).

Long before the arrival of glass in Rome, the Egyptians and Mesopotamians used it to imitate ceramics, precious stones, and rock crystal. Glass vessels were shaped much like ceramics on a lathe, or by being sagged over a mould when it was heated to the consistency of a thick paste (Beretta 2004: 5). This limited the forms of glass vessels to open shapes that could easily be removed from the mould. In the early history of Rome, glass was virtually unknown except for a few imported prestige items. It was not until the second and first centuries B.C. that glass imports from Syria and Alexandria really became known in Rome and were imported in relatively large numbers (Neuburg 1962: 72). These imports were still limited almost entirely to luxury prestige items only available to those with wealth, but as time went on the Romans expanded their applications of glass to include windows, lamps, draperies, tableware, aquariums, cinerary urns, sarcophagi (Diodorus Siculus *Bibl.* 3.5), *unguentaria*, and jars for food (Beretta 2004: 5-6). The shift to a large-scale use of glass began in the later half of the first century B.C. As Roman power was established in the eastern Mediterranean, the technology for actually making glass came to Rome and there were rapid advances in glass-working technology. The expanding network of Roman control and improved communication made glass a common item across the entire Roman world. It was in this period that the most important advance in glass making technology in over one and a half millennia was discovered: That the breath of the glass-worker could inflate molten glass.

The invention of glassblowing opened up almost unlimited possibilities for shaping glass objects, greatly increased the speed with which objects could be produced, and reduced waste. Within a few decades of coming to Rome, glass had become common in Roman sites of all sizes, both civil and military (Harden 1969: 45). It is not entirely clear when or where glass blowing

was actually invented, but it is generally agreed that the discovery was made in the Eastern Mediterranean sometime in the mid first century B.C. (Israeli 1991: 46). The rise of early master glassblowers in Syria suggests this region as a probable place of origin. Syrian styles were dominant in the early history of blown glass. A blown flask and was found along with a cast Syrian bowl in cave tombs in a pre-Herodian cemetery in Engedi, Israel, a site that was destroyed circa 40-37 B.C. and not reoccupied until much later. These pieces were dated to around 50 B.C. (Harden 1969: 47). The first blown glass began to appear in Rome around A.D. 20 and was likely imported from Syria (Neuburg 1962: 73).

Glassblowing had not been a large-scale operation anywhere in the Roman world until Augustus came to power and several crafts began concentrating in Italy where there was stability and a large market. Judean and Syrian craftsmen were imported as slaves, and sometimes immigrated as free workers, bringing the knowledge of eastern technologies like glassblowing with them. In the new climate of stability brought on by the Augustan peace, ideas and materials flowed freely throughout the new Roman Empire. Glass-working techniques such as moulding, casting, and the new idea of free-blowing made glass rapidly become a rival to ceramics (Fleming 1997: 3). Some of those who migrated to Italy as free workers set up shops in Rome, Campania, and Aquileia where good commissions were available (Stern 1999: 444). Mould-blown Syrian styles were favored so heavily in Northern Italy that Harden suggests that most of the glasshouses were founded by Syrian workers moving closer to a large market to avoid a long sea voyage for fragile, and in the case of decorative items, expensive wares. Harden even suggests that the most famous Roman-era glassblower, Ennion, may have moved his workshop to Northern Italy, since many of his cups have been found in the area (Harden 1969: 49-50). There were also some Alexandrian craftsmen who set up workshops in Italy along the coast

between Cumae and Liternum, and in Rome at the Porta Cassena once the sand from the Volturnus was found to be suitable for glass-making, at the very beginning of the Augustan era (Neuburg 1962: 73). Initially the glass produced in Italy appears to have been utilitarian ware made close to their markets to save on transportation costs. Pliny the Elder supported this statement saying that the first Syrian Glassblowers who came to Rome were in fact producers of utilitarian ware, but Alexandria was still the source of artistic glass (Pliny *Nat. Hist.* 34.26.194).

No one knows for certain how craftsmen figured out that glass could be blown, but Yael Israeli argues that people tried to create vessels out of the same mosaic glass from which they made beads. He suggests that workers pinched shut the ends of beads, or tubes intended for beads and inflated them (Israeli 1991: 46). An excavation of the Jewish quarter of Jerusalem's old city, carried out by Professor Nahman Avigad in 1971, discovered what appears to be the earliest known evidence for glassblowing. The finds suggest that early experimentation with glassblowing was done with glass tubes closed at one end by heating and being pinched or folded over. Some of the finds at this site had tiny holes in the closed end showing that they were not properly closed, but the edges were definitely rounded by heat. There are others that appear to have reopened at the weak closure point during the blowing process. The closed end was then reheated and the glass was inflated from the cool open end rather than through a blowpipe, which had not yet been invented. The archaeological context of this early blown glass can be convincingly dated to the middle of the first century B.C. The cache was discovered in an out-of-use ritual bath beneath a road that was constructed by King Herod in 37-34 B.C. In the bath, along with the glass were pieces of pottery and coins dating to the first half of the first century B.C. (Israeli 1991: 47-50).

In spite of the ease of producing glassware through glassblowing and the spread of

glasshouses throughout the Empire, it is often hard to pinpoint centers of manufacture. A few writers, such as Pliny, make occasional mention of glass centres like Sidon (Pliny *Nat. Hist.* 36.193), but inscriptions on vessels are the best evidence for many glass-working centres including Alexandria, Aquileia, Diospolis, the Belus region, Puteoli, Rome, Sidon, and parts of Gaul and Spain. A few centres are known from other inscriptions, but it is often difficult to definitively pinpoint glass-working sites from the archaeological record. Roman era inscriptions noting glassworkers have been found in Dalmatia, Athens, Lyons, and possibly Piacenza where someone is noted with the cognomen *Vitri* (glass): *Caius Terentius/ Caius Lucius Dioscorus/ posuit sibi et verecundo lib(erto)/ Cnaeus Pompeio Vitri/ [illegible marks]* (*CIL* XII, 1276; Isings 1957: 2). Another inscription mentions a neighborhood in Pozzuoli in which the glass industry supposedly flourished, but there is as yet no archaeological evidence of a workshop: *Mavoritii/ Q. Flavio Maesio Egnatio Lolliano/ C. U. Q. K. Praetori Urbano Auguripu/blico Populi Romani Quiritum Consuli/ Albei Tiberis et Cloacarum Consuli Operum/ Publicum Consuli Aquarum Consuli Camp/ Comiti Flaviali Comiti Orientis Comiti Primi/ Ordinis et Proconsuli Provinciae Africae/ Regio Clivi Vitrari Siveviciturari/ Patrono Dignissimo* (Di Pasquale 2004: 38).

The problem with identifying glass workshops is that they are often small, are sometimes combined with a shop, or with another industry, and can sometimes be confused with pottery workshops. Glass workshops can be small because it is not actually necessary to make the glass and produce glassware in the same facility. In fact, glassmaking is almost always carried out in a separate facility generally referred to as a 'primary workshop.' Primary workshops were usually found close to the sources of raw materials (Fleming 1997: 10). These sites were often situated near the seashore, on wooded hillsides so that they had access to fuel sources, and to beach sand, which was a natural mixture of quartz, feldspar, and crushed seashells. Such sand could provide

both the silica and the lime (sea-shells) needed for making glass (Fleming 1999: 52).

In general, Roman glass had a fairly homogeneous composition, suggesting a fairly limited number of raw material sources being utilized throughout the Roman world (Price 2005: 168). In fact only five glassmaking areas making use of local sands are recorded in the first century A.D. literary record. Strabo (16.2.25) mentioned the Syro-Palestinian coast (excavations have so far only confirmed Byzantine and early Islamic primary workshops in this region) and Egypt, which has been confirmed by archaeological remains that are not precisely dated. Pliny (*Nat. Hist.* 36.194) listed the other three as Campania, Spain, and Gaul (Stern 2004: 96-97). Primary workshops have been found in Egypt at Lake Maryut near Alexandria and at Wadi Natrun and on the Syro-Palestinian coast between Apollonia and Akko (Ptolemais), close to sand from the River Belus (Price 2005: 168; Strabo *Geo.* 16.2.25). This kind of site is often identified by large rectangular furnaces that are made to produce massive amounts of raw glass (Price 2005: 168). These large sophisticated furnaces were necessary to make glass, because in order to successfully melt enough materials to produce the eight to ten tonnes held by such furnaces, the ingredients had to be heated to about 1050°C for between five and ten days. It was often necessary to produce such large amounts at one time to make it worth the production cost.

Three large furnace sites have been excavated in the last half-century. The most famous furnace sites, Bet She'arim, and the site of Arshuf were excavated in the 1950s and 60s, and a furnace site at Hadera was excavated in the 1990s (Fischer 2008: 19). Bet She'arim and Arshuf installations each contained eight to ten tonne glass wasters from failed melts that were initially mistaken for glass floors because of their massive size. Unfortunately modern bulldozers had removed much of the surrounding contextual data making dating difficult. The excavation at Hadera uncovered sixteen furnaces used for glass melts with enough evidence to fully

reconstruct the furnace plan and a firebox dug 50cm into the ground. The evidence shows that furnaces were built for single use only and were disassembled for the removal of the glass. In spite of the large number of furnaces capable of producing huge quantities of glass, only twenty-five kilograms of glass was found on the site, showing that the glass was clearly shipped elsewhere. The evidence at Hadera shows that the site was only in use for a limited time period, perhaps as short as one manufacturing season (Fisher 2008: 19-20). The glassmakers would have had to move on once the combustible materials of the vicinity were exhausted.

Most glassmaking was carried out in the East close to traditional raw material sources, and though there are a few exceptions,² the vast majority of glass furnaces in Western Europe and Britain have been identified as secondary workshops (Stern 2008: 520). Secondary workshops actually produced glass goods. They did not make raw glass, but relied on imports of that material from primary workshops. Raw glass was shipped all over the Empire to meet the needs of secondary workshops. The ingots were much less of a worry for shipping than finished vessels since they were much less fragile. Evidence for the shipping of raw glass has been found in shipwrecks from the early Imperial period. One example is a first century A.D. wreck near the island of Mljet off the coast of Croatia that contained one hundred kilograms of raw glass.

Secondary workshops also made use of cullet, or recycled glass chunks. Trade in cullet actually became a business in its own right. Cullet was sometimes transported by sea, but was often collected in the vicinity around the workshop where sulphur match heads would be traded for any old, or broken glass (Price 2005: 168-169). Even before the invention of glassblowing there was limited recycling in glass. The earliest recycling did not involve re-melting. The cullet was often used in architectural mosaics. Curved bits could also be used for inlaid eyes on bronze

2 A few glassmaking sites in the Western half of the Empire have been dated as early as the

sculptures or mummies. Pliny did not even believe that glass could be re-melted (Stern 1999: 451). He said: *fragmenta teporata adglutinantur tantum, rursus tota fundi non queunt*, or “broken fragments can only be made to stick to each other, they cannot be totally remelted” (Pliny *Nat. Hist.* 36.199). Glassblowers clearly did re-melt cullet and use it for new products by the A.D. 86 when Martial wrote his Epigrams, because the use of recycled glass had become a large scale business. Martial, Juvenal, and Statius all mention the trade of sulphur for broken glass as though it were a common activity (Martial *Ep.* 1.41.3-5 and 10.3.3-4; Juvenal *Sat.* 5.47-48; Statius *Silv.* 1.6.73-74). The discovery that cullet could be completely re-melted undoubtedly predates A.D. 79, and a basket of broken glass from Pompeii appears to have been intentionally collected for the purpose of recycling (Stern 1999: 451). At this point strongly coloured glass was also going out of fashion, so most collected glass was be fairly clear and did not pose a risk of blending colours and creating a muddy looking new product (Stern 1999: 451).

Since the raw glass was actually made in a separate location from where it was worked, glass workshops could be set up anywhere there was a market for their products, and this did not require the same extensive amount of space required for huge melting furnaces (Fleming 1997: 10). Within half a century of Rome's domination of Europe and the Eastern Mediterranean glass-working went from a local art to an empire-wide industry with working sites in nearly every region. By the end of the first century B.C. the western glass industry was most prominent in Northern Italy, Dalmatia, the Ticino Valley (southern Switzerland) and Campania, and by the mid first century A.D. major production centers had developed further north and west in Avenches, Switzerland and Lyon, France (Stern 2004: 80-81). Western sites were often well suited for glass workshops, because of the vast timber reserves in Western Europe (Grose 1989:

242). Timber reserves were of key importance for glassworkers because of the huge amounts needed to maintain adequate furnace temperatures. Modern glassblowers in Turkey who still use furnaces similar to those used in Roman times estimate that they burn about one hundred kilograms of wood every day (Fischer 2008: 91).

The use of a large amount of fuel, a large concentration of glass in one area, or a large output of glass from one production site did not mean that a glass workshop was a large factory employing large numbers of slaves or free labourers. In fact, the opposite tended to be true. Most Roman glass workshops were quite small, or even just parts of other buildings that house other businesses (Price 2005: 171). Comparative studies of modern glass-workers using primitive furnaces show that a single worker can turn out an average of one hundred vessels per day (Stern 2004: 102). The workshops found in Avenches, Switzerland; Besançon, France; and Moorgate and Regis house in London were found in warehouses, and other buildings, and relatively little can be told about the glass-worker's space (Price 2005: 171). A large operation with many workers required multiple furnaces, since each glassblower requires his or her own working port, and Roman pyrotechnology did not allow for the maintenance of required temperatures with more than one opening in furnace.³ Some glass-working sites only had one furnace, as is the case at Mancetter, in Warwickshire, England, but others such as workshops at Avenches and in Lyon had clusters of circular furnaces in close proximity to one another (Price 2005: 171). This does not mean, however, that many workers were blowing glass at the same time. Modern examples from Herat, Afghanistan show us that a furnace can only be used every second day since it takes a full 24 hours to cool down after a day of use (Stern 2008: 541). Multiple furnaces might be meant for a single glassworker, to allow him to work on consecutive days.

3 The earliest evidence for a furnace with multiple ports is in a 15th century drawing in the

Small workshops, or workshops connected to other businesses, can easily be overlooked or misinterpreted. Even locations that have evidence for large amounts of glass could represent a retail location rather than a workshop. That said, it is usually hard to tell the exact purpose of a retail space unless its activity came to a stop suddenly through some sort of disaster. The earliest glass retail space that has been discovered comes from the colony of Cosa, north of Rome, and dates *circa* A.D. 40-45. The site was destroyed and sealed off when the northwest wall of the forum basilica collapsed on the adjacent building, which contained several rooms that investigators have identified as rented retail space. Excavation of the rooms has yielded coins, over 200 Arretine vessels, 12 amphorae, over 40 pottery lamps, and 76 glass vessels (mostly tableware). The fact that the glass and ceramics are all contemporary to the destruction period suggests that this was a retail shop's storeroom. The vessels are also well preserved and lack signs of use. All of this suggests that these were new products produced and gathered together just before destruction (Price 2005: 180). Another first-century example of a glass retail area provides evidence that the Roman glass trade was well established as far afield as the colony at Colchester, England. There, a fire destroyed a building on the main street in *insula* XIX containing a shop that sold both glass and ceramics. Hundreds of South Gaulish Samian vessels, some coloured pottery, and a large amount of glass were found. It appears that the pottery was stored on the floor and on low shelves, with the glass above it. An exact tally of the glassware is impossible, because it was almost completely melted by the fire. Stamps on the Samian ware could date this shop somewhere around A.D. 50-55, although arguments have been made for A.D. 60/61, the Boudican destruction (Price 2005: 180).

Glass workshops were often located out near the edges of towns or cities. As cities

expanded and surrounded them, the workshops were built within city walls, near public buildings, on major thoroughfares, or in areas that had gone out of residential use (Price 2005: 174). This process could complicate identification based on the position of a site within an urban center. Martial tells us that the glass workshops in Rome during his time were found in the Trastevere, an area known for the polluting trades like tanning, where the sulphur hawkers took the cullet (Martial *Ep.* 1.41.3-5; Fleming 1997: 11).

There were far fewer glass workshops in the Roman world than there were for other fire-based industries. Stern cites statistics from Switzerland to back up this claim, stating that only 23 glass-working sites have been located in that country, representing only six percent of fire-based workshops. She compares this number to 87 workshops that dealt with copper alloys (23%), 143 (39%) for iron working, and 116 (32%) for pottery workshops (Stern 2008: 541). Post excavation analysis has been able to identify more than 70 glass-working sites in France, and over 20 in Britain. These sites vary in nature but are often identified by furnace remains. Their small furnaces can usually only be identified by the ground plans and substructure. The furnaces are generally circular with one flue and an average diameter of between 0.4m and 1m (Price 2005: 170). Piles of cullet, wasted droplets, or nearby heaps of slag can also be used to identify glass workshops (Neuburg 1962: 64).

One of the best-studied examples of a workshop from the period of interest to this paper is a second to third century A.D. workshop from Bet She'arim (Sheikh Abreiq) near Haifa, Israel. This workshop was in a roughly cross-shaped building. The main part of the building was constructed of thick clay bricks that conserved heat. The actual workroom was separated by a doorway and had a mosaic floor, which is now blackened where the furnace stood. The rooms that form the arms of the cross have been interpreted as annealing chambers where the glass

slowly cooled to avoid flaws which can be caused if the surface and interior of the glass cool at different rates (Neuburg 1962: 66). In many smaller workshops annealing appears to have been done in ash piles just to the side of the ovens. A good example of this was seen at a Byzantine workshop from Bet She'an, which was destroyed by an earthquake at some point in the late sixth or early seventh century. This shop had a single furnace in a central room with two adjacent piles of ash for annealing. These piles contained olive pits, which helped to retain heat and keep the surface of the glass objects placed within the piles from cooling too quickly. Many lumps of glass and finished vessels were found in this room, as well as in a storage room to the north, which also contained pots and baskets with stacks of cullet and materials for maintaining the furnace (Price 2005: 172; Stern 2008: 525).

The workshop at Bet She'arim must have been a large producer if the separate rooms were actually needed to contain all the products being annealed. It may be just as likely that these rooms stored finished products, or were used to house fuel, cullet and raw glass, as the north room was at Bet She'an. Storage space for cullet and furnace fuel was also the purpose of a side room in a glass workshop that Alysia Fischer visited in Turkey, in 1996, as part of her study of production techniques through modern analogies (Fischer 2008: 88-89). This seems to have been a common use for rooms away from the oven, and in order to minimize risk of errors in annealing a product it was likely better to have the annealing site in the immediate vicinity of the furnace where it could be placed directly after being formed without having to carry the hot glass through the workshop. Staying close to the furnace would also allow the glassworker to quickly begin a new piece and not waste furnace heat by being away from his station. That being said, the interpretation of the side rooms as annealing chambers must not be dismissed. It is not unheard of to have separate annealing chamber, as there was an adjacent structure specifically

for annealing at a workshop in Avenches. Workshops that turned out high volumes of glassware required a substantial amount of space for annealing, and this could have actually been a limiting factor in the space available for working. Annealing can take eighteen to twenty hours depending on the size of a vessel. Such physical restraints prevented the glass industry from having large-scale workshops with hundreds of employees or slaves like some pottery and metalworking facilities (Stern 1999: 454-455).

The techniques used by the workers in these early glasshouses have been a matter of conjecture in the last century. Although there is almost no written evidence for glassblowing techniques, Seneca and Petronius marveled at the low cost and speed at which glass became common, and at its novel qualities (Seneca *Ep.* 90.31; Petronius *Sat.* 50). Also, workshops are rarely found intact or studied thoroughly, and blowpipes rarely survive. Some of our best contemporary evidence for ancient techniques comes from artistic representations of glassblowing on clay lamps. First century lamps from Asseria, Croatia and Skolarice-Krizisce (Slovenia) depict what looks like a glass furnace and a craftsman with a blowpipe (Price 2005: 170). Archaeological finds show that blown vessels had almost superseded all other forms of glass vessels by the late first century (Price 1976: 114). Most of what we know about glass production techniques comes from studying the remains of vessels themselves. Vessels that were sagged over a mould or turned on a lathe usually have evidence of tooling or the mould itself, and have open forms because they could not otherwise be separated from the mould. Closed forms like bottles could only be created through inflation. Blown vessels often have pontil scars, or impressions of moulds into which they were blown (Stern 1999: 450).

Most decorated mould-blown glass was produced in the first century A.D. In the second and third centuries mould blowing tended to be used for mass-producing storage containers such

as square, hexagonal, or cylindrical bottles (Price 1976: 120). The transformation of mould-blowing from an artistic technique to a method of mass production for utilitarian vessels was largely an Italian development that took hold all over the western part of the Empire, soon after the death of Tiberius in A.D. 37. Decorative mould-blowing did not cease. Decorative pieces continued to be produced in the East, but on a much more limited scale than they were in the first century (Stern 2004: 80, 112). Hinged moulds were popular in the first two centuries A.D., and could be made of wood, ceramics, metal or plaster. Other moulds could be made of three or four completely separate pieces, or in the West just two pieces. For rectangular bottles a rectangular slab with the base design was used for the bottom, and four vertical slabs were inserted into slots along the edges of the base. The glassblower himself did not always make the moulds, but moulds often represent a separate artisan's work in the industry. Common mouldings included inscriptions in both Greek and Latin, and scenes of the circus or the amphitheater (Stern 2004: 113-115; Klein and Lloyd 1984: 11).

When blowing glass, the hot glass is gathered on the end of a blowpipe and inflated into a bubble called a "parison" which was shaped and cooled, rolled on a marvering table, and often further inflated. A glassworker could shape his products with wooden paddles, moulds, pincers, or cutting tools. Throughout the whole process the pipe was rotated so that the soft glass would not sag in any one direction. Once shaped the vessel could then be knocked off the blowpipe, spun around and attached to a rod called a pontil, which held it while the rim was formed and decorations or ring bases were added (Klein and Lloyd 1984: 11). Early glassworkers did not actually need to use molten glass. Most are believed to have used preheated chunks, which were picked up on the end of a blowpipe that had been prepared by rolling the heated tip in finely ground heated glass which would then bind to the chunk being picked up. This is a technique for

which we actually do have some written evidence dating as far back as the third century A.D. It is found in a fragmentary poem on a papyrus fragment preserved at Oxyrhynchus, Egypt:

First he heated the tip of the blowpipe, then snatched from nearby a chunk of bright glass and placed it skillfully within the hollow of the furnace. And the Crystal as it tasted the fire was softened by the strokes of Hephaistos like... He blew from his mouth a quick breath... like a man essaying the most delightful art of the flute. The glass received the force of the breath and became swollen around itself like a sphere before it. It would receive another onslaught of the divine breath, for often, swinging it like an oxherd his crook, he would breath into... (*The Oxyrhynchus Papyri* 3536; Stern 2004: 93).

The fragment does not mention the ground glass on the blowpipe, but knowledge from modern glassblowers lets us know that it is necessary. The passage also describes a technique known to modern glassblowers whereby the artisan stretches out the shape of the bulb with centrifugal force as he or she swings the blowpipe. A second century poem attributed to Mesomedes of Crete describes an alternative method for picking up a chunk of preheated glass with tongs (Mesomedes of Crete *Anthologia Palatina* 16.323). Until making the realization that glass could be used when runny, glassblowers tried to avoid letting the glass get too hot for fear it would drip off and go to waste (Stern 2004: 94).

Working with molten glass involved more challenges than working with glass chunks and tended to have more waste as a result of dripping, but this technique allowed for greater clarity and a much wider variety of possible forms. Working with molten glass required the temperature to be maintained between 1050 and 1150°C for the duration of the working process. Once in this temperature range, glass would be approximately the consistency of honey, which is thick enough to gather on a blowpipe, but still very flexible (Stern 2008: 523). If temperatures fell lower than 1050°C, striae, bubbles, and impurities are visible in the finished product. The high temperature would have made the working conditions difficult as the blowing port would emit

fierce heat, and there is no evidence that the Roman furnaces had shield doors, as seen on modern furnaces, that could be closed when the worker did not actually need access to the interior heat.

In order to work with molten glass, the gathering technique also had to be rethought. Rather than preheating the blowpipe, the worker actually had to cool the tip of the blowpipe. Cooling may have seemed counter-intuitive to experienced glassblowers, but cooling the skin of the blowpipe took less time than heating a new chunk. Working with molten glass enabled glassblowers to produce even larger vessels, since the blower could dip the pipe into the molten glass more than once to gather additional glass, rather than being limited to the amount of glass in a chunk. This method of glassblowing gained popularity in Italy and the West much faster than it did in the Eastern Mediterranean, which continued primarily to use chunks for glassblowing up to the fourth century. Stern suggests that the greater availability of fuel in the west may have played a part since molten, or 'hot' blowing requires substantially more fuel (Stern 1999: 451-454). 'Hot' glass-working was not just important for blown vessels, but was also important for the development of flat glass, which had to be poured into trays. The discovery of flat rectangular window-panes at Pompeii shows that the ability to use molten glass was known in Italy by the mid first century A.D. (Stern 1995: 43).

A downside to working with higher heat is that hot glass has a tendency to bind with other materials like a mould when it too is hot. Mould-blowing with 'hot' glass would have been a tricky procedure in which the mould would have to be removed quickly at precisely the right time to prevent damage to the vessel or to the mould. There were, however, methods of reducing the chances of having the glass and the mould bind that go back to the fifth and fourth centuries B.C. Many Greek moulds from this period have traces of an aluminium oxide called *corundum*

that served as a separator (Stern 2008: 525). Mould-blowing appears to have been developed in the Eastern Mediterranean where, as Stern puts it, “glassblowers could explore the technology far from the dangers of the capital” (Stern 2004: 113). The earliest evidence we have for mould-blown ware (Augustan, pre- A.D. 14), was actually found in the West, in a Roman mining settlement at Magdalensberg, Austria, but its style suggests that it was made by an eastern glassblower, possibly even Ennion, the most famous of ancient glassblowers. Early mould blown pieces imitated chiseled relief on metal-wares (Stern 2008: 538-539). The use of mould-blowing reached its greatest potential however when it began to be used simply to mass produce utility wares in smooth walled moulds that could be reused many times. The prismatic shape of many of these types of mould blown bottles facilitated packing in wooden crates for shipping and simple base mouldings allowed for brand recognition, which became significant in several of the roles that glass played in Roman society (Stern 2008: 539).

The role of glass in the Roman Imperial period was not limited to decorations or containers, or to any particular level in society. Everyone from a lowly slave to the Emperor himself used glass in his daily life. Glass fit into all parts of daily life. Glass was used for eating, drinking, toiletry, lighting, and even holding the ashes of the dead (Newton and Davidson 1989: 18). This material also played important roles in the advancement of science and medicine, by providing clear laboratory implements. Glass was used early experimentation in optics, the shipping and marketing of goods, the heating systems for Rome’s famous baths, and in some cases as symbols of status, or of artistic taste or skill. Glass was able to fill roles that no other material available at the time could fill, and it could substitute for many other materials. The Romans did not take this material for granted. They commented on glass, represented it in art, and recognized the traits that made it special above other materials. Glass was held in high

esteem and under the Romans the industry enjoyed a heyday and great advancement encouraged by open communication and the relatively free trade of ideas.

Glass guilds did emerge in the Roman world, and though they may have kept the secrets of glass within their membership, they had much broader networks than in many later periods. In medieval France only a few specific families were privy to the secrets of glass making, and the knowledge was only to be passed down through the male line. In 1369, in hopes of benefiting from the then rare and prized glass industry, Duke John of Lorraine tried to encourage glassblowers to settle in his territory by giving them letters of privilege. In 1448, Jean de Calabre took similar measures granting glass workers a charter to work in the Forest of Darney in the Vosges. The secrets of glassmaking were so closely guarded in post Roman Italy that members of the glassmakers' guild that formed in Venice in 1220 were prohibited from emigrating on pain of death. In 1579, England granted special benefits to its prized glassmakers by granting 'glass men of good behaviour' a license from justices of the peace that gave them immunity from prosecution (Newton and Davidson 1989: 18-19).

Shortly following the invention of glassblowing, glass was in use in all parts of the Roman Empire and at all social levels. Fleming estimates that circa A.D. 116 there were about 54 million people living within the borders of the Roman Empire, and that as many as eight million households used sixty or more glass items every day. Many of the remaining Roman households would have used some glass on a regular basis. These glassware ranged from the unguentaria used in the morning toiletries of the ladies in the household to the tableware used for the evening meal. Even the slaves would have, in many cases, used glass tableware and containers. Fleming goes on to say that if we allow for each of these eight million homes to break around twelve pieces of glassware per year, then the glass industry would need to turn out

almost 100 million items every year to make up for the demand, and that is not even taking into account the demand from households that used less than sixty pieces per day (Fleming 1999: 60).

As the popularity of glass rose and glass began to be used by all social classes, and as glass workshops sprung up throughout the Roman world, glass items that were not highly decorative lost much of their luxury status. As a result, the cost of glass diminished. By the mid first century, there was so much glass in circulation that the term *vitrea fracta* or “broken glass” became synonymous with “trash” (Fleming 1999: 27). Goods buried by the eruption of Vesuvius allow us to compare numbers of glass vessels to ceramics and metal vessels from the same point in time. At Pompeii, glass finds outnumbered thin-walled pottery by as many as two or three times, suggesting that it had almost completely replaced earthen tableware (Stern 2004: 103). This statistic may be fairly accurate, but it is not absolute because the glass is being compared to *thin walled* pottery, which does not stand up as well as thicker pottery and may be overlooked or miscounted if broken up into small enough bits. Glass was so prevalent in Roman society, and was held in such high esteem that Ray Winfield Smith went so far as to suggest that glass played a larger role in Roman life from birth to death and beyond than it did in the lives of Europeans and Americans in the 1940s. The reasons he gives for his claim are that oils used in a baby’s first bath would have been stored in glass, and some of their first nourishment may have come from special flasks that have been identified as nursing bottles. Children had glass toys, adolescents may have played games similar to chess or checkers with glass ‘men,’ and there were adult sports in which contestants juggled glass balls. Glass was also involved in certain rites of passage. When a young patrician reached the age of majority, the hair from his first shave was placed in a special pyxis to be carried to a consecration ceremony (Smith 1949: 49-50). Martial described the practice of smashing glasses in celebration after a toast, encouraging the purchase

of cheaper local wares over imported crystal (Martial *Ep.* 12.74). Even after death glass could be important for use as cinerary urns of grave offerings (Smith 1949: 51). Suetonius recorded the pyxis ceremony in his *Life of Nero* (Suetonius *Lives of the Caesars* 4.12.4). Carefully wrapped locks of hair have been found in Roman graves, each of them still in the pyxis that contained it (Smith 1949: 51). Nero is said to have had his water boiled in the winter and then cooled by placing it in glass containers in the snow (Pliny *Nat. Hist.* 31.40). Nero is by no means the only example, in the literary record, of members of the Imperial household using glass. Even though Petronius' story of the unbreakable glass from the *Satyricon* is a fabricated tale, it still suggests that glassware was something that was both used and prized by even the highest citizens in Rome, since the glass bowl was being presented to the emperor Tiberius himself. Another set of imperial anecdotes concerning glass can be found in Lampridius' passage on Elagabalus in *Scriptiones Historiae Augustae*. Lampridius describes the use of glass in practical jokes. Hangers-on were served banquets of imitation food made of glass, and when servants were ordered to pour out water for washing the double walled glass cups would have the illusion of being full, but really just have a little bit of water trapped between the inner and outer walls of the vessels (*SHA: Antoninus Elagabalus* 25, 27).

Wealthy homes would be full of fancy glass tableware, kitchen articles, dressing table items, and purely decorative objects (Smith 1949: 50). Many other useful items made of glass were found in homes and in public spaces. Some mirrors were made of glass, and some Romans had window glass, a building feature that was not affordable to everyone but which was fairly common (Smith 1949: 50). Windows also played a key role in the great baths of the Roman world. Window glass was necessary both to let in light, and the warm rays of the sun, and to keep in the heat from the baths' furnaces. The largest baths required huge quantities of glass.

Surviving records from the first century B.C. to the second century A.D. are hard to find, but we know that baths were built and can figure out how large their windows were. We can actually see what the expenses on glass were in some later baths. The public baths at Oxyrhynchus, for example, used six thousand pounds of glass costing 1,320 talents. Window glass was not the only use of glass in bath complexes. The baths of Caracalla also included 16,900 square meters of mosaic glass (Stern 1999: 458). Glass was also used to decorate elements of statues, and to decorate walls, vaults and furniture (Price 2005: 167).

Window glass is mentioned in Diocletian's Price Edict, but is assigned a low maximum price (8 and 6 denarii per pound for first and second quality respectively) (Stern 1999: 464) suggesting a lack of importance. This is likely a result of the Price Edict's composition while Diocletian was living in Antioch and many of the prices reflect conditions in that city (Stern 1999: 461). Glass was less important and less common in the Eastern Mediterranean where the climate was more temperate. Glass was used quite regularly in the West and also in Egypt, though written records of window glass in Egypt date to the fourth century (Stern 1999: 464).

Glass was used for many other roles because of its unique properties. The ability of glass to advance the ripening of plants led to frequent use of glass to cover vegetable gardens, it could be used to bend light and to serve as a magnifying aid, though the proper focal point could not yet be achieved to correct vision, and glass could imitate various precious stones (Smith 1949: 50). At the same time that utilitarian glassware was common, lavish gold-sandwich glass, imitation rock crystal and gemstones, and beautiful cameos were being produced (Newton and Davidson 1989: 24-25). Cameo glass could be created in a number of ways. A bubble of white glass could be blown and have a paraison of another colour pressed inside, or a glass object could be shaped and then dipped in layers of other coloured glass, or one colour could be blown

into shape and the other cast around it (Goldstein 1982: 10-11).

Other properties of glass, such as its clarity and the fact that it does not affect the taste of its contents, make glass highly valuable for many roles. Pliny recognized its qualities for preserving food without changing the flavour and recommended that grapes should be kept in glass (Pliny *Nat. Hist.* 14.17). Propertius praised it as a drinking vessel and suggested that it was the best kind of vessel to drink from in the summer (Propertius *Eleg.* 4.8.35), and Petronius' character Trimalchio claims to prefer glass for its lack of odor, going so far as to say he would prefer glass to gold if it were not fragile (Petronius *Satyricon* 50). Glass instruments were used to prepare medications, which were then stored in glass containers (Smith 1949: 51). This material aided in the advancement of scientific knowledge, and continues to do so, because many instruments such as lenses, as well as later devices such as thermometers, barometers, and all sorts of chemistry equipment, rely on transparency (Di Pasquale 2004: 40). Glass was easy to clean and reuse as well as being easily replicated in the same shape to allow for easy storage. These traits made glass a useful material for storage vessels used in transportation (Newton and Davidson 1989: 24). Some industries even worked closely with the glass industry because glass was so well suited to their products. For instance, there is epigraphical evidence that shows that in Puteoli the glass-workers and the frankincense dealers worked in the same part of town, probably because the frankincense was sold in glass bottles (*Regio clivi vitrari sive vici turari* "the quarter of the glassworkers also known as the quarter of frankincense dealers.") (Stern 2004: 104). Glassworkers in Campania may also have been closely tied to the perfume industries, because the region was well known for glass, and according to Pliny the region was famous for perfumes (Isings 1957: 5; Pliny *Nat. Hist.* 18.111).

By the mid first century A.D. the importance of glass and its special traits were even

being recognized in art forms that did not use glass. Glassware appeared in literature – the examples above and more– and in Vesuvian wall paintings (Price 2005: 167). One scene in the house of the Vetii in Pompeii has traditionally been identified as cupid goldsmiths making coins, but Giovanni Di Pasquale argued that it might in fact depict glass-working. Paintings of glass were not strictly limited to Pompeii either (Di Pasquale 2004: 32, 39). Pausanias praised the transparency of glass depicted in a painting by the painter Pausias at Epidauros, which showed a woman, perhaps Metis, drinking from a cup, and the viewer could see her face through the cup (Pausanias 2.27.3).

Rome provided benefits to the empire's glassblowers at various times in order to encourage this vital craft. To assist Italian glassworkers and offset the cheapness of some Egyptian imports Aurelian imposed an import duty in the early 270s (Newton and Davidson 1989: 27), and in 337, by order of Constantine or one of his sons certain groups of artisans, including glass workers, were exempt from personal taxes and compulsory duties to allow them to improve their skills and train future generations to continue the crafts (Fischer 2008: 13; Price 2005: 178). Theodosius II again introduced a tax exemption for glass-workers in the early fifth century.

Glass-working was a hugely significant craft for its role in the economy, its contribution to technological and scientific advances, and its variety of uses. The Romans recognized the material as something unique and wonderful and took the industry to heights not reached until modern times. To the Romans, glass, unlike many other crafts had a somewhat magical quality that was worthy of high praise and encouragement. Because of its great importance the people who worked with glass began to mark their works and take credit for their role in society. The questions, however remains, to be addressed: Who were the people who stimulated such

advances and powered the glass industry? Did they get the credit and recognition that they deserved? Was credit the reason for marking their works? Finally, who among those dealing with glass products is represented by the marks we now find on surviving Roman glass vessels?

Chapter Two: Glass Makers and Their Marks.

As shown in the preceding chapter, glass was remarkably versatile, and its qualities amazed ancient people. Not surprisingly, the people whose livelihoods were based around glass wanted to leave their marks and be recognized for their craft. Unfortunately, difficulties arise in determining the role of individual makers' marks and the role in production of the person whose mark appears. It can be a difficult task to determine whether a stamp or signature on glass is that of the worker or a 'brand name' referring to the owner of the workshop. Signatures could also be those of a mould-maker who was taking credit for his artistic design, much like the vase painters of ancient Greece, who were often different from the potters. Additionally, glass vessels were often made to contain specific substances, and like a perfume bottle or a drink bottle today, a mark may refer to the maker of the contents rather than of the vessel itself.

At times, glassmakers enjoyed special treatment in recognition of the importance of their craft, and after the Roman period, when knowledge of glass-working was closely guarded, they were prized workers. But who were the people who worked with glass in ancient Rome, and how did they fit into Roman society? This chapter will examine the kinds of people who made glass vessels and how they were viewed in ancient Rome, and will look at various types of makers' marks, and will briefly look at the evidence for some individuals whose work is known. The chapter will conclude with a short look at the work and dispersion of the most famous first-century maker of mould-blown glass, Ennion.

Glass blowers worked with their hands in uncomfortable conditions and engaged in commerce. In ancient Rome, careers that required such work were considered ungentlemanly. Stern labels glassblowers as *banausoi* or furnace workers (Stern 2004: 78). The term *banausoi* comes from βαναύσοις, which was an epithet for the class of artisans or craftsmen and could

often be used to mean 'vulgar' or 'in bad taste' (Liddell and Scott 1968: 305). Aristotle commented on the term saying, "We term 'banausic' those crafts that make the condition of the body worse, and the workshops where wages are earned, for they leave the mind preoccupied and debased" (Aristotle *Politics*. 8.2.1). Seneca echoed this statement when he argued that it was not the wise that invented the tools for the crafts, or devised ways to mine the earth. He claimed that people with nimble, but not "great or elevated" minds invented these things, as is the case with anything that is "sought with a bent body and a mind focused on the ground" (Seneca *Ad Lucilium Epistulae Morales*. 90.10-13. translation in Greene 2008: 803). The ancient commentaries that suggest that certain crafts had a negative impact on the body apply well to glass-working.

Fischer dedicates an entire chapter of her book *Hot Pursuit* to the physical effects of glassblowing. There are the expected possibilities of skin burns and cuts, but there are also many serious, long-term effects from which glassblowers often suffer. The physical strain, along with the presence in the air of smoke, silica, and metal oxides from colourants put glassblowers at risk of chronic bronchitis, emphysema and silicosis (Fischer 2008: 140-143). Glassblowers are also at risk of damage to the heart, kidneys, and reproductive organs as a result of prolonged exposure to extreme heat. Eye problems like conjunctivitis (pink-eye) and cataracts are other potential problems for glassblowers, because molten glass gives off both infrared and ultraviolet radiation (Fischer 2008: 144-148). Glassblowers frequently suffer from muscle strain in the neck back and shoulders from carrying hot glass around the workshop on the end of a blowpipe, and carpal tunnel syndrome is common because of the need for the constant rotation of the blowpipe to prevent sagging during the working process (Fischer 2008:149-150).

Seneca's passage noted above supports the dominant upper class view that the 'proper'

gentlemanly pursuits in Rome should allow a man time to further his mind and participate in political activity, and that crafts and commerce were below the dignity of free-born citizens. As a result, most craftsmen were not respected or admired, and many were slaves working for shop owners (Fleming 1999: vii). Passages such as this must, however, be recognized as expressions of elite prejudice. The writings of Seneca and Cicero, another who commented on ‘vulgar’ Roman professions (Cicero *De Off.* 1.42), represent the upper echelons of society, and their writings represent the views of their peers. (Di Pasquale 2004: 38). Evidence shows that the prejudice against craftsmen did not penetrate all levels of society, and those who produced wares of high quality enjoyed a degree of prestige among the working classes. The products of some workshops and individual glassblowers enjoyed wide distribution, which suggests that people recognized the quality of the products, and may even indicate some degree of ‘brand’ recognition. The people associated with craftsmen felt no shame in commemorating them, after death, with gravestones that named the crafts or trades and even showed some at work (Greene 2008: 803). For instance, a glassblower by the name of Julius Alexander is known from his grave marker in Lyon, France, which proudly names his profession and tells us a little of his life. We know that he was not just an employee of a glass shop, but rather an “*opifex arti vitriae*” or master in the art of glass, who lived to the age of seventy-five years five months and three days at some time in the third century. The inscription also tells us that he was happily married for forty-eight years, and was born in Carthage (Price 2005: 176).

Glassblowers even appear to have enjoyed a degree of recognition and respect from craftsmen who worked in other materials. For instance, glassblowers have been depicted in decorations on clay lamps. A Roman pottery lamp from Northern Italy shows two glassworkers at work, and identifies them by name. The names tell us a little about who the glassworkers were.

Both men appear to be freedmen, because they lack the Latin *tria nomina* of natural-born citizens. The man blowing the glass is named Trellus, and his assistant's name is Athenio. The assistant's name tells us that he was as a freedman or slave, because he lacks the three names of a citizen, and it also allows us to infer that he, or his family, hailed from Athens (Stern 1999: 457).

Glassblowers were one of the most humble categories of workers in the Roman world, yet they could become specialists in various aspects of the craft. Such workers made great discoveries about glass that had far reaching consequences for science and technology (Stern 2004: 78). The low status of glassworkers is paradoxically at odds with the concept of 'name-brand' products. The concept of a "name-brand" product that raises the status of both owner and producer does not fit with the Roman idea that craftsmen were members of the lowest social station and had jobs that were looked down upon by their social 'betters.' Glassworks in the West were initially relegated to the edges of communities and only moved inward as settlements grew and surrounded them or made the edges of cities too far from markets for the workshops to be viable. In Rome, glass was worked in the Trastevere, where other 'unpleasant' industries like tanning were practiced (Fleming 1997: 11).

Literary sources make multiple references to glass, but they do not comment on the glassworkers (Di Pasquale 2004: 37). No literary texts give the names of any glass-workers, but the names of a number of glass-workers survive from funerary inscriptions, and a few glassworkers are named among traders and artisans in legal documents from early first-century Egypt. (Price 2005: 178). Our best sources of names for Roman glassblowers are the ones they themselves left on their work in the form of stamps. We know the names of over 130 glassworkers from their signatures (Stern 1995: 69). These names, as suggested above in the case of Athenio, are often our best indicators for who glassworkers actually were, and how they migrated around the

Empire to produce glass for different urban populations. It was fairly common to have phrases like, "The Cypriot" or "of Sidon" following signatures. Signatures labeling the maker as Sidonian appear in both Latin and Greek on the relief mouldings on handles for free-blown cups. The language used could even vary between works of a single worker, suggesting that he catered to a wide market. Aristoon, Artas, and Philippos all signed work in both Greek and Latin, and used the Sidonian toponym. A few others who produced the same style of vessel and marked themselves as Sidonian are only known from Greek signatures, namely Neikoon and Eirenaios (Stern 1995: 68). There is actually a large enough body of drinking cups from Italy that were signed on the handles in the same way but by different Sidonian glassblowers, to suggest some sort of guild organization among the migrant workers (Stern 1995: 95).

Pieces with signatures of this sort probably indicate that the worker was practicing his craft outside of his hometown and used the mark to identify himself and distinguish himself from other craftsmen in the region in which he worked. Unfortunately toponyms did not usually tell us where the individual actually worked, but by the mid first century regional production patterns and dispersion patterns are visible, and glassworkers can be identified as working in a limited geographical area (Price 2005: 178). There are very few who actually name the site of their workshop in their marks, which could have been helpful if the goal was to advertise their wares and expand their business.

The common occurrence of signatures, or other makers' marks, indicate that they must have served some purpose. Glassblowers and other craftsmen who signed their products took pride in their work and must have seen a benefit from being known in their field. Determining the intended role is complicated by the fact that there are numerous types of makers' marks on glass, and it is not always easy to even determine what type of mark a particular stamp or

signature is. A stamp or signature on a vessel could be the mark of the individual who made the piece, the workshop owner, the maker of the mould, the manufacturer of the contents, or even an administrative mark of quality or control. Scholars have made attempts to identify marks based on the type of vessel, location of the mark on the vessel, type of script, and formula used in the signature (Stern 2008: 539; Stern 1995: 68-71+74; Klein and Lloyd 1984: 29). On some occasions, it is possible to make a fairly certain identification, but in many cases identification involves guesswork. Here, I will examine various types of marks and the evidence that is used to identify the role of the signatory.

Identification of a maker's mark based on the type of vessel is tricky, and can often only be done in broad strokes. Studying the shape of a vessel to determine the role of a maker's mark is better for eliminating possible identities for the signatory than for pinpointing the actual role of this person. Tableware is a perfect example for a case in which certain identities can be eliminated based on type. Since tableware was not used for the transport and sale of other products, it is clear that the signatures were not related to contents. Tableware does not, however, pinpoint the role of the signatory, because it does not specify whether the signature represents a worker, a workshop, or a mould-maker. Names such as M. Licinius Deceus and C. Caesius Bugaddus appear on Roman glassware without any solid indicator as to whether these people were archetype makers, chop owners, or the actual glassblowers (Price 1991: 58). The tableware category does not even necessarily preclude identification as administrative marks.

Imperial or administrative stamps tend to be found on bottles, which might indicate administration over trade of contents, but they may also have indicated imperial control over a glass workshop or the entire glass industry in a region. Administrative marks usually are clearly identifiable in their own right because of the features of the stamp itself, and examining the form

of vessel is not necessary to identify them. Administrative stamps came in the form of monetary stamps – that is a coin imprint – or have legends such as *vectigal patrimonium*. Occasionally, administrative stamps contain the abbreviation *AUG* to clearly indicate when the administrative body actually was the imperial family. Most bottles with marks of this sort have been found in Italy and the Western Empire, but one bottle found in Northern Italy was stamped with a coin minted in Koinon Bithynia (A.D. 128/9) showing that the practice was also carried out in the East (Stern 1999: 469; Fleming 1999: 65).

The exact purpose of administrative marks is not entirely clear. Only a relatively small number of these inscriptions have been discovered, suggesting that they were not usually meant to be a legally binding guarantee the quality of contents at a retail level. It is not clear which point of production, packaging or distribution the inscription represented, or even for whom it was designed. In some cases, a monopoly of the sort indicated by stamps containing the word *patrimonium* was imposed as punitive actions. A precedent was set after the first Jewish rebellion in A.D. 66, when the Romans established a monopoly over balsam, and many ointment containers were marked with imperial stamps (Fleming 1999: 65; Mollo, 2003: 18-19). The reason for Roman monopolies in the Western Empire was more likely to facilitate the administration of the glass industry itself than in the Eastern Empire. In the East, trade, business, and civil administration was well established by the time of Roman conquest. Rome's Western subjects, on the other hand, did not have the well-established organizational, technical, and business skills of their conquerors, so the Romans themselves were better suited to administering workshops. For this reason, powerful Roman families using Eastern slaves and freedmen as business managers dominated glass centers such as Magdalensburg. The result of this practice was fewer local names in signatures on Western glassware than on wares produced in the East,

where the locals could manage their own small businesses. (Stern 1999: 459).

Stamps on the underside of mould blown storage or transport bottles are completely ambiguous unless the legend on the vessel actually states or hints at the identity of the person being represented. Such marks could just as easily be the maker of the vessel's contents as any of the glassworkers or workshop owners (Stern 1995: 69). In order to identify stamps on this type of vessel, without the help of the maker's signature, scholars often have to look at other factors such as the find context. One example that strongly suggests that bottom stamps can represent the maker of the vessel or the glass shop is an order of vessels from Herculaneum that was found still enclosed in packing materials. One of the vessels in the shipment was an empty square bottle with the name P. Gessius Ampliatus on the base. This vessel appears to have been for sale simply as an empty bottle, so the mark has to refer to the glass shop rather than to contents (Stern 1999: 468).

Sometimes the type of vessel gives us hints about the origins of the person whose mark is present, or about the region in which his or her wares were produced, but it rarely provides any information about the identity of this individual. One style of barrel-shaped mould blown bottle was common in Northwestern Europe for over 200 years, but the shape tells us little other than the general region of production.

A variation of these bottles with ribs is often referred to as a 'Frontinus bottle' because of the most common maker's mark on this form of vessel. The name Frontinus was prevalent over such a long period that he is believed to have been the originator of the barrel-shaped class (Richter 1911: 16). Frontinus appears in a variety of abbreviations, but they are all believed to be from the same workshop, or from related branch workshops. *FRONTI*, *FRO*, *FRONI*, and *FRONT* are all believed to stand for the same Frontinus. Frontinus may have been a glass blower,

but the long run of wares with some form of his signature (over 200 years) makes it clear that his name became synonymous with a workshop and was used for many generations as a 'brand-name.' The continued use of the Frontinus name shows that there was likely some form of 'brand' recognition, and that association with a quality archetype was important for business. The continued use of a familiar name would also have caught the attention of buyers because the name is a tool that would register the product in the buyer's minds as something they know, as personal names such as Ford and Giorgio Armani do today, and buyers have an instinctive tendency, as observed in modern society, to prefer products they recognize (Aaker 1996: 10-11). That said, it must be considered that the reason for the continuation of one name could simply be a result of multiple generations of glassblowers carrying on a family name. Even if that was the case, which is not unlikely, one might expect that at some point someone would make a change such as the introduction of a *praenomen*, or initial by some worker to distinguish his work and make his own name if the 'brand' were not of consequence.

A standard form of rectangular flask is called a 'Mercury flask.' These are also named for a common mark, but the name is applied by modern scholars and does not represent ancient recognition of a specific brand or an ancient generonym (object known by the name of a popular brand, as with "Kleenex"). 'Mercury flasks' were often stamped with symbols of the god Mercury, but stamps showing Victory, geometric figures, animals, or inscriptions indicate that this style of flask was produced by many different workshops (Richter 1911: 16). 'Mercury flasks' appeared under the Flavians and became common in the second century so we are often able to date roughly the workshops that produced them (Stern 1997: 130).

The script used in a signature can be helpful in determining the role of the signatory, but in some cases it still leaves points of debate. If a signature on mould-blown or moulded glass

appears in mirror image as though it was signed on the mould, it is usually safe to assume that it is the signature of the mould-maker. Moulds for both glass and ceramics were often signed freehand, and moulds left either an imprint or a relief of the signature in mirror image on the vessel. Mould makers and glassworkers were, in some cases, the same person. If the mould-maker's mark is the only one present we must also consider the possibility that the mould-maker also worked the glass, or operated the glassworks. At the same time, if we have a signature that reads properly from left to right with no signature in mirror image, it is still possible that the glassworker and mould-maker were the same person. The only times we can determine for certain that the mould maker was a different person than the glassworker is if both signatures are present. Both types of signature are rarely found on the same vessel, because the mould maker's signature was often partially or entirely obscured by polishing, or by the attachments of rims, bases, or handles in the finishing of a vessel (Greene 1986: 160). The fact that the mould-maker's signature often did not appear on the finished product suggests that the mould-maker's signature was of more importance in verifying the quality and authenticity of his work to the glassworkers who would purchase his moulds, than to the sale of the finished work.

Other cases in which script can be helpful in determining the role of the signatory is the actual letter-forms. According to Price, it is generally agreed that nicely formed, uniform lettering impressed by a mould or stamp likely represents the owner of a workshop or the creator of the archetype, while signatures written in letters that have been scratched into a mould or vessel by hand in cursive are generally ascribed to the actual worker making the moulds or finishing the work (Price 1991: 58). While Price's interpretation of cursive signatures is quite easy to accept, well-formed, uniform moulded inscriptions that are not cursive could, in my opinion, represent a worker just as easily as a workshop. Many workshop owners or managers

likely worked with glass, and successful artisans could have had a professional signature. If the workers were distinct from the owners, the workers likely would have been responsible for making the moulds and stamps for workshop owners, so it stands to reason that they were also capable of producing high quality stamps or moulds for their own signatures.

The interpretation of moulded signatures often comes down to the formulae used in the inscriptions. A signature is a 'brand mark' or the mark of the workshop when it includes some form of the word *officina*. The formula *EX OF(ficina)* is well known on vessels that indicate their workshop of origin (Stern 1997: 130), and in some situations individual workers included their own names along with the *officina* for which they worked (Stern 1995: 69). Another common formula was, "Ennion (or other name) made me/it" (Klein and Lloyd 1984: 29). These formulae use variations on the terms *fecit* or ἐποίησεν. Inscriptions that follow the formulae "Sentia Secunda *fecit*" or "Ἐννίων ἐποίησεν" appear to refer to the actual worker, and many of these are well made moulded signatures (some still debate this interpretation and believe it was just a convention that was used by workshop owners).

In some cases, where terms like *fecit* and *officina* are lacking, the grammatical form of the signature is used to interpret the role of the signatory. Stern states that the nominative is often thought to represent a master glassblower or owner, as in Sentia Secunda, and the genitive is believed to mark the vessel as the product of the workshop "of so-and-so" (Stern 1999: 469). Stern also suggests that roles might also be determined based on whether the signature was the *tria nomina* of a citizen or the name of a freedman (Stern 1999: 469). There are, however, various examples throughout the Empire of successful freedmen owning their own businesses, such as the warehouse known as the *Horrea Epagathiana* at Ostia, so unless a freedman's name is paired with a *tria nomina* signature one cannot immediately assume that a freedman's name

indicated a subordinate worker rather than workshop owner or manager. Occasionally two signatures found on the same piece both exhibit the *tria nomina* formula. When two citizen's names appear, the signatures likely represent a partnership or composite role between the producer, and the refiner or dealer of some valuable contents (Stern 1999: 469).

Other formulae that went along with signatures often tell us more about the cultural identity of the maker and the purpose of the signature than the signature itself. A common phrase found on Syro-Palestinian vessels, or vessels from the workshops of Syro-Palestinian craftsmen, reads *μνήσθη ὁ ἀγοράζων* "may the buyer be remembered/reminded," which is sometimes interpreted as a "buyer beware" or "watch out for imitations" phrase (Richter 1911: 16). A "watch for imitations" interpretation suggests that glassworkers were proud of their work, and wanted people to recognize their skill and buy from them in the future, rather than from imitators. Some people see the phrase as a translation of a Semitic blessing formula into Greek indicating a person from a Hellenized Semitic culture. The phrase comes in a couple of variations, some of which address the buyer and some want the buyer to remember the maker. Some of them are ambiguous because of the strange verb forms that could be invoking memory of the buyer or the maker. The ambiguous form reads, "*μνήσθη ὁ ἀγοράσας.*" *Ἀγοράσας* is an aorist participle of *ἀγοράζειν* (to buy) and seems to have the same meaning as the present participle *ἀγοράζων*, which appears on other cups, such as those bearing Ennion's signature. The ambiguity of the phrase comes from the word *μνήσθη*, which Stern interprets as a standard spelling of *μνησθείη*, the optative aorist passive of *μμνήσκεισθαι* "to be reminded/ to remember". This verb can be interpreted as middle or passive voice (Stern 1997: 132).

The different grammatical possibilities allow for interpretations as "may the buyer (himself) be remembered," or "May the buyer be reminded of/ remember (the glassblower)." In

the latter instance, the phrase may be playing with the signature on the other side of the cup, forming a sentence: “May the buyer be reminded of... [maker’s name (Meges/Iason/Neikais)].” Such a phrase may have been an advertising technique, although it does appear on some vessels without signatures, a fact which supports the blessing over the advertisement.

The passive interpretation of this verb still provides difficulty, because there are no parallels in the literature of Classical or Koine Greek. The only indication of a passive meaning comes from a neo-Platonic philosopher, Proklos (A.D. 412-485), who used a perfect tense of the verb with a passive meaning (ὑπεμνήσται/ “it has been observed”), which presupposes the undocumented aorist passive with the meaning “to be remembered” that is associated with the μνήσθη on the glass cups. Stern suggests that the odd form is likely a result of attempts to translate a shortened form of a Semitic blessing into Greek. Both the full form – “may so-and-so be remembered before the god so-and-so” – and its shortened form are known from Phoenician, Hebrew, Nabatean, and Syrian inscriptions (Stern 1997: 132). The evidence leads me to believe that the phrase was likely intended primarily as a blessing. In the cases where a signature accompanies the phrase, however, I believe it sent a strong message to the buyer about who it was to whom he owed the blessing and the vessel, thus fulfilling the role of an advertisement and reminding the buyer of the maker. Of course we can never know if the glassworkers knew of the double meaning and intentionally used this verb form for a play on words, but nonetheless, the meaning was there for a literate audience to see and is worth some consideration.

In the case of decorated mould-blown works, the signatures are often clearly presented on the body of the vessel, or sometimes on the flat handle. These placements of signatures clearly indicate pride in the workmanship. Since most decorative vessels were for use as tableware rather than storage or shipping containers, it is clear that the signatures represent the glass

industry rather than products such as olive-oil, wine, medicines, or perfumes, which were often stored in glass. These signatures can often be seen as akin to artist's signatures or as brand names that seek recognition for the workshop. As suggested above, the marks on the bottoms of vessels are often ambiguous if they lack the formulaic terms *fecit* and ἐποίησεν. Even if they lack these signifying terms, they may still be marks of the workshop or glassworker intended to advertise wares. Modern glass brands like Corningware® or Pyrex® also place their marks on the bottom of vessels, showing us that it is not necessary to blatantly advertise on the vessel to have successful business, but that glassworks do want individual works to be recognizable.

Some researchers have tried to claim that even the inclusion of *fecit* in the absence of *officina* does not necessarily mean that the person whose signature is present made the vessel. The name of a successful glassworker who also owned his own shop may have appeared on pieces made by his employees or successors, and moulds including *fecit* or ἐποίησεν may have continued to be used. In some instances, however, the argument that *fecit* does not mean the signature was of the actual glassworker appears to be a way of rationalizing an old prejudice that a woman could not be a glassblower because it was considered "too dangerous" (Stern 1997: 129). Among the body of known Roman period glass signatures, there are three names that are female. One is in Greek: Neikais; and the other two are Latin: Ennia Fortuna and Sentia Secunda. Little is known about the first two. Ennia Fortuna is only known from a retrograde signature on the bottom of a first or second-century square 'Mercury' bottle in Berlin (Stern 1997: 130). There is even some debate over the gender of Neikais, although the objections are not very convincing. Some have tried to claim that Neikais, found on five first-century barrel-shaped mould blown cups, is a shortened form of the common male name Neikaios, or that it is the name Neikias with metathesis of the alpha and iota. This spelling of the name Neikais has, however,

been attested in Cyrenaica. The *-is* ending strongly suggests that it is a feminine name, which would make Neikais the first known female glassblower in the Eastern Mediterranean (Stern 1997: 130).

Sentia Secunda, however, is well known and seems to have been both a workshop owner and a glassblower. She is also one of very few glassblowers with Latin names to include a toponym in her signature. The majority of toponymic signatures indicate artisans working far from home, but Sentia Secunda used a toponym to indicate the location of her workshop in Aquileia (Stern 1999: 469). Her glassware was traded extensively in the area surrounding Aquileia. Two rectangular bottles found at Linz, Austria bear her signature and the use of a toponym seems to have served to advertise her workshop to people living outside of Aquileia so that they would know where to find more of her work. Sentia's signatures generally appear on the bottom of plain mould-blown glass. These signatures worked as a brand name for her wares, and advertised the quality to those who bought and used them.

We can tell that her signature refers to the glass production and not the contents because she is the only known glassblower whose signature tells us both where she worked and what she made: *Sentia Se/cunda Fa/cit Aq(uileia) Vitr(earia)* (Stern 2004: 116). A few detractors dispute this interpretation of her signature, claiming that *vitr* does not actually refer to the glass of the vessel, but to a medicinal or colouring substance made from an herb with the same root. We know that such an herb did exist. Apuleius, writing in the fifth century, did list an herb, in his *Herbarium*, called *vitreaia*. This herb got its name from the vibrant blue dye it produced, which resembled the blue pigment *vitrum* (so-named because the Romans believed it was made from ground glass), which Caesar claimed that the Britons used to make "their appearance in the battle

more terrible” (Stern 2004: 117).⁴ Stern suggests that Caesar’s description of the glass-based pigment used by the Britons was actually a mineral-based pigment containing aluminium, silica, and copper, which they used rather than a vegetal pigment like woad. This mineral-based pigment appears to have actually been used, and has been preserved skin of a Celtic warrior found in a peat bog at Lindow Moss (Stern 2004: 117). The problem with claiming that the abbreviation *vitr* on Sentia Secunda’s signature relates to the contents is that it appears on a variety of different style bottles, not all of which would have been produced strictly to hold pigments. This interpretation likely originates from a prejudice that only decorative wares were worth signing by the glassworker.

In the heyday of decorative mould blowing (first century A.D.), signatures were proudly placed on the sides of vessels where all could see and pay recognition to the skill of the artist. Five men of this period are well particularly well known and appear to come from Syro-Palestinian coast. Meges, Aristreas, Artas, Iason, and the most famous of them, Ennion. This name is a Hellenized Semitic name, and he regularly signed his works with Ἐννιον ἐποίησε, or “Ennion made me” (Stern 1999: 457-8). His name tells us that he came from a Semitic culture, and he included a version of the blessing formula discussed above, helping to solidify this identification. In the 1970s one of Ennion’s jugs and some other fragments were uncovered in the Jewish quarter of Jerusalem’s Old City (Israeli 1983: 65). More than thirty signed fragments of Ennion’s works are known today, thirteen of which are drinking cups, with several other pieces attributed to him by style (Stern 1995: 69-71). His works have been found across the Empire in Spain, Gaul, Italy, the Southern Ukraine, Israel, Morocco, and Cyprus (Stern 1997:

4 *Omnes vero se Britanni vitro inficiunt, quod caeruleum efficit colorem, atque hoc horridiores sunt in pugna aspectu* “In truth, all the Britons dye themselves with *vitrum*, which makes the colour of sky and makes their appearance in the battle more terrible. (Caesar, *De Bello*

129; Newton and Davidson 1989: 24). The earliest known fragment of an Ennion vessel, dating from the late first century B.C., was found in an Augustan context at Magdalensberg, showing that mould blowing was in full swing, in at least some parts of the Empire, even before it took off in Italy after the death of Tiberius in AD 37 (Stern 2004: 112-113).

Ennion, or his workshop, was active for an extended period of time. In addition to his Augustan works, three signed Ennion cups were found in closed contexts dating the late Tiberian and early Claudian periods, and a fourth is from either the Tiberian or Claudian period (Price 1991: 65). Ennion produced two or three types of cylindrical cups, beakers, juglets, and hemispherical bowls (Price 1991: 64-65). The majority of Ennion's signed works come from Northern Italy, including all but two of his drinking cups (Stern 1995: 71), leading some to believe that Ennion either established a Northern Italian branch of his workshop, or actually moved to Italy, and maybe even to Rome. The two cups found outside of Italy were both discovered on Cyprus (Harden 1935:164-165). Loan argues that the Ennion pieces found in Rome were in fact made in Syria and that even a possible Italian branch of Ennion's workshop was more likely somewhere on the coast near Cumae or Liternum rather than in Rome, as was initially thought (Loan 1938: 96). More recent arguments claim that his moulds may have migrated without him through mould exchanges, or that he was simply a savvy businessman who had good trade connections, knew how to find the right partners, and was producing fine luxury items for the purpose of trade (Stern 1999: 458). Stern does not believe that Ennion moved to Italy and does not see enough evidence to say definitively that he even had a workshop there. The argument that he moved to Italy is simply based on the number of vessels found there, but the numbers are not concentrated highly enough in Italy to strongly argue for an Italian

workshop (Stern 1997: 130).

Ennion's decorative patterns include ivy, palmettes and other stylized vegetal motifs, gadroons, vertical ribbing, and lozenges (Harden 1935: 165- 167). The jug found in the Old City of Jerusalem has three friezes. The jug appears to be the fourth piece from a single series of moulds that was used to create three other jugs catalogued by D.B. Harden in his 1935 article on Romano-Syrian mould-blown glass. Despite having been warped by fire, likely in the A.D. 70 Flavian sack of Jerusalem, this piece displays the great skill of the artist and most of the motifs used by Ennion. The jug had three friezes separated by horizontal ribs. The upper relief has palmettes alternating upward and downward, and the second frieze contains a network of lozenges surrounding the *tabula ansata* bearing the inscription Ἐννίων ἐποίησεν, "Ennion made it." The bottom frieze has a band of gadroons with small spikes or petals between the upper arches. The foot of the vessel is decorated with downward facing gadroons and spikes (Israeli 1983: 66-67).

Ennion's moulds produced highly detailed, shallow relief images. Ennion's use of shallow relief makes his vessels stand out above other mould-blown glass, because the low relief enabled him to quickly separate the mould from the intricately designed glass without causing distortion (Stern 1995: 69-70). Ennion placed his signature proudly in the centre of the bodies of his vessels inside a *tabula ansata* frame. This style of signature is not at all common. The only other known glassblower to have used the *tabula ansata* frame for his works was Aristeas the Cypriot, whose style so closely resembles Ennion's that many have suggested that the two of them either were partners, or that Aristeas was a pupil of Ennion (Stern 1995: 71). Ennion's signature clearly is an artist's signature that shows pride in his designs, but the signature does not guarantee that Ennion personally made each of his vessels. He likely designed the mould, and

perhaps made the archetypes for the various kinds of vessels that bear his name.

Ennion and other glassblowers of the Late Republic and Early Empire were of various ethnicities and could be male or female. They may have been lower-class and been viewed as ungentlemanly and base by the elite of Roman society, but they were masters of their craft. Glassblowers produced amazing works and advanced a material that has proved useful in many activities, and they were proud of their work. Glassworkers were respected by their peers and by other people engaged in commercial activities. These craftsmen proudly displayed their associations with the trade on their grave markers for posterity, and in life, they left their marks on their works so that people would know who, or what workshop to patronize for high quality glassware. Their signatures advertised their craft and their skill, and showed their pride in their work. It is often difficult to identify exactly who the signatures represent, and sometimes marks on glass represent the pride and advertising needs of workers different crafts related to the glass industry, such as mould-makers or the makers of vessel contents. Fortunately there are often hints that can at least help us narrow down the possible identities of the individuals represented by the marks. Regardless of who a maker's mark represents in the end, whether it is a glassworker, workshop owner, mould maker, or the maker of a vessel's contents, all these marks serve to show us that craftsmen were proud of their roles and sought recognition from their customers and peers.

Chapter 3: Ceramics and Stamps

The greater part of the human race uses pottery vessels. (Pliny NH 35.160)

Earthenware has been a major part of almost every culture in human history since the Neolithic period, which in Central Europe began in the seventh millennium B.C., and may even have been used by some nomadic populations in the late Paleolithic (Renfrew and Bahn 2007: 201). The discovery that it was possible to create water-tight vessels and various other objects out of fired clay is often considered to be one of the defining features of the so-called Neolithic Revolution, and pottery styles have been defining features of cultures around the world ever since. In the Roman world ceramics were produced on an unprecedented scale, and in an incredibly wide variety. Fired earth was used for bricks and roofing tiles, for sculpture, and for almost every conceivable form of vessel. The Roman world is known for its enormous quantities and many varieties of amphorae, which were needed for the vast trade networks that spanned the breadth of the Empire. These amphorae were produced in massive quantities for transportation and storage. Huge *dolia*, ranging in capacity from 400 to 3000 litres were used for storage (Peña 2007: 20), clay oil lamps spread throughout the Roman Empire, and a wide variety of cookware and tableware, both decorative and utilitarian, were mass produced, exported throughout the Empire, and used in households at all levels of society. The scale of production can be illustrated at Monte Testaccio next to the Tiber in Rome where the hill of discarded amphora sherds represents as many as 53 million vessels (Jackson and Greene 2008: 508).

Decorative, glossy, red moulded-ware or *terra sigillata* is one of the best-known types of Roman pottery. The red *terra sigillata* was the specialty of potters at Arretium (modern day Arezzo) during the Augustan period (Brown 1976: 75). The forms of Roman ceramics have been

thoroughly investigated and do not have to be covered in detail here. But the stamps that are found on these vessels are worth examination because they provide key clues to the organization of the industry and of the trade in ceramics and their contents. Stamps can also tell us a great deal about the identity of the people they represent, the social ranks of these people, and their roles in production. The stamps also provide evidence for their intended purposes on ceramic vessels and perhaps even in other media.

Our understanding of the ceramics industry in Rome is largely reliant on the stamps left by the manufacturers, but there are a few other factors we can examine. The distribution of forms and the tallies of pottery finds are useful in determining the size of the industry, uses of vessels and the spread of designs, but they tell us very little about how the industry was organized. Aside from stamps, our textual evidence for the industry is quite scant, made up mostly of funerary inscriptions. There is of course Diocletian's Price Edict, but it provides us with little more than the cost of pottery and an idea of some of the types. The most detailed textual evidence comes from a few third century contracts preserved on papyri in Oxyrhynchus, Egypt and second century papyrus lease contracts from a village in the Hermopolite. The contracts show that potters leased a pottery or part of a pottery from the owner of the land on which it was situated for a set length of time. The owner provided the workshop, the necessary tools, raw materials such as clay, water, pitch, and fuel, while the lessee was responsible for providing the workers. Under the agreement the lessee was to produce a set number of vessels and was paid in cash and in kind (Fülle 1997: 121).

These pottery yards were not always made up of a single production unit. There could be several workshops or kilns run by different managers within the same complex (Fülle 1997: 121). This system of leases and workshop complexes led to a variety of different stamps and

combinations of stamps coming from the same production site. The stamps and combinations thereof provide our best evidence for the organization of the industry and help us formulate theories on the reasons behind the marking of products.

As was noted in the chapter on glass production, ceramics could be produced in large workshops with many workers, since a furnace was not required for each individual worker. There were several processes that needed to be undertaken before the clay could actually be worked. The clay had to be dried, then broken into small clumps before water could be reintroduced. Small fragments of dry clay absorb water readily, making a slurry that could be sieved or allowed to settle to remove impurities. The resulting clay had to be treaded or kneaded, and then have a temper mixed in making it ready for throwing or moulding (Jackson and Greene 2008: 502). Some workers could be employed in the preparation duties while others were throwing vessels. Still more workers could be responsible for producing attachments such as handles, spouts, rings and bases and fixing them on vessels that had already been formed on a wheel. Someone other than the potters often carried out firing. Firing could be done on the same premises as the pottery workshop, or in a completely separate facility, and a single firing batch could contain the works of many different potters. The presence of works by multiple potters in the same kiln necessitated some way of distinguishing among the finished pieces.

Distinguishing between potters may have been necessary even within a workshop. Stamps bearing the signatures of many different workers have been associated with single potteries, leading many to believe that potteries were often large manufactories, the largest incorporating over one hundred slave or free workers (Fülle 1997: 112). More recently, however, these numbers have been called into question based on the evidence provided by pottery stamps. It is clear that pottery workshops ranged greatly in size. Some manufactories were small, part-

time operations that were connected to agricultural villas, others were small urban workshops employing a few full or part-time employees, and then there were larger full-time operations (Peña 2007: 32).

At the smallest end of the production scale, pottery was made for personal use and perhaps local exchange for necessities. Even some of these part-time rural potteries, however, may have sold a small surplus at rural or urban markets (Greene 1996: 164-165). These workshops required few workers other than the normal slaves and freedmen who worked for the owners in various capacities. On the other end of the spectrum, it is possible that there were some manufactories that employed large numbers of workers. But in all likelihood, workshops with large workforces all working at the same time were the exception rather than the rule. Studies of stamps within the last few decades suggest that it is unlikely that many, if any, would have reached the hundred-plus workers that scholars have suggested. To estimate the size of pottery workforces, scholars have tried to count the number of slaves and freedmen whose names are associated with the owner of the workshop (Fülle 1997: 112-113). These numbers could be estimated because of multiple stamps on individual vessels listing the workshop owner and the potter. Recent estimates suggest that even most of the largest workshops had no more than sixty to seventy workers at a time, with an average somewhere around ten to twenty (Greene 1986: 160). There are 110 workshop groups with known personnel and producers without known personnel that were active in Arretium in the first two centuries of the Imperial period. Of these groups, only four have more than thirty slaves or freedmen using their own names on stamps (Fülle 1997: 133-134).

There are, however, some problems with this method of counting workers. Chronological studies of stamps suggest that it is unlikely that all of the names associated with a workshop

worked at the same time. Many workshops such as those of C. Laecanius Bassus in Istria, Northern Italy, which will be discussed further below, were in operation for several generations, and Roman names frequently were passed down within families. As a result, not all of the stamps from these workshops with his name were contemporary (Fülle 1997: 134). Sometimes even workers who were contemporary to one another and were associated with a specific owner may not have worked in the same workshop. The Laecanii owned several Istrian amphora manufactories in the first century A.D. Many different names have been associated with products of his workshop. At least twenty-nine *vilici* have been identified as connected to the Laecanius family's amphora production in the first century A.D. Only fourteen of these names are definitively associated, based on finds in a production context, with his largest workshop located at Fasana. Laecanius amphorae were produced over multiple generations, so it is possible that only half a dozen or so were ever working in the same workshop at the same time (Fülle 1997: 124). Another example is the workshop of C. Annius at Arretium. He had thirty-seven different employees who used their own names in signatures over a roughly twenty-year period, and not all of them would have worked at the same time. Eleven of these workers overlap with the list of employees of L. Annius, a relative who seems to have taken over ownership. These eleven appear to be the only ones who were working for C. Annius at the time when his workshop passed to L. Annius (Fülle 1997: 134).⁵ An additional problem is that some slaves in the same workshop could easily have had the same name and cannot be distinguished from one another to be properly counted.

The first step in understanding the role of stamps is to understand what was being stamped, and where these items were being stamped. As we have seen, the discussion of signed

5 A Chronological list of Annius stamps will be found in appendix 1.

glassware addressed the problem of whether or not stamps represented the production of the vessels or of the vessels' contents. As was the case with glass, marks on tableware clearly referred to vessel production rather than contents. On tableware the stamps can appear in a variety of locations. They can appear within the decoration on moulded wares, as was the practice of the Italian potter Ateius and his slave Xanthus, or more often were placed above or below the decoration (Oswald and Pryce 1966: 47), and were commonly seen on the interior base of plain wares (Fülle 1997: 118). Since tableware was not sold containing other products there is no question of whether or not the stamp refers to the production of the piece itself. The big question for stamps on tableware is the role in production that the stamp represents, and it is the form of the stamp, which will be discussed shortly, rather than its position that is key for interpretation. These questions are important for understanding tableware production because over ninety percent of *terra sigillata* tableware is signed (Fülle 1997: 117). On vessels used for the transport, storage, and trade of other materials, however, the meaning of stamps can be less clear.

There are two main ceramic classes used for storage and trade. *Dolia*, large, often fixed or semi-fixed jars were used for storage, while amphorae were used both for storage and transportation. Fortunately for modern scholars, the position of ceramic stamps can make the industry they represented fairly clear. Amphorae were produced on a large scale, and they were produced in a fairly standard series of forms that could be used to contain a multitude of products. Amphorae and *dolia* were rarely designed and produced specifically for one content producer, and depending on the product that was contained in the vessel, they could frequently be reused. For these reasons, it was not a common practice to stamp the maker of the contents on the vessel itself. Production stamps on amphorae and *dolia* are almost exclusively those of

people representing the ceramics industry. The marks of the content producers are often found on the stoppers of vessels rather than on the vessels themselves (Fülle 1997: 115).

Stamps also began to appear on clay lamps in the late first century B.C. (Bailey 1972: 23). Stamps on pottery lamps are generally those of the producer of the lamps. Oil was sold separately, so the stamps could not have referred to the marketing and production of oil, but there are still questions as to whether these stamps refer to workshop owners, the worker who made the lamp, the mould maker, or even, in some cases, the owner of the lamp. Owners of lamps and other pottery products occasionally are marked on the piece, but these markings are almost all post-production additions. These markings were often painted on (few of these survive) or scratched through the glaze into the surface of the fired piece (Bailey 1972: 24-25).

Post-production signatures on lamps and other clay products tend to be alphabetic signs, usually limited to a personal name, often in the genitive (possessive) case, an abbreviation of a name, a single letter, or a symbol such as a star or triangle. Some of the longer forms clearly indicate the owner, or a person or persons entitled to use the vessel, and most of the shorter ones appear to have served the same purpose (Peña 2007: 29).

Knowing what kinds of vessels were being stamped – such as lamps, tableware, amphorae and *dolia* – is not enough to properly determine the purpose of stamps. The person represented by the stamps must be identified. The stamps of workshop owners were usually the easiest to identify. Owner's stamps are the first kind of stamp that I will examine here. Owners' signatures are possible to identify by both the location of the stamp and more importantly by the formula of the signature. On undecorated tableware all stamps are usually found on the interior base, but names appeared more prominently on decorative ware, or on closed vessels such as transport amphorae. Some signatures on decorative ware are found within the decoration, which

can be difficult to interpret, but most stamps are often set distinctly above or below the decoration *in planta pedis* (in a frame the shape of a human footprint). The most common position was on the upper body, neck, or rim of a vessel between the handles. They are often identifiable as workshop owner's stamps because of the prominent locations, but the formula is still important to confirm this interpretation. The importance of the formula is the reason for problems with interpreting signatures found within the decoration. When the letters are divided by decorations, or arranged in circular patterns, the word order and the full form of abbreviated words can be difficult to identify. Stamps also occasionally run vertically, and it is not always clear whether it runs from top to bottom or bottom to top (Fülle 1997: 118).

Workshop owners were generally free citizens. Their stamps showed some form of the *tria nomina*, whether in abbreviated or full form. On many amphorae, the *tria nomina* are commonly written as only a three-letter abbreviation. Signatures on these amphorae or other vessels may also be partially or fully expanded. Sometimes these names came to represent a family business rather than one individual and were carried down over generations as workshop names. On some occasions a stamp would even represent two families operating a workshop together as represented by the stamp *III F.F. [et] II L. V. P.*, or could simply be the name of a workshop that did not specifically name the owner. Workshop names often included terms such as *figulus/figlina*, *fundus*, or *officina*, which help to clearly identify them. Some examples read *FIG(linae) ASSVEIANENSES*, *FVNDI PERSEIANI*, *OFF(icina).IUSTI*, *ALBVCI.OF(ficina)*, and *EX OF(ficina) C(orneli) BEL(). Servi*, or *liberti* names often followed to show who managed the operation (Millet 1996: 752; Greene 1986: 160).

Workshop names, or owner's names are often key identifiers used to indicate the vessels of a single workshop over time, because vessels would be produced by a number of workers over

time and worker's stamps could vary. Owner's stamps and workshop names could be consistent, or at least almost the same over multiple generations. One such stamp, which reads '*MOMO*' represented a workshop or *officina* that was active from pre-Claudian dates until late in the reign of Vespasian (ca. A.D. 35-80) (Oswald and Pryce 1966: 48). Consistent owner's stamps allow us to tie the vessels of many different workers to the same pottery. This consistency must, however, be looked at along with other factors such as the origin of the materials used, regional styles, gaps in production of a style, and the frequent re-use and trade of moulds.

Evidence has been found for a potter or workshop owner named Mercator using the moulds of an earlier producer named Cinnamus, and an individual by the name of Lucaeus reused moulds of a Reginus. Confusion can also arise when potters in different times or locations shared the same names. Oswald and Pryce noted both a Iucundus and Vitalis from South Gaul, and a Iucundus and Vitalis from East Gaul (Oswald and Pryce 1966: 48). Conversely, stamps with slightly different names may still have represented the same potter. One producer of Gallo-Belgic wares used six different versions of his name (Julio/Julios, Juliu/Julius, Jullio/Jullios) and at least 2 misspellings (Jullos and Juliosi) distributed across 107 recorded pieces from 33 sites. Variant spellings of names were not uncommon, when compared to producers of Samian ware (Rigby 1981: 39). The owner of the workshop or master potter was often not the one stamping the work, or making the dies for stamps, and workers likely had varying degrees of literacy.

Worker's stamps did not always represent the worker who actually threw the vessel. They could represent the lessee of the shop, a supervisor, or the potter. These stamps were sometimes found immediately next to the owner's stamp, but more often were in a slightly less conspicuous location such as above a handle, or somewhere along the rim. In most cases, it is generally agreed that these stamps represent the *offinator* or *vilicus*. These people were managers, or the

people responsible for a portion of a workshop's production, indicating a vertical division of the workforce (Fülle 1997: 125). In smaller workshops these *officinator/vilicus* stamps may represent the potters themselves, but in larger shops these individuals likely had people working under them. Even in these cases, *officinatores/vilici* may have once been potters themselves who had moved up to management roles, or they may be the people who created the archetypes for vessels.

Officinatores, vilici, and other workers could be freeborn citizens, freedmen, or slaves with *peculium*. Their names can come in a variety of forms, some of which can facilitate or, in some cases, complicate identification of social status. Fülle states that it is easy to distinguish most freeborn from freedmen. Both can use the *tria nomina* but freedmen often include filiations mentioning their former master and specifying their status. Fülle does address one problem in distinguishing between these two classes: many patrons and freedmen used the same *duo nomina*. The resulting problem is that if there is no *cognomen* present on a stamp, and a freedman does not specifically note his status with some form of the word *libertus*, more than one person could have used the same stamp over the same period of time distorting our count of people involved in the industry. Multiple users of a single stamp could also occur if a master had more than one slave with the same name. Fülle goes on to say it is easy to identify those who were definitely slaves, but that there are some signatures that could be either freedmen or slaves. Most slave names consist of a simple slave name plus the name of the owner and are sometimes followed by an 's' for *servus*. There is, however, a possibility that some freedmen continued to use their old signature, which includes the 's,' or that some ambitious slaves might leave it out and use a form identical to that of a freedman noting filiations. A few stamps also note a liminal stage where a slave had been conditionally manumitted but was still technically a slave. These

stamps bore the abbreviation STA for *statuliber* after the name to make their status clear (Fülle 1997: 119-120 + 132).

If a stamp represented the person who actually made the vessel, the name often contained some form of *fecit* or *manibus* (*LABIO FECIT* or *PONTI.MAN*). We are fortunate that the formula is fairly regular, because qualifications of signing individuals were often shortened to a single letter. If the entire inscription consists of abbreviations and word divisions are not made clear, the expanded form of abbreviations, and therefore the meaning of the inscription can be difficult to interpret (Greene 1986: 160). Formulae show us what to expect in certain parts of inscriptions and help us to properly separate and expand abbreviations. Another feature that helps identify workers' names is the fact that they frequently are Greek or Asian names in forms that show the worker to be a slave or freedman (Brown 1976: 75).

As was mentioned in the discussion of glass stamps in Chapter Two, mould-makers sometimes left their marks too. Makers of ceramics moulds, like makers of glass moulds, often scratched their names freehand in the mould. These impressions left retrograde relief signatures on the vessel, but these are usually obscured in the finishing of a vessel by the addition of foot rings, handles and rims. In examples where such a signature was not obscured, it is possible for a single vessel to preserve the name of the workshop/owner, the mould maker, and the potter, giving us a good sense of the variety and number of people involved in the production of a vessel and the social roles of some of the players involved (Greene 1986: 160).

The relationship between *officinares/vilici* and owners is the basis of one of the main hypotheses concerning the purpose of pottery stamps. The most common interpretation is that stamps were used to regulate the workshops or the broader industry from within, more than for marketing or for commemorating the workers. Since multiple *officinares* often leased property

from and had contracts with the same owner, there may have been a need to keep track of the output of each *offinator*. This did not mean, contrary to some suggestions, that signatures were necessary to keep track of the output of each individual potter, but that each contracted *offinator* had to be meeting the requirements of his lease (Fülle 1997: 132).

A major reason for keeping track of the work done under the management of an *offinator* is the firing of large quantities of pottery at once. Firing could be done in a communal kiln shared by all the *offinatore*s working in the same pottery complex or even in a separate establishment (Fülle 1997: 133). Firing was a complicated process and was often undertaken by specialists who operated kilns independently of workshops, or by a large workshop that possessed its own kiln and rented out kiln space to smaller workshops (Greene 1986: 160). La Graufesenque, Gaul, and Torrita di Siena, in Etruria each have kiln sites that provide evidence of the products of various potters being fired in the same kiln at the same time (Fülle 1997: 117).

The space required and the duration of the firing process provides another reason for firing products at a site separate from a workshop. The firing and cooling process would have taken up to a week or two for large vessels such as amphorae. During the cooling process, other amphorae could be prepared for the next batch. A substantial amount of storage space would have been required for vessels waiting to be fired and for those freshly removed from the kiln. In many workshops this would have left very little space left for the potters to work (Fülle 1997: 125). Large kilns at Djerba could have held up to 160 oil jars, and each of two kilns at Giancola could have held 120-180 amphorae depending on how they were arranged. (Fülle 1997: 125).

If the firing process was not carried out correctly and the piece dried out too rapidly, or if there were flaws from the shaping process, pieces could break, warp, fuse together, or otherwise become spoiled. A certain degree of spoilage was expected during firing because vessels were

the products of high rates of manufacture, and not every piece was carefully formed like a piece of art. We can see evidence of spoilage as wasters in workshop excavations, and in examinations of complete pieces from other sites. If pieces with imperfections were not too badly damaged to be usable, they were marketed as is. For example, excavations at Chester, in England turned up a group of over 160 Gallic *Sigillata* vessels that included about 26 vessels with at least one minor defect. Defects included warping of rims or feet, pronounced finger marks on the slip, sloppiness of throwing, blurring of decoration, tool marks, over-firing, or crazing of the slip (Peña 2007: 33-34). Stamping pottery that was to be fired in large batches along with pieces by other potters or workshops could help to identify the potters stuck with rejects, facilitate the payment of individual *officinatores* or potters, or the amount each one owed the kiln operator (Fülle 1997: 117).

Many scholars have tried to argue for specific roles to be assigned to stamps, but it is possible for a stamp to serve more than one role at a time. They may well have served to assist in the organization of the ceramics industry, and at the same time they may have served a purpose related to advertising and/or guaranteeing the quality of workmanship. Stamps would allow people to know the source of fine products so that they could buy from the same workshop.

Although it is unlikely to have been done, some scholars have suggested that the stamps were a guarantee of quality, and a buyer, knowing the origin of his vessels, could get reparations if a product was faulty. Concerning products such as amphorae, it would also be important to guarantee volume, because both the amphorae themselves and their contents were usually sold based on their volume.

These advertisements and guarantees could only be very general proofs, because of the problems of shared moulds and stamps, and the distances of trade in the Roman Empire. Without

reliable trade contacts, it would often be difficult to trace a product back to its workshop to buy from the same source unless the product was being traded close to the production site (Fülle 1997: 116-117). Reliable trade contacts would also have been necessary if one were to try and track down a producer to bring a lawsuit against him for producing faulty wares, and such a lawsuit would be unlikely for a single piece. One would need to have been careless enough to buy an entire faulty batch in order to make such a suit worthwhile.

Tracing long distance trade would likely have been very difficult because evidence suggests that middlemen often bought up large consignments from many producers and sold them off, likely to local merchants or wholesalers as they traveled from port to port. As a result, end-users had no direct contact with the workshops from which the products came and in many cases would have no idea where it was. One example of such consignment trade comes from a shipwreck off the Northeast coast of Spain from the 60s or 70s A.D. known as Cala Culip 4. Its cargo contained 4,118 pottery vessels, including 2,601 pieces of Gallic *Sigillata*. Forty-six different makers are attested by the makers' stamps on the Gallic *Sigillata*. Twenty-three makers were only represented once, four makers were attested by over one hundred stamps, and one maker was represented 1,001 times. This wreck suggests that the ship was selling off parts of its large consignments in small lots as it stopped at different ports. Since it was unlikely that the entire cargo would sell in a single centre, only a portion of the cargo would have been unloaded for sale at each port. If not all the pieces in a batch sold, the odd leftover would return to the ship and remain on board longer than the rest of the vessels from the same producer (Peña 2007: 37).

Since stamps could not provide a very solid guarantee, it is unlikely that their primary purpose was for an absolute guarantee that could have legal ramifications. Guarantees really should not have been much of an issue for tableware, since the thickness, colour, smoothness,

and quality of the relief would be fairly apparent before purchase. Tableware was generally purchased in bulk, so spot checks were likely sufficient, and it was unlikely that someone would buy an entire faulty batch without noticing. Individual flawed pieces within a batch would generally not result in legal action. Stamps, however, could have stood for a guarantee in the eyes of a buyer. If a buyer saw a stamp he might be inclined to think that the producer was proud of his work and was confident enough in its quality to guarantee it (Fülle 1997: 116-117).

Arretine ware was known for its high quality. A stamp that marked moulded red-gloss ware from Arretium, or even marked ware resembling the Arretine style or purporting to be Arretine, could easily have been seen as a mark of quality and attracted buyers. In this way the stamps would be serving as a form of advertisement. We know of some cases of vessels that can be traced to Campania but that claim to be Arretine ware (Fülle 1997: 116). These vessels could be examples of false advertising and capitalizing off of the reputation of true Arretine pottery, unless *Arretine* had already become synonymous with 'quality red-glazed tableware' in ancient Rome. Such a function would not have been the main role of stamps on Arretine ware or its imitators because that would require a pre-existing reputation for the quality of Arretine ware, and even the earliest known Arretine ware is stamped. Although it is very likely that stamps on Arretine ware were being used to advertise once the type was well established, the evidence for stamping on even the earliest Arretine ware is proof that there must have been other purposes, perhaps including the organizational purposes discussed above.

One final reason for stamping pottery that Fülle addressed was to identify the producers to ensure that Senators were not engaging in wholesale trade. Since a Claudian plebiscite of 218 B.C., senators had been banned from all wholesale trade that was unrelated to agriculture and commerce. Members of the senatorial order clearly were involved in pottery manufacture, and in

59 B.C. Caesar had renewed and modernized the plebiscite in the *Lex Iulia Repetundarum*. For this reason some suggest that producers started stamping wares in the first century to protect themselves from being associated with illegal trade. The problem with this argument is, as Fülle pointed out, the stamps do nothing to prove that members of the elite were or were not involved (Fülle 1997: 117). If a senator was directly involved and he was afraid of being accused, his name could simply have been omitted, but even the presence of his name would not have been damning evidence. As we have seen, the owners of the land and the workshops were frequently identified by stamps, and they were not often directly involved in production or marketing. Management, labour, and the commercial activity was the responsibility of the *officinatores* or *vilici* and their assistants. The owners were often little more than landlords, which was perfectly acceptable for a senator or senatorial family. In fact, we know of several senators and their families that are recorded by pottery stamps including Appius Claudius Pulcher who was consul in 38 B.C., and the family of two first-century A.D. senators both named Caius Laecanius Bassus (Bezeczky 1995: 41+43).

C. Laecanius Bassus is important for this discussion because the Laecanius workshops exhibit many of the issues mentioned above. There was a wide trade network through which the products of these workshops dispersed, and there are a wide number of different stamps associated with a common name over a long period of time. Stamps later continued to appear from the same workshops, but with different owner's names after the workshop changed hands. The Laecanius workshops were large operations that had many workers and spanned multiple generations. The workshops of Laecanius provide examples for the problems of counting the number of workers at any one time. There were workers at different times associated with the same owners, and the same owner's name represented different individuals over time so it is hard

to tell which workers were associated with which Laecanius. The Laecanius workshops also provide examples of stamps that can be considered as having organizational, as well as advertising and product guarantee purposes.

The Family of Laecanius owned one of the largest pottery production operations in Istria from the late first century B.C. to A.D. 78/80, at which point the family seems to have died out in the region (Bezeczky 1998: 4). The estimated rate of amphora production of his workshops in Istria was 15,000 per year over the 80 to 100 years, during which they were owned by the Laecanii (Bezeczky 1998: 83). The Laecanius potteries continued under Imperial control from *circa* A.D. 78/81 to A.D. 137. It is then unclear if production ceased for a time or continued, but we have evidence of further production from these workshops in the latter half of the second century A.D. under M. Aurelius Iustus (Bezeczky 1998: 4). Laecanius is most closely associated with amphora production, for Istrian agricultural trade. The region was well known for its high quality wine and olive-oil (Bezeczky 1995: 41-42). In fact Pliny claimed that it was the famous Istrian wine (*Pucinum*) that was in part responsible for the long life of Augustus' wife Livia (Pliny *NH* 14.60).

The trade in oil and wine appears to have been the driving force behind Laecanius' operations. The export of olive-oil from Istria began in the late first century B.C. and extended to Cisalpina, Noricum, and Illyricum (later Pannonia). Laecanius amphorae have been found in all of these regions. Finds from Fasana, Pola, Brioni, Parentium, Aquileia, Magdalensberg, Flavia Solva (two sites by this name), Emona, Poetovio, Salla, Savaria, Carnuntum, and Aquincum have turned up over 400 Laecanius amphorae (Bezeczky 1995: 41)⁶. The Laecanii were not the only pottery owners in Istria to take advantage of the industry. Other well known owners include

6 A full list of Laecanius amphora find locations and a distribution chart appear as

the aforementioned Apius Claudius Pulcher, T. Statilius Taurus Sisenna, P. Clodius Quirinalis, P. Iturius Sabinus, P. Q. Scapulae (believed to be the merchant and landowner mentioned in Cicero's *Pro P. Quinctio* 4.17 and in Pliny's *NH.* 7.183) and "P. Sepulli P.F." who is identified as the *triumvir monetalis* of 44 B.C., P. Sepullius Macer (Bezeczky 1995: 43; Bezeczky 1998: 5)

The main workshop owned by Laecanius was located at Fasana. Gnirs, beginning in 1909, excavated a huge pottery manufactory at Fasana. He uncovered a kiln, amphorae, stoppers, tiles, *spicae testaceae* (paving bricks, laid in such a fashion as to imitate grains in an ear of corn), domestic instruments, and terracotta lamps. More than 100 of the amphorae found at Fasana bear the stamps of Laecanius and his *vilici* dating over a span of fifty years. One imperial stamp and some stamps of M. Aurelius Iustus were also found in the workshop. (Bezeczky 1995: 44-45).

Laecanius' amphorae always bore two stamps. One stamp reading LAEC, or in many cases LAEK (the 'c' ending only appears in the earliest stamps so a generation change may be indicated)⁷, appeared on the centre of the chalice shaped rim between the handles (all 400 of Laecanius' amphorae had chalice shaped rims and fit into the Dressel 6B category)⁸ and the stamp of the *vilicus* appeared above one of the handles. There are a few exceptions to this rule. Occasionally *vilici* who used single letter abbreviations placed their stamps directly adjacent to the Laecanius stamp separated by a full stop. Bezeczky believes that due to the high number of *vilici* associated with Laecanius (at least 65 *vilici* are known, 45 of which are known from

appendix 2.

7 Another bit of evidence for multiple generations of Laecanius family members being involved in the ownership is one stamp that reads C.LAELAEK. Bezeczky suggests that this stamp may have represented two members of the family, possibly close to a change in ownership between generations (Bezeczky 1995: 53).

8 Dressel 6B amphorae were characterized by a chalice shaped rim connecting to the neck at a sharp angle, a continuous profile along the neck and body, an oval or bag-shape body ending in a knobbed toe. The handles were oval in section. The amphorae ranged from 80-90cm in height and had rim diameters of 13-16cm. (Bezeczky 1995: 51)

amphorae)⁹, and the fact that the family likely did not directly manage the workshop there was need to be able to account for the work of the *vilici*. The fact that he had a single large kiln at Fasana for all of his workers, meant that the stamps were necessary organizational tools for his accounting system because the work of all the *vilici* would be mixed together and be indistinguishable without stamps (Bezeczky 1998: 11; Bezeczky 1995: 51-53).

The stamps from the Laecanius workshops are almost all unique. Very few seem to have been reused, but the stamps, like the vessels are of high quality. Out of the entire body of 400 Laecanius amphorae, only two or three show any evidence of mistakes, and even those were corrected with wet clay (Bezeczky 1995: 53). The care taken in even the stamping of vessels suggests a degree of pride in the work, and these stamps may have served as both guarantees of quality and advertisements. I believe that both of these purposes are valid because of the nature of trade in the region. First, since he was selling amphorae it was important to be able to guarantee volume, and those who packaged goods in his wares would have wanted to know the source of their amphorae. In this way, they could guarantee the amount of their own product being traded, and have some means of legal recourse if the volume was found to be incorrect. Oil and wine producers would have been able to make use of these guarantees since Laecanius amphora were traded locally to Istrian producers who wished to ship their goods elsewhere. These producers could to know the source of their vessels and act on any guarantees. The close proximity of his trade would also have made effective advertising possible. Advertising may have been necessary because the Laecanii were not the only major producer of amphorae in Istria. Laecanius' workshops were clearly successful in marketing. This statement is based on the

9 These numbers are minimum numbers and omit cases, in which abbreviations may be referring to the same person as a similar or incomplete stamp. They also omit stamps that Bezeczky could not classify based on the documentation, which he had not seen, and which are

broad distribution of Laecanius amphorae and the prominence of the Laecanius stamp over that of other producers. For example, in Magdalensberg, Noricum, more than 150 examples of Laecanius amphorae-stamps bearing the names of 23 *vilici* have been documented dating to the late Republic and early Empire. At the same site, other workshops were represented only by between five and twenty examples (Bezeczky 1995: 47; Bezeczky 1998: 76).

Pottery stamping was a common practice in ancient Rome and served a variety of purposes. Though makers' marks were not large prominent 'brand' logos per-se, they were used in a limited capacity to advertise the goods of their owners and sometimes, as in the case of Arretine ware, could have been used to elicit the comparison to known wares of high quality and attract buyers. At the same time, stamps served as some degree of general guarantee of workmanship or the volume of the vessel. In short-range trade these stamps allowed buyers to determine the origins of their purchases and seek reparations for faulty wares, holding the industry to a standard. These guarantees were, of course, limited in effectiveness because of long-range trade with multiple middlemen, multiple signing individuals with the same name, forgeries, and the sharing of moulds. Even so, the presence of a stamp may have provided some comfort to a buyer, suggesting to them that the maker was confident in the quality of his work and was not afraid to make his identity known even if it could lead to legal action if a product was faulty.

These purposes that related to buyers were, for the most part, secondary, as stamps did not have the power that modern brands have, and ceramics workers like glassworkers were considered to be of low moral and social standing by the elite of society. Pottery stamps were most useful for organizational purposes during the manufacturing and marketing process. Stamps

missing from collections (Bezeczky 1995: 57-61).

identified which workshop was responsible for individual pieces at a communal firing site, or at a wholesaler. They also identified the products of various *vilici* or *officinatores* who were running portions of operations in a workshop complex. Stamps facilitated payment of workers, and kept track of quotas and the fulfillment of contracts.

Today the stamps serve additional purposes. They help scholars to understand the organization of the industry, document trade patterns and potter movements, and understand the chronology of production sites. Although there are still mysteries regarding some aspects of stamps, and many can be difficult to read or interpret, they are an invaluable primary source, without which we would not have anywhere near the understanding that we do of Roman industry.

Conclusions

As we have seen, makers' marks in ancient Rome served many purposes. These roles were not simply clear-cut 'brand' labels to advertise a product and bring attention to the owner or producer. Roman makers' marks lacked the marketing power and much of the prestige of modern brand names, but they still served a variety of purposes. Fortunately for us, stamps can be very useful to scholars who are interested in the Roman economy.

We have also seen uses of Roman makers' marks that were not intended or foreseen by their creators, allowing us to study their social ranks and business hierarchies. Roman makers' marks were not limited to the names of workshop owners, or famous designers. The marks left by the Romans can range from owners or landlords of senatorial rank right down the social ladder to the lowest levels of society. We can see politicians and slaves side-by-side on individual pieces of work allowing us to reconstruct the hierarchy of industries. These stamps can show us the roles played by individuals of different ranks and allow us to trace the movement of craftsmen and their work. These dispersion patterns allow us analyze the vast trade networks of Rome.

One purpose of signatures on Roman products was to identify an artist. The earliest known signatures on ceramics date back to the early sixth century B.C. These early signatures such as that of Sophilos (ca. 580 B.C.), or those of Ergotimos and Kleitias (ca. 570 B.C.) were signatures of artists, who were signing their work to accrue fame, mark the authenticity of their pieces, and ensure that they would be remembered (Pedley 2007:193-196). Vase painting did not share the same popularity in the Roman world as it did in Archaic and Classical Greece. Vessels were mass-produced as serial products and signatures took on roles much different from those of

artists signing unique pieces of work. The concept of artists' signatures did not, however, disappear entirely. Though, not overly common on ceramics, decorative glassware was frequently signed in a prominent location. Even though many vessels were made in moulds that could be used to produce several identical or nearly identical pieces, such as the mould blown wares of Ennion, decorative glass was much more than a mass produced product designed strictly for utilitarian use. Vessels such as those produced by Ennion and other decorative mould-blowers of the first century A.D. displayed a mastery of the craft of glassblowing, and a great deal of artistry in the intricate designs. Ennion's wares were traded as decorative prestige pieces from the Black Sea to Spain, and his signature was proudly displayed in the centre of the decorations framed for all to see in a *tabula ansata*. One can hardly argue that these vessels were not the work of an artist and that he was not signing them to make his name known.

Artists' signatures served to advertise their wares, but as we have seen, it was not just the artists of the ancient world who advertised their identities on their wares. Advertising was important as well to the producers of utilitarian wares in both glass and ceramics. In the stamping of utilitarian wares we can see the beginning of something that could be seen as a forerunner of modern product branding. Marketing was not necessarily the primary purpose of the stamps that the Romans left, and they lacked the same prestige and power that "brand names" carry today, but there was a definite degree of advertising power even in Rome. To see ancient Roman advertising at work in signatures, one has to look no further than the example provided of Arretine ware and its Campanian imitators. Stamps on vessels produced in Campania claimed that the vessels were produced in Arretium. The only reason for including such a fraudulent claim on a stamp would be to capitalize on a recognized quality product. Since Arretine ware was known for its high quality, the use of the Arretine name would have advertised a product as

one of good quality, and preferable to others. Another example of stamps having an advertising purpose can be seen in regional amphora sales to producers of Istrian wine and olive-oil. The Laecanii no doubt wanted to be known among wine and oil producers so that they could compete with the many other potters in the region. The prominent presence of the Laecanius stamp on amphora rims allowed local producers to identify the workshop from which vessels came, and perhaps to think of that workshop when the need for more amphorae arose.

Glass signatures also served some advertising purposes. The advertisements on glass vessels could serve either to identify the glass producer or the maker of the contents. Stamps on tableware clearly identified the glassblower, but there are sometimes problems identifying the role of signatures on vessels that were made to contain other items for sale and/or transport. In order to identify the signature as that of a glassworker, scholars often need to identify the same name on vessels that were used for different types of contents or on other inscriptions such as funeral markers. Fortunately some glassworkers such as Sentia Secunda of Aquileia make identification simpler by including some form of the word *vitrum* or glass in the signature's formula. Other formulaic terms that help to identify signatures as those of glass producers could include *ex officina*... "from the workshop of...", *fecit* "made it," or ἐποίησεν "made it."

Regardless of the difficulties in determining the role of stamps and whether they refer to contents or the vessels themselves, the mere presence of signatures clearly tells us one thing: whichever individuals were signing work, be they glassworkers, potters, or the producers of contents, they often had a desire to be recognized and to let their contribution be known to consumers.

Advertising in Rome could also have been used to suggest quality. If this were the case, it is likely that the presence of the stamp itself was being used just to suggest quality by showing

that the producer was proud enough of his work to be recognized. Some scholars have suggested that signatures were used as formal guarantees of quality, to facilitate the tracking of a product's origins to get reparations for faulty products. Due to the frequency of forgeries, mould sharing, and the large scale of imperial trade in which products could pass through several hands and over great distances; the likelihood of an effective system of guarantees is very unlikely.

Advertising functions appear to have been largely secondary for Roman makers' stamps on ceramics. The fact that the earliest Arretine ware was being marked before the type was well established and known beyond its own region has been taken as clear evidence that there was more behind the stamps than just advertising. The Arretine case clearly shows us that stamps could serve multiple purposes at the same time.

The primary purpose behind the stamping of ceramics, not just from Arretium, but also throughout the Empire, was for the internal organization of workshops and local industry. We know, from the stamps, that many different workers could be employed in a single workshop and evidence from legal documents shows that various managers working under lease agreements with the owners actually operated the workshops. The owner of a workshop would have been able to use the stamps of his *officinatores/vilici* to monitor the production of his lessees, and the stamps also helped to identify work carried out by different workshops or *officinatores/vilici* in order to facilitate payment of potters, or the payment of a kiln operator by individual potters, or to distinguish property in batches being fired in communal kilns.

To modern researchers attempting to understand the nature of Roman industry and trade, Roman makers' marks have taken on several new and unintended roles. These marks help us trace the development of styles, the movements of craftsmen, and the distribution of trade goods. Stamps help us understand who it was who actually produced goods that were at the heart of

Roman daily life. Makers' marks help us identify the structure and hierarchies of industries and identify the social roles of producers. They tell us who was involved at various levels of industries.

The find locations of various vessels with the same stamps illustrate the range of trade. Stamps provide examples for Empire wide trade through examples of decorative luxury wares such as Ennion's vessels, or we can see the more localized trade in utilitarian wares such as the barrel shaped jars of Frontinus, in Northwestern Europe (Richter 1911: 16), or the amphorae of Laecanius, which were largely confined to central Europe with find sites spanning the modern countries of Italy, Austria, Germany, Switzerland, Slovenia, Croatia, Bosnia Herzegovina, Hungary, Montenegro, and Serbia (Bezeczky 1998: 75).

Trade distribution is often useful to identify the source of products if the workshop has not been located, because finds are usually more frequent in close proximity to their source. By identifying the region of origin we can trace not only the works of a single producer, but also the spread of a style or an innovation in an industry. For instance, the mould blowing of glass appears to have arisen in the Eastern Mediterranean in the area around Sidon. We can trace the origins of certain motifs and mould-blowing techniques that are found in other areas, such as Northern Italy, back to Sidon by studying the names in the makers' marks on the vessels that carried the styles westward. Names and distribution patterns also help us to understand the ramifications of the Augustan Peace, and conquest of the Eastern Mediterranean by showing us how craftsmen moved around the Empire, and traded their moulds. We also see the impact of glass and metal ware on ceramics and can then monitor the spread of moulded earthenware such as *terra sigillata* in much the same way as we trace the spread of glass and its related technology.

The most obvious use for stamps by modern scholars is to identify who was actually

producing glass and ceramics in Rome. Stamps tell us names, and sometimes the location of the workshop or the individual's place of origin. The names themselves can often tell us if the producer was from the Roman West, or if he or she was from the Greek East or a member of any other group of people conquered by the Romans. Features on stamps, such as blessing formulae, can show us the cultural or religious affiliations of a producer. Other formulaic aspects can identify if the producer was freeborn, a freedman, a foreigner, or a slave.

The names on stamps and the formulae in which they are presented can also enable us to understand a great deal about the organization of the glass and especially the ceramics industry. Makers' marks in the glass industry can represent either the actual glassblower or the workshop owner. The formula of a stamp is usually the only way to definitively tell which production role a signature represents. The smaller scale of the glass workshops suggests that owners and glassblowers were often the same people, making the distinction unnecessary, but there are exceptions. Sometimes a master's name and assistant's name were noted together. Multiple signatures were more common in the ceramics industry, suggesting the involvement of more people in production. Evidence for larger numbers of workers in the ceramics industry than in the glass industry is corroborated by the size of excavated workshops. The signatures are far more useful than the simple workshop remains for estimating the size of a workforce, and for showing us the hierarchy of the industry. Comparisons of stamps can show us what families owned workshops, how long they were involved in the industry, and how many people worked under them, or operated sections of the workshop for the owners.

The stamps on Roman glass and ceramic vessels were functional in a variety of capacities, and although they were not exactly the same as modern brand names, they were used to advertise the craftsmanship of the piece and attract future business from people who used the

vessel. Makers' marks fulfilled the primary purpose of brands, which is to give exposure to the producer, and although they lacked the same marketing power as modern brands, and the names themselves did not carry as much prestige, but the practice of signing wares may still be considered as an ancient forerunner the modern concept of branding.

Bibliography

- Aaker, David A. and Erich Joachimsthaler 2000. *Brand Leadership*. New York and London: The Free Press.
- Aaker, David A. 1996. *Building Strong Brands*. New York and London: The Free Press.
- Alicu, Dorin and Emil Nemes 1977. *Roman Lamps from Ulpia Traiana Sarmizegetusa*. Oxford: British Archaeological Reports.
- Bailey, D. 1972. *Greek and Roman Pottery Lamps*. London: British Museum.
- Beretta, Marco (ed.) 2004. *When Glass Matters: Studies in the History of Science and Art from Graeco-Roman Antiquity to the Early Modern Era*. Firenze: Leo S. Olschki.
- Bezeczky, Tamás 1998. *The Laecanius Amphora Stamps and the Villas of Brijuni*. Vienna: Verlag der Österreichischen Akademie der Wissenschaften.
- Bezeczky, Tamás. 1995. "Amphorae and Amphora Stamps from the Laecanius Workshop," *Journal of Roman Archaeology* 8: 41-64.
- Brill, R.H. 1988. "Scientific Investigations of the Jalame Glass and Related Finds," in G. D. Weinberg, (ed.), *Excavations at Jalame: Site of a Glass Factory in Late Roman Palestine*. Columbia: University of Missouri Press, 257-94.
- Brown, David 1976. "Pottery," in D. Strong and D. Brown. (eds.), *Roman Crafts*. New York: New York University Press, 75-91.
- Burford, Alison 1972. *Craftsmen in Greek and Roman Society*. London: Thames and Hudson.
- Callender, M. H. 1965. *Roman Amphorae, with an Index of Stamps*. London and New York: Oxford University Press.
- Cuomo, S. 2007. *Technology and Culture in Greek and Roman Antiquity*. Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, and São Paulo: Cambridge University Press.
- Daumas, Maurice. (ed.) 1962. *A History of Technology & Invention: Progress Through the Ages, Volume I: The Origins of Technological Civilization*. Trans. Eileen B. Hennessy. New York: Crown Publishers.
- Duncan-Jones, Richard 1974. *The Economy of the Roman Empire*. Cambridge University Press.
- Dyczek, Piotr 2001. *Roman Amphorae of the 1st-3rd Centuries A.D. Found on the Lower Danube: Typology*. Warszawa: Wydawnictwa Uniwersytetu Warszawskiego.

- Eckardt, Hella 2002. *Illuminating Roman Britain*. Montagnac: M. Mergoïl.
- Eiring, Jonas and John Lund (eds.) 2004. "Transport Amphorae and Trade in the Eastern Mediterranean," *Acts of the International Colloquium at the Danish Institute at Athens, September 26-29, 2002*. Aarhus: Aarhus University Press.
- Fleming, Stuart James 1999. *Roman Glass: Reflections on Cultural Change*. Philadelphia: University of Pennsylvania Museum.
- Fleming, Stuart James 1997. *Roman Glass: Reflections of Everyday Life*. Philadelphia: University of Pennsylvania Museum.
- Fülle, Gunnar 1997. "The International Organization of the Arretine *Terra Sigillata* Industry: Problems of Evidence and Interpretation," *The Journal of Roman Studies* 87: 111-155.
- Goldstein, Sidney M., Leonard S. Rakow, and Juliette K. Rakow 1982. *Cameo Glass: Masterpieces from 2000 Years of Glassmaking*. Corning: The Corning Museum of Glass.
- Gorin-Rosen, Y. 2000. "The ancient glass industry in Israel: Summary of the finds and new discoveries," in Nenna (ed.) *La route du verre: Ateliers primaires et secondaires du second millenaire av. J.C. au Moyen Age*. Travaux de la Maison d'Orient Méditerranéen 33. Lyon: Maison de l'Orient Méditerranéen-Jean Pouilloux, 49-63.
- Greene, Kevin 2008. "Inventors, Invention, and Attitudes Toward Technology and Innovation," in J. P. Oleson (ed.), *The Oxford Handbook of Engineering and Technology in the Classical World*. Oxford and New York: Oxford University Press, 800-818.
- Greene, Kevin 1986. *The Archaeology of the Roman Economy*. London: B.T. Batsford Ltd.
- Grose, David F. 1991 "Early imperial Roman Cast Glass: The Translucent coloured and Colourless Fine Wares," in M. Newby, K. Painter (eds.), *Roman Glass: Two Centuries of Art and Innovation*. Volume XIII of Occasional Papers from the Society of Antiquaries. London, 1-18.
- Grose, David Frederick 1989. *Early Ancient Glass: Core-formed, Rod-formed, and Cast Vessels and Objects From the Late Bronze Age to the Early Roman Empire, 1600 B.C. to A.D. 50*. New York: Hudson Hills Press: in association with the Toledo Museum of Art.
- Hall, Jenny 2005. "The Shopkeepers and Craft-workers of Roman London," in A. Mac Mahon, J. Price (eds.), *Roman Working Lives and Urban Living* Oxford: Oxbow Books, 125-144
- Harden, D.B. 1969. "Ancient Glass II: Roman." *Archaeological Journal*. 126: 44-77.
- Harden, D.B. 1956. "Glass and Glazes," in C. Singer et al. *A History of Technology*. Vol. 2. Oxford: Clarendon Press, 311-345.

- Harden, Donald B. 1935. "Roman-Syrian Glasses with Mold-Blown Inscriptions," *Journal of Roman Studies* 25: 163-86.
- Harden, D.B. 1934. "The Glass of the Greeks and Romans." *Greece & Rome*. 3. 9: 140-149.
- Harris, W.V. 1993. "The Inscribed Economy: production and distribution in the Roman Empire in the light of instrumentum domesticum," *Journal of Roman Archaeology*, Supplementary Series 6, Portsmouth, Rhode Island.
- Harris, W.V. 1980. "Roman Terracotta Lamps: The Organization of an Industry," *Journal of Roman Studies*. 70: 126-145.
- Hartley, Brian & Brenda M. Dickinson; with Geoffrey B. Dannell [et al.] 2008. *Names on Terra Sigillata: An Index of Makers' Stamps & Signatures on Gallo-Roman Terra Sigillata (Samian Ware)*. London: Institute of Classical Studies, University of London.
- Hodges, Henry 1970. *Technology in the Ancient World*. New York: Knopf.
- Humphrey, John W., John Peter Oleson and Andrew N. Sherwood 1998. *Greek and Roman Technology: A Sourcebook*. London and New York: Routledge.
- Isings, C. 1957. *Roman Glass From Dated Finds*. Groningen and Djakarta: J. B. Wolters.
- Israeli, Yael 1991. "The Invention of Blowing," in M. Newby and K. Painter (eds.), *Roman Glass: Two Centuries of Art and Innovation*. Volume XIII of Occasional Papers from the Society of Antiquaries. London, 46-55.
- Israeli, Yael 1983. "Ennion in Jerusalem," *Journal of Glass Studies*. 25: 65-69.
- Jackson, Mark and Kevin Greene 2008. "Ceramic Production," in J. P. Oleson (ed.), *The Oxford Handbook of Engineering and Technology in the Classical World*. Oxford and New York: Oxford University Press, 496-519.
- Klein, Dan and Ward Lloyd. (eds.) 1984. *The History of Glass*. London: Orbis.
- Lauwers, Veerle 2007. "Glass Technology in Late Antiquity: A Bibliographic Note," in L. Lavan, E. Zanini, A. Sarantis (eds.), *Technology in Transition A.D. 300-650*. Late Antique Archaeology Vol. 4. Leiden and Boston: Brill.
- Lavan, Luke, Enrico Zanini, and Alexander Sarantis (eds.) 2007. *Technology in Transition A.D. 300-650*. Late Antique Archaeology Vol. 4. Leiden and Boston: Brill.
- Loane, Helen 1979. *Industry and Commerce of the City of Rome 50 B.C. – 200 A.D.* Philadelphia: Porcupine Press.
- Mac Mahon, Ardle and Jennifer Price (eds.) 2005. *Roman Working Lives and Urban Living*.

Oxford: Oxbow Books.

Mentasti, Rosa Barovier, Rosanna Mollo, Patrizia Framarin, Maurizio Sciacaluga, and Anna Geotti (eds.) 2003. *Glass throughout time: History and Technique of Glassmaking from the ancient world to the present*. Milan: Skira.

Millet, Piero Berni 1996. "Amphora Epigraphy: Proposals for the Study of Stamp Contents," *Archaeologica e Calcolatori*. 7: 761-770.

Mollo, Rosanna and Patrizia Framarin 2003. "Glass and Areas of Production in the Ancient World," in Mentasti et al. (eds.), *Glass throughout time: History and Technique of Glassmaking from the ancient world to the present*. Milan: Skira.

Moorey, P.R.S. 1994. *Ancient Mesopotamian Materials and Industry: The Archaeological Evidence*. Oxford: Clarendon Press.

Nenna, M.-D. (ed.) 2000. *La route du verre: Ateliers primaires et secondaires du second millenaire av. J.C. au Moyen Age*. Travaux de la Maison d'Orient Méditerranéen 33. Lyon: Maison de l'Orient Méditerranéen-Jean Pouilloux.

Newby, Martine and Kenneth Painter (eds.) 1991. *Roman Glass: Two Centuries of Art and Innovation*. Volume XIII of Occasional Papers from the Society of Antiquaries. London: The Society of Antiquaries of London.

Newton, R. and S. Davidson 1989. *Conservation of Glass*. London and Boston: Butterworths.

Nijboer, Albertus Johannes 1998. *From household production to workshops: archaeological evidence for economic transformations, pre-monetary exchange and urbanisation in central Italy from 800 to 400 BC*. Groningen: Rijksuniversiteit.

Oleson, John Peter (ed.) 2008. *The Oxford Handbook of Engineering and Technology in the Classical World*. Oxford and New York: Oxford University Press.

Oswald, Felix and T. Davies Pryce 1966. *Introduction to the Study of terra Sigillata*. London: Gregg Press.

Oxyrhynchus Papyri. Vol. 50 London: 1983.

Painter, Kenneth and David Whitehouse 1991. "The Portland Vase," in Newby and Painter (eds.), *Roman Glass: Two Centuries of Art and Innovation*. Volume XIII of Occasional Papers from the Society of Antiquaries. London: The Society of Antiquaries of London. 33-45.

Peacock, D.P.S. 1982. *Roman Pottery, An Athnoarchaeological Approach*. Addison-Wesley Longman.

- Pedley, John Griffiths 2007. *Greek Art and Archaeology*. 4th ed. Upper Saddle River, New Jersey: Pearson/Prentice Hall.
- Peña, J.T., and M. McCallum 2009. "The Production and Distribution of Pottery at Pompeii: A Review of the Evidence; Part 1, Production," *American Journal of Archaeology* 113: 57-79.
- Peña, J. Theodore 2007. *Roman Pottery in the Archaeological Record*. Cambridge, and New York: Cambridge University Press.
- Price, Jennifer 2005. "Glass-working and Glassworkers in Cities and Towns," in A. Mac Mahon, J. Price (eds.), *Roman Working Lives and Urban Living*. Oxford: Oxbow Books, 167-190
- Price, Jennifer 2003. "Broken Bottles and Quartz Sand: Glass Production in Yorkshire and the North in the Roman Period," in Pete Wilson and Jennifer Price (eds.) *Aspects of Industry in Roman Yorkshire and the North*. Oxford: Oxbow Books, 81-93.
- Price, Jennifer 1991. "Decorated and Mould-Blown Glass Tablewares in the First Century AD," in *Roman Glass: Two Centuries of Art and Innovation*. Martine Newby and Kenneth Painter (eds.) Volume XIII of Occasional Papers from the Society of Antiquaries. London, 56-75.
- Price, Jennifer 1976. "Glass," in D. Strong, D. Brown (eds.), *Roman Crafts*. New York: New York University Press, 111-125.
- Renfrew, Colin and Paul Bahn 2007. *Archaeology Essentials: Theories Methods and Practice*. London and New York: Thames & Hudson.
- Richter, Gisela M. A. 1911. "The Room of Ancient Glass," *The Metropolitan Museum of Art Bulletin*. 6. 6: 1-24.
- Rigby, Val 1981. "The Potter Julios – A Suitable Case for Study?" in A.C. Anderson, A.S. Anderson (eds.), *Roman Pottery Research in Britain and North-West Europe: Papers Presented to Graham Webster*. Part I. Oxford: BAR International Series 123(i), 39-51.
- Scheidel, W., I. Morris, and R. Saller 2007. *The Cambridge Economic History of the Greco-Roman World*. Cambridge: Cambridge University Press.
- Simpson, C. J. 1997. *The Excavations of San Giovanni di Ruoti. Volume II, The small finds* Toronto: University of Toronto Press.
- Smith, Ray Winfield. 1949 "The Significance of Roman Glass," *The Metropolitan Museum of Art Bulletin*. New Series, 8. 2: 49-60.
- Stambaugh, John E. 1988. *The Ancient Roman City*. Baltimore and London: Johns Hopkins University Press.

- Stern, E. Marianne 2008. "Glass Production," in J. P. Oleson (ed.), *The Oxford Handbook of Engineering and Technology in the Classical World*, 520-547.
- Stern, E. Marianne 2004. "The Glass *Banausoi* of Sidon and Rome," *Beretta*: 77-120.
- Stern, E. Marianne 1999. "Three Notes on Early Roman Mold-blown Glass," *Journal of Glass Studies*. 42: 165-167.
- Stern, E. Marianne 1999. "Roman Glassblowing in a Cultural Context," *The American Journal of Archaeology*. 103. 3. 441-484.
- Stern, Marianne 1995. *Roman Mold-blown Glass: The First Through Sixth Centuries*. Rome: "L'Erma" di Bretschneider in association with the Toledo Museum of Art.
- Stiff, Dan 2006. *Sell the Brand First: How to Sell Your Brand and Create Lasting Customer Loyalty*. New York, London, and Toronto: McGraw-Hill.
- Strong, Donald, and David Brown (eds.) 1976. *Roman Crafts*. New York: New York University Press.
- Weinberg, Gladys Davidson (ed.) 1988. *Excavations at Jalame: Site of a Glass Factory in Late Roman Palestine*. Columbia: University of Missouri Press.
- White, K.D. 1984. *Greek and Roman Technology*. London: Thames and Hudson.

Appendices

Appendix 1:

Table 1: C. Annius Stamps With Dependants

Stamp	Number of Finds	Finds in Arezzo	Variants of Stamps	Moulded Vessels
C.ANNI	49	8	5	24
ACHORISTVS+?	2	1	2	2
ALBAN(us)/C.ANNI	7	1	3	
ANTEROS/C.ANNI	8	2	2	
APOLLO/C.ANNI	18	3	3-4?	
APTVS/C.AN(n)I	1		1	
ARCHILAVS/C.ANNI	5	2	1	
ASTRAGAL/C.ANNI	8	4	3	
ATTICVS+?	1	1	1	1
AVCTCS/C.ANNI	18	2	7	
AN(ni)/AVC(tus)	1		1	
BLAND(us)?/C.ANNI	1		1	
CERDO/C.ANNI	28	5	4	
C.AN(n)I/CHRESI(mus)	1		1	
CHRESTVS/C.ANNI	9	4	5	1
CHRESTVS+C.ANNI	10	3	5	10
CISSVS/C.ANNI	14	6	4	
DIOMEDE(s)C.ANNI	2	2	2	
DIONISI(us)/C.ANNI	7	2	1	
EPAP(H)RA/C.ANNI	6	3	5	
EROS/C.ANNI	7	5	5	1
C.AN(ni)/EROS	1	1	1	
C.ANNI/FELIX	1		1	
GEMELLV(s)/C.ANNI	7	2	6	
GLVCO/C.ANNI	24	3	9	
HILARVS/C.ANNI	3	1	2	
INGENV(u)S/C.ANNI	12	1	2	
INVENTVS/C.ANNI	8	2	5	
ONESIM(us)/C.ANNI	22	14	4	
C.ANNI/OPILLI(o)	1	1	1	
PANTAG(at(h)us)/C.ANNI	1	1	1	1
PANTAGATVS/C.ANNI	13	3	5	10
PANTAGATHVS+C.ANNI	6	1	2	6
PANTVS(?)/C.ANNI	1	1	1	
PHILE[-]/C.ANNI	3	3	2	
PHILEROS/C.ANNI	3	3	1	
PHILOMVSVS/C.ANNI	2	2	2	
PRIMV(s)/C.ANNI	4	2	2	

QUARTIO/C.ANNI	6	1	4	
RVFIO/C.ANNI	21	11	4	
SALVIV(s)/C.ANNI	11	7	3	
SECVNDV(s)/C.ANNI S(ervus)	1		1	
SVRVS/C.ANNI	2	2	2	
ZETVS/C.ANNI	5	1	3	
C.ANNI/CORNE(lius).S(ocio rum?)	1		1	

(From Fülle 1997: 147)

Table 2: L. Annius Stamps With Dependents

Stamp	Number of Finds	Finds in Arezzo	Variants of Stamps	Moulded Vessels	also in C. Annius' Group
L.ANNI (internal stamp)	19	5	13		
L.ANNI (external stamp)	7	7	1	3	
ACH(oristus?)/L.ANNI	1		1		*
ALBANVS/L.ANNI	3	2	3		*
ANTEROS/L.ANNI	1	1	1		*
APOLLO/L.ANNI	2		1		*
ATTICVS/L.ANNI	4	3	4	2	*
AVCTVS/L.ANNI	6		1		
L.ANNI/CLEM(ens)	1	1	1		
DIOGENES/L.AN(ni)	1		1		
DIOM(edes)/L.ANNI	1		1		*
EPIGON(us)/L.ANNI	2		2		
EROS/L.ANNI	2	2	1		*
FAVST(us?)/L...NI?	1		1		
GERMAN(us)/L.(Anni?)	1	1	1		
HIL[arus]/L.AN[ni]	1	1	1		*
IESIS(?)/L.ANNI	1	1	1		
INGEN(uus)/L.ANNI	5	1	3		*
MONTAN(us)/L.ANNI	4	1	2	2	
PHILERO(s)/L.ANNI	12	4(+1?)	3	1	*
QUARTIO/L.ANNI	8	1	3		*

(From Fülle 1997: 148)

Appendix 2:

- Distribution of Laecanius Amphorae by time period: (after Bezczy 1998: 73-74)

UP TO THE END OF THE AUGUSTAN PERIOD:

Italia: Altinum, Aquileia, Patavium, Mantua, Cremona, Novaria, Dertona.

Noricum: Magdalensberg.

Illyricum Inferius: Emona, Savaria.

TIBERIAN/EARLY CLAUDIAN: (*peak period*)

Italia: Altinum, Aquileia, Carreum, Potentia, Cremona, Ateste, Mediolanum, Mantua, Novaria, Patavium, Parabiago, Parmensis, Roma, Saronno, S. Ambrogio, Dertona, Vercellae, Verona.

Noricum: Aguntum, Magdalensberg, Maribor, Iuvavum, Virunum.

Illyricum Inferius: Emona, Poetovio, Salla, Carnuntum, Ráckeve, Rittium, Teutoburgium, Siscia.

Raetia: Augsburg, Oberstimm.

CLAUDIAN/FLAVIAN:

Italia: Altinum, Aquileia, Carreum, Potentia, Cremona, Ateste, Mediolanum, Mantua, Novaria, Patavium, San Vittore Olona, Augusta Taurinorum, Dertona, Vercellae.

Noricum: Celeia, Flavia Solva, Aguntum.

Pannonia: Aquincum, Solva, Emona, Poetovio.

Raetia: Augsburg, Curia

- Territorial Distribution of Laecanius Amphorae: (after Bezczy 1998: 83)

Istria	309	46.9%
Italy	147	22.3%
Noricum	165	25%

Pannonia	32	4.9%
Raetia	6	0.9%
Total	659	100%

- Trade Distribution of Laecanius Amphorae (ignoring finds in Istria) (after Bezczy 1998: 83)

Italy	147	42%
Noricum	165	47.1%
Pannonia	32	9.1%
Raetia	6	<1.8%
Total	350	100%