

MINING MATTERS:
RURAL COMMUNITIES AND INDUSTRIAL LANDSCAPES
IN ROMAN IBERIA (2nd c. BCE – 3rd c. CE)

By
Linda R. Gosner

A Dissertation
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Institute for Archaeology and the Ancient World as satisfying the dissertation
requirement for the degree of Doctor of Philosophy

Date _____
Peter van Dommelen, Advisor

Date _____
John Bodel, Advisor

Recommended to the Graduate School

Date _____
Felipe Rojas, Reader

Date _____
Susan E. Alcock, Reader

Date _____
Jonathan Edmondson, Reader

Approved by the Graduate Council

Date _____
Peter M. Weber, Dean of the Graduate School

Curriculum Vitae

Linda R. Gosner was born February 22, 1985 in Easton, Pennsylvania and grew up in Tucson, Arizona. She received a Bachelor of Fine Arts in Dance (2007) as well as a Bachelor of Arts in Anthropology and Classics with minors in Spanish and Near Eastern Studies (2008) from the University of Arizona. Her honors thesis in anthropology, which considered the construction and use of the mortuary temple of Tausert in Luxor (Egypt), was completed under the direction of Richard Wilkinson. She graduated *summa cum laude* with honors in both degrees and was inducted into Phi Beta Kappa. In 2008-2009, Linda received a Fulbright fellowship to study in Portugal, where she conducted research at the Museu Nacional de Arqueologia (Belem). She also attended the Universidade de Lisboa with a scholarship from the Instituto Camões, earning a certificate in Portuguese language. Before and after college, Linda also worked in the Arizona State Museum as a curatorial assistant in the Archaeological Collections Repository and the Gloria F. Tapestry Center. In 2010, Linda began a PhD at the Joukowsky Institute for Archaeology in the Ancient World at Brown University with a fellowship from the Andrew W. Mellon Foundation. Linda's dissertation research was supported by a Mellon/ACLS Dissertation Completion Fellowship, an Archaeological Institute of America Archaeology of Portugal Fellowship, two Joukowsky Summer Research Travel Grants, two Brown Doctoral Research Travel Grants, and the Joukowsky Institute for Archaeology and the Ancient World. While Linda's primary research is situated in the western Mediterranean, Linda has conducted fieldwork—including excavation, survey, and ceramic analysis—widely in the Mediterranean and Middle East. She has worked in Spain at Torre d'en Galmes (Menorca), Pollentia (Mallorca), Pintia (Castilla y León) and in Portugal at Ammaia (Marvão) and Torre de Plama (Monforte). She also worked at the Tausert Temple Project and the South Asasif Conservation Project, both in Luxor, Egypt. While at Brown she participated in the Brown University Petra Archaeological Project under the direction of Susan Alcock, the Brown University Abydos Project under the direction of Laurel Bestock, and the Brown University Labraunda Project under the direction of Felipe Rojas. She is a current member of the Progetto S'Urachi (Sardinia), directed by Peter van Dommelen and Alfonso Stiglitz, where she co-supervises (with Alexander Smith) a site and regional survey of the area around S'Urachi.

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On Naming Conventions

This dissertation incorporates published literature from Anglophone, Spanish, Portuguese, and French academic traditions, which have somewhat differing customs of discussing place names and of citing authors. I tried to maintain personal preferences of the authors themselves while also being transparent about who and what I'm referring to by using these general guidelines. First, the archaeological and historical places that I refer to often have both Latin place names (with varying degrees of certainty) and modern place names. I have normally chosen to use the name that is most common in literature to refer to each place when I refer to it multiple times, but I have noted on first mention both modern and ancient naming in the following manner: Latin place name (modern place name, autonomous district or territory, country). Modern naming traditions have also posed a dilemma, as Spanish and Portuguese tradition dictates that people are named with their father's surname and their mother's surname, usually without a hyphen. In practice, some scholars have chosen to use just their father's name according Anglophone tradition in select publications or just their mother's surname for personal reasons. In my bibliography, I have adhered as closely as possible to the original choice of each author for their own publications. When naming conventions for individual authors vary from publication to publication, I have used both names for consistency in my own bibliography.

Come and listen you fellows, so young and so fine,
And seek not your fortune in the dark, dreary mines.
It will form as a habit and seep in your soul,
'Till the stream of your blood is as black as the coal.

It's dark as a dungeon and damp as the dew,
Where danger is double and pleasures are few,
Where the rain never falls and the sun never shines
It's dark as a dungeon way down in the mine.

It's a-many a man I have seen in my day,
Who lived just to labor his whole life away.
Like a fiend with his dope and a drunkard his wine,
A man will have lust for the lure of the mines.

I hope when I'm gone and the ages shall roll,
My body will blacken and turn into coal.
Then I'll look from the door of my heavenly home,
And pity the miner a-diggin' my bones.

The midnight, the morning, or the middle of day,
Is the same to the miner who labors away.
Where the demons of death often come by surprise,
One fall of the slate and you're buried alive.

-Dark as a Dungeon by Merle Travis, 1948

CHAPTER 1

INTRODUCTION: MINING MATTERS

In October 2010, the world watched intently as an elaborate rescue effort was mounted to retrieve thirty-three Chilean miners who had been trapped deep within the tunnels of a gold and copper mine two months earlier. Though this story had an unusually happy ending, and all the miners survived, the investigations that followed highlighted many of the ways that workers are exploited at mines operated by international corporations and colonial enterprises. Just five years later, many of the miners—having enjoyed a brief moment in the spotlight—have returned to their lives in the mining communities of the Atacama Desert in Chile in order to support their families and supply international markets with valued metal ore (Tobar 2014). They suffer from ongoing physical, financial, and emotional effects of their traumatic experiences, but are still tied to, and dependent upon, their multi-generational mining communities and their underground livelihoods. In a recent interview, Mario Sepúlveda—one of the leaders of the group while they were trapped—explained, “I am going back to the mines because it is the one place I feel safe” (Graham 2014). Mining, as the case of the Chilean Mining Disaster shows, has always played a complex role in local and international economies and in the relationship of local communities to their landscapes. This is a history that began in antiquity.

The impact of large-scale mining on local communities is a topic as relevant to the Roman world as it is to contemporary society. In the Roman provinces, mines were

opened up in many regions on an unprecedented scale in order to procure materials for local, regional, and empire-wide purposes (Hirt 2010). Mining in the Roman Empire had not only Mediterranean-wide impacts in antiquity but also global impacts that persist to the present day. In fact, environmental studies tracing atmospheric lead pollution in the Greenland ice caps show that pollution from mining across the Mediterranean reached unprecedented heights during the Roman Empire, levels that were not matched again until the Industrial Revolution (Figure 1.1; Hong et al. 1994).

The Iberian Peninsula (modern Spain and Portugal), in particular, is rich in almost every kind of metal, including gold, silver, copper, lead, and tin, among others. Much of the pollution found today in the Greenland ice caps can be traced to mining in southern Iberia from the 4th century BCE to the 1st century CE,¹ a period corresponding first with Carthaginian and later with Roman occupation of the territory (Rosman et al. 1997). Although indigenous traditions of mining in Iberia date back as early as 4000 BCE, the increased scale of extraction and corresponding high levels of environmental contamination are clearly correlated with the Roman conquest and political domination of the area beginning in the late 3rd century BCE. Ancient historians and their modern counterparts have often cited a desire to access these metal rich landscapes as one of the primary incentives for Roman interest in Iberia in the first place (e.g., Strabo 3.2.8-11; Blázquez Martínez 1978: 409). As the peninsula was integrated into the Roman Empire as the Roman province of Hispania,² a process that was initiated at the end of the 3rd

¹ Up to 70% of the lead can be traced to mining in southwest Iberia during this period, while a significant portion of the remaining pollution comes from the southeast Spanish regions of Cartagena and Mazarrón. (Rosman et al. 1997: 3413–3416).

² This was a complex and multi-stage process. In 218, the Roman senate declared Hispania a province. From 197 BCE, Hispania was divided into two provinces: Hispania Ulterior and Hispania Citerior. Then

century BCE and concluded nearly two hundred years later, mining became one of the most important industries there, alongside other kinds of production, including that of salted fish products, oil, and wine.

Iberian metals—previously limited to local and regional trade networks—became important to the Roman economy on a Mediterranean-wide scale. This can be observed in the distribution of metal ores in the form of ingots, objects, and as subsidiary products such as pigments from Iberia to distant places, as well as the use of these metals in gold, silver, and copper-based Roman coinage. For instance, isotopic analysis of Roman imperial copper-based coinage from mints in Rome under Augustus and Tiberius shows that from 16 BCE to 43 CE, these coins were made primarily of mixed ores from southern Spain and Sardinia, and occasionally from Tuscany. Coins from the later end of this period (34-37 CE) were made exclusively from ore derived from the Riotinto mines in southwest Iberia (Klein et al. 2004: 478–479). Aside from coins and raw materials, pigments from silver smelting and cinnabar were also distributed widely and used in rather unexpected ways. For instance, archaeometric studies indicate that red pigments derived from smelting at Riotinto, Cartagena, and Mazarrón were used in wall paintings in villas throughout Italy (Mazzocchin et al. 2008: 692) and those from Riotinto were used in Roman-era mummy portraits from the Fayum in Egypt (Walton & Trentleman 2009: 858).

Rationale and Major Contributions of this Dissertation

from the time of Augustus, the region was divided into three provinces: Baetica, Tarraconensis, and Lusitania (Richardson 1996; Richardson 1986).

There can be no doubt that mining played a role in Roman imperial expansion into the Iberian Peninsula and that Iberian metals came to play an important role in the development of the Roman imperial economy. Iberian mining had far reaching impacts in antiquity and global environmental repercussions still visible in pollution records. Absent from many discussions of the large-scale impacts of the expansion of the mining industry, however, is a substantive discussion of how these changes impacted local communities on the ground in and around mining districts. The aim of this dissertation, then, is to investigate the local social and economic impacts of the expansion of the Roman mining industry in Iberia from the initial period of Roman conquest at the end of the 3rd century BCE through the 2nd century CE. I investigate the impacts of industry in the four places that were exploited heavily during these centuries: northwest Iberia, Cartagena/Mazarrón (southeast Spain), the Sierra Morena (south-central Spain), and the Iberian Pyrite Belt (southwest Iberia), districts that have long been understood to be the primary mining centers in Roman Iberia (Domergue 1990; Domergue 1987). To do so, I build a model for examining the formation and transformation of mining communities in Roman Iberia by looking at interactions and daily practices in the context of landscapes, settlements and households, technological practice and labor organization, and local, regional, and imperial economies. Through this multi-scalar analysis of major changes—and subtle continuities—in each of these settings from the late Iron Age through the early empire, I reveal the role of these mining communities in building the economy of the Roman Empire, and the impact of empire on their lives.

This project makes several key contributions to studies of the Roman Empire as well as to anthropological studies of mining in world history. While the significance of

mining in Iberia is well understood among archaeologists and ancient historians focused on Roman imperialism and the ancient economy, the rich archaeological and archaeometric data from mining centers in Spain and Portugal have not been widely employed in Anglophone scholarship or outside of specialized circles in Iberia and France. This dissertation brings together archaeological, historical, epigraphic, environmental, and archaeometric data that have not often been investigated in concert to form a broad synthesis of the impact of Roman conquest on the mining industry in Roman Iberia as a whole. My focus on the everyday life and lived experiences of those living in mining communities provides a new socially-oriented dimension to studies of the Roman economy and imperialism that tend to focus on large-scale processes rather than small-scale impacts.

Beyond the contribution to studies of the Roman Empire, my aim is to make this work relevant to comparative studies of resource extraction, industrial landscapes, and colonialism in other epochs of history. The extraordinarily rich data from the Roman Mediterranean and from the Iberian Peninsula in particular can make a concrete contribution to historical and anthropological studies of industrial landscapes and mining communities across time and space. In this dissertation, I present an anthropological model for studying mining communities by looking at everyday practices and interactions at multiple scales of analysis. My hope is that this model will provide the basis for a common theoretical language that will facilitate cross-disciplinary and cross-cultural conversation in the future.

Outline of the Dissertation

This dissertation is divided into two parts. The first, “Social Approaches to Iberia’s Industrial Past,” takes inspiration from the foundational 1998 edited volume, *Social Approaches to An Industrial Past: The Archaeology and Anthropology of Mining* (Knapp et al. 1998). It delves deeper into the rationale for the project and outlines my approach to studying mining communities and industrial landscapes, which is illustrated through my first case study.

In Chapter 2, I highlight the connection between mining and empire in many times and places in global history, contextualizing the entanglements between mining and foreign colonizers in Iberia not as a unique instance, but part of an often-repeated historical pattern. I argue that interrogating the complex relationship between the extraction of natural resources—including metals, the formation of empire, and the social construction of communities can illuminate the localized impacts of imperial and colonial endeavors. This chapter provides an overview of the “state of the field” of scholarship on mining and metallurgy in Roman Iberia, with an emphasis on integrating data from disparate fields and modes of inquiry to better understand the complex role that mining played in the expansion of the Roman Empire in Iberia and the experience of local communities.

In Chapter 3, I present my theoretical and methodological approach for investigating mining communities through archaeological inquiry. Drawing from recent studies of “community” in archaeology (Canuto & Yaeger 2000; Varien & Potter 2008a), I define communities as dynamic groups of people brought together over time through the repeated interactions of their daily lives, interactions with each other, with landscapes, and with objects. These interactions form the basis for social understandings

that can lead to the formation of group solidarity and identities connected to shared experiences. Mining communities and industrial landscapes lend themselves particularly well to archaeological studies because the interactions that take place in the context of mining often leave behind material traces. As Bernard Knapp has argued, “the materiality of the mining experience is a major factor in the social construction of a mining community, and by extension of the mining landscape” (Knapp 2000: 236). I contend that the best way to understand mining communities, then, is through a multi-scalar, practice-based analysis of interactions in the context of four settings: landscapes, settlements and households, labor organization and technological practice, and finally local, regional, and imperial economies. My goal here is to present a research framework that can be used to study mining communities in any historical context, and one which will facilitate cross-cultural comparison in future research.

In Chapter 4, I put the approach presented in the previous chapter into practice through a substantive analysis of gold mining in northwest Iberia, with a specific focus on the UNESCO World Heritage site of Las Médulas, the largest gold mine of the Roman Empire. This is a region where archaeological evidence for all aspects of mining is particularly well preserved, and there is a strong correlation with Roman conquest and the opening of gold-mines on an unprecedented scale. Through a diachronic study of gold mining from the Iron Age through the 2nd century, I reveal the many ways that imperial governance in the region transformed landscapes and the everyday experiences of communities living in and around Las Médulas.

The second half of this dissertation, “Mining Communities and Industrial Landscapes in Southern Iberia,” presents a substantive analysis of three major mining

districts in southern Iberia through the four thematic settings outlined above. Each chapter is organized around one theme: Landscape (Chapter 5), Settlement and Household (Chapter 6), Labor and Technology (Chapter 7), and finally Economies (Chapter 8). I take as case studies the silver and lead mining district of southeast Iberia (Cartagena/Mazarrón); the silver, lead, and copper mining district of the Sierra Morena in south-central Iberia; and the Iberian Pyrite Belt in southwest Iberia, comparing and contrasting archaeological, epigraphic, historic, and environmental data from each area.

Although there are long histories of scholarly inquiry in each region, this group of mining districts have rarely been investigated alongside one another because they are separated by modern national and regional divides, as well as by ancient provincial divisions within Hispania. I group these cases together for several heuristic reasons. First, as a unit, these regions provide evidence for mining from the earliest moment after Roman conquest in late 3rd century BCE through the 2nd century CE, which allows me to undertake a diachronic analysis of changes and continuities in the industry over time. Second, southern Iberia has a common history of colonial encounters that does set it apart from the case of northwest Iberia presented in Chapter 4. In the 1st millennium BCE, the region successively came under the economic and—to varying degrees—political control of the Phoenicians, the Carthaginians, and the Romans. The connection between these various colonial/imperial encounters and the mining industry is one that played a role in social change in the region even before Roman conquest, and set the stage for the formation of mining communities in the centuries under consideration here. My analysis, then, takes these long-term connections into account, providing an analysis of the many

ways Roman conquest transformed local communities in mining districts in southern Iberia.

Finally, I conclude the dissertation in Chapter 9, emphasizing again the significance of historical ties between mining and empire, and how socially-oriented studies of mining across time and space can illuminate the localized impacts of imperial and colonial endeavors on communities. I reiterate the importance of making use of data across disciplinary and temporal divides, and constructing arguments at multiple scales of analysis. I suggest several avenues for future investigation, and ways that continued research on mining communities and industrial landscapes can contribute to our understanding of key issues in Mediterranean history and archaeology including environmental change, culture contact, political economies, labor history, movement and migration, and everyday life in the past.

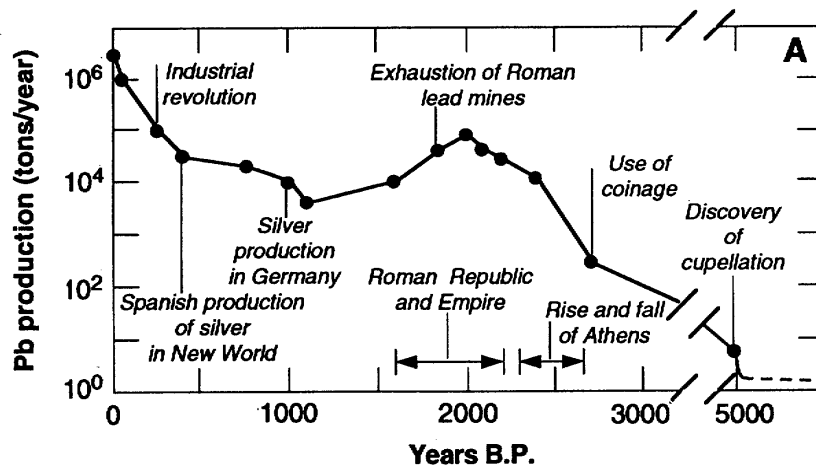


Figure 1.1 Changes in worldwide lead production over the past 5500 years, as demonstrated by atmospheric lead pollution deposited in the Greenland icecaps (Hong et al. 1994: 1842).

PART I:
SOCIAL APPROACHES TO IBERIA'S INDUSTRIAL PAST



Figure 1.2 The gold mining landscape of Três Minas, Vila Pouca de Aguiar, Portugal (author photo).

CHAPTER 2

MINING AND EMPIRE: INTERSECTIONS AND FUTURE DIRECTIONS

Mining and Empire

Estimates have it that between 1550 and 1800 in Spanish colonial Latin America, about 136,000 metric tons of silver were produced, approximately 80% of the overall global production of silver during these years (Robins & Hagan 2012: 627). While silver was extracted in many parts of Latin America, especially Mexico and Peru (Garner 1988; Brading & Cross 1972), no locale is more famous for its silver production than the Bolivian town of Potosí. The settlement was established in 1545 to provide easy access to the rich silver deposits in the nearby hill called El Cerro Rico. When Spanish Viceroy Toledo introduced the process of amalgamation to extract silver from low-grade ores using mercury in the 1570s, production expanded exponentially. The town soon grew into a bustling economic center, producing massive quantities of silver and importing nearly all of its food and other products for local consumption. By the early 1600s, Potosí boasted a population of as many as 160,000 inhabitants who lived and worked around the silver mines, participating in mining and in other industries there (Van Buren 1999).

The connection between Spanish colonial silver mining and the formation of empire quite literally placed Potosí on the map. It became one of the largest cities in Latin America and began to appear as a major landmark on maps of imperial Spanish possessions. The importance of Potosí in the European imagination prompted cartographers to emphasize its location—depicting the Cerro Rico and naming the city in

prominent letters—for centuries to follow (Figure 2.1, Figure 2.2).³ But as silver from Potosí filled Spanish imperial coffers, local communities were transformed forever. On a rotating basis, men between 18 and 50 years of age were gathered from nearby indigenous communities to participate in the dangerous work of mining and silver refining for yearlong periods. This was part of a larger tribute system called the *mita*, in which indigenous communities in the Spanish colonial Andes were forcibly resettled in new towns. The *mita* followed a model intended to at once provide a mechanism for the Spanish to control and civilize local populations and a way to extract resources in the form of labor and material goods (Dell 2010).⁴

Recent studies have shown the transformative—and often destructive—impacts that labor in the silver mining industry had on indigenous communities and others living and working in Potosí. Work in the mines was sometimes considered a death sentence, and some chose to flee the area rather than comply with forced labor obligations. Those who stayed were exposed to the various hazards of working underground, including injury and death from rock collapses and noxious fumes. The process of amalgamation also released toxins from mercury into the air from which no one escaped: from 1574 to 1810, up to 39,000 tons of mercury vapor were released in Potosí. Miners, refiners, and those working in subsidiary and even industries unrelated to mining at Potosí suffered various health effects of mercury poisoning, which has now been attributed to higher

³ For a collection of maps in this vein, see the digital collection at the John Carter Brown Library that was gathered for the exhibition “Subterranean Worlds: Mapping the Underground” that took place from April to August 2015 (John Carter Brown Library 2015).

⁴ Mumford provides an excellent historical account of resettlement of native populations in the Andes from a historical perspective (2012).

rates of fetal death, the history of violent behavior among the city's residents, and many reports of mental illness and death (Robins & Hagan 2012; Robins 2011).

In world history, there is a frequent connection between colonial entanglements, the formation of empires, and the extraction of coveted natural resources. This brief account of Spanish colonial mining and indigenous communities at Potosí served to highlight not only the conceptual place that mines and mining settlements can come to play in the creation of empire, but also the very real ways that colonial mining can impact social structures and economic interactions on the ground in these places. Mining and metallurgical studies, then, should not be confined to the pages of journals of science and engineering, but can make a concrete contribution to our understanding of imperial and/or colonial political and economic strategies, and the impacts that these have on local communities. As Bernard Knapp has rightly pointed out:

Studies of mining and metallurgy have the capacity to expand and alter our understanding of processes of colonialism and imperialism, and the challenge of frontiers. Deposits of metal ores are unevenly distributed over the surface of the earth and empires have often established mining colonies at a great distance to extract metals for home consumption (1998: 11).

The history and legacy of mining in Latin America has long been a topic of interest to scholars of Spanish colonialism in Central and South America. Studies address such issues as women and gender in mining communities, human health, power and inequality, environmental degradation, and local, regional, and global economies (e.g., Velasco Murillo 2013; Studnicki-Gizbert & Schechter 2010; Love 1977; Deustua 2000; Higgings 1999; Haskett 1991; Dore 2000; Dell 2010; Concepción Gavira 2003). Many of these same issues have also been highlighted in studies of other colonial situations (e.g., Ehrenreich 1998; Lawrence 1998; Bell 1998) and more recent scholarship on international corporations and their mining interests in far-off territories (e.g., Gordon &

Webber 2008; Ali 2003). One such example is the Canadian company Gabriel Enterprises' efforts to introduce cyanide gold mining in present-day Romania at Roșia Montană—also the location of many of the best-preserved subterranean gold mines in the Roman Empire, known in antiquity as *Alburnus Maior* in the province of Dacia. Despite the intervention of organizations including cultural heritage specialists on behalf of UNESCO and environmentalists with Greenpeace as well as local grassroots campaigns opposing the mines, Gabriel Enterprises is currently in the permitting stage of opening new cyanide mines (Ion 2014; Wilson et al. 2011; Wilson et al. 2013; Anon. 2012). They cite the creation of jobs and building the local economy as some of the goals of the new mining project (Gabriel Enterprises 2015), which would simultaneously have devastating environmental impacts on the landscape and human health in local communities.

The point to be made here is that, across time and space, colonial and imperial projects, as well as international corporations have targeted rich mineral deposits in the lands they have dominated, either politically or economically (or both).⁵ As David Killick and Thomas Fenn have put it: “the quest for metals has been a major driver of exploration, long-distance trade, colonization, and imperialism” (2012: 560). The processes involved in imperial and colonial metal extraction invariably have a wide range of social and economic impacts on local communities. The connection between colonial

⁵ Colonialism, imperialism, and international business interests do not all operate with the same goals in mind, and I am not subsuming all of them under the same definition, but acknowledging that all three have driven foreign movements into new territory to gain access to metal resources. While all three do involve foreign groups going to distant territory for economic, and often politically driven reasons, it is important to acknowledge differences. Imperialism is distinct from colonialism in that one of its major goals and outcomes is the formation of an empire. In this dissertation, I use the term imperialism for the Roman presence in Iberia even before the Roman Imperial period beginning with the Emperor Augustus. During the Republican period Rome was acquiring foreign lands for both political and economic gain, and these were eventually incorporated into the Roman Empire's administrative and financial system. Thus, it is fair to see these as the beginnings of Roman imperialism on the one hand, but also the continuation of a series of colonial encounters on the other.

entanglements and metal extraction in the Iberian Peninsula, then, must not be thought of as a unique or singular instance but contextualized as one of many instances of this phenomenon in world history. Turning now to the geographical focus of this dissertation, in the following pages, I interrogate the connection between mining and various colonial encounters in the Iberian Peninsula during the 1st millennium BCE.

Colonial Entanglements and Mining in the Iberian Peninsula

The landscapes of the Iberian Peninsula were famous in antiquity for their richness in metals, and there is reason to believe that such metals were a draw for foreign trading and colonial interest in the region from early on. Strabo, a Greek geographer and historian of the 1st century BCE, wrote of Iberia: “Up to the present moment, in fact, neither gold, nor silver, nor yet copper, nor iron, has been found anywhere in the world, in a natural state, either in such quantity or of such good quality” and he praised Iberia—citing Posidonius—as a “never-failing treasury of empire” (Geography 3.2.8-9), somewhat ironic since Spanish colonialism in the Americas was driven, in part, by a desire to access new metal deposits outside of the Iberian Peninsula.

Drawing from historical accounts including Strabo and other ancient writers including Pliny the Elder, Livy, and Polybius, as well as the rich body of archaeological evidence that attests to the scale of ancient mining in Iberia, contemporary scholars have consistently linked the motivation for various colonial entanglements in the 1st millennium BCE with a desire of foreign traders and political regimes to access the metal rich landscapes of Iberia. For instance, José María Blázquez wrote:

“The Iberian Peninsula was the El Dorado of the ancient world. Mineral exploitation was the determining cause of all colonizations—Greek, Phoenician, Carthaginian, and —of course—Roman” (Blázquez Martínez 1978: 409, *my translation*).

On one hand, this statement is certainly overly simplistic: other natural resources aside from metal, such as marine and agricultural products, were exploited during the 1st millennium BCE alongside metals. This, in turn, encouraged colonial interactions with the indigenous inhabitants of Iberia who participated in various types of production as well as the formation of new trading centers to facilitate the transport of goods in and out of the peninsula. However, pollution records and archaeological evidence from mining districts together demonstrate that, with each successive colonial encounter, the scale of metal exploitation increased. Briefly examining the nature and history of colonial encounters in Iberia, then, helps provide a clearer view of how mining activity fit into local, regional, and Mediterranean-wide economic activity connected with these colonial enterprises. It also shows that there was a precedent in Iberia for the connection between mining and empire that emerged the period of Roman domination.

Phoenicians and Carthaginians in Iberia

Colonial interaction began long before the Roman conquest of Iberia, with the Phoenician trading posts that were established by the 8th century on the coasts of Andalucía, the southeast Mediterranean, and along parts of the Atlantic seaboard. This followed a period of contact and trade, but not permanent settlement sometimes known as the “precolonial” period in which objects from the Eastern Mediterranean began to appear in Iberia.⁶ The best known and perhaps most important Phoenician trading center

⁶ Van Dommelen and Knapp argue that the notion of a precolonial period is spurious (Knapp & van Dommelen 2015). Further the chronology of early trading is still up for debate. Some scholars suggest a restricted chronology with the precolonial period beginning in the 9th century BCE (Celestino Pérez 2009: 229–232), while others suggest that the term encompasses the extended period from the 13th to the 8th century BCE, coinciding with the Late Bronze Age (Bronze Final) and early Iron Age (see extended arguments in the volume Celestino et al. 2008). The earliest dates, frequency, and intensity of precolonial

was Gades/Gadir (Cádiz) in southwest Spain,⁷ located near the metal-rich interior of southwest Iberia, and the territory occupied by the indigenous Tartessians.⁸ Although there was a long tradition of metallurgy in this region dating back to at least 4,000 BCE, archaeological evidence suggests that Phoenician presence in the region spurred a major increase in extraction of various metal ores. The settlement of Cerro Salomón, for example, was founded around 750 BCE to house those involved in the extraction of gold, silver, and copper from the Riotinto mining district. The ore from these mines was processed either on site or transported south to Huelva; silver smelting furnaces have been excavated at both locales (Aubet 2001: 281; Blanco et al. 1970). Aubet suggests that, while most mining and metallurgical activity was carried out by Tartessian populations, the introduction of Phoenician technological innovations into indigenous metallurgical practice enabled an increased output from local mines, which reached “industrial proportions” during the 7th century BCE (Aubet 2001: 283). Indeed, certain technological advances in smelting have been associated with the arrival of the Phoenicians and subsequent transfer of technological tradition for use in smelting furnaces in southwest Iberia (Hunt Ortiz 2004; Hunt Ortiz 2003).

contact in Iberia, of course, varied by period and place; they are constantly being reconsidered in light of new archaeological evidence for early trade.

⁷ The founding date of Gadir is much debated. Archaeologically, the city cannot be traced earlier than the 8th century BCE, while ancient sources suggest that the city was founded around 1104 BCE with the establishment of a city for commercial purposes and equipped temple dedicated to Hercules (Diodorus 25.10.1; Ruiz Mata 2002:155–156).

⁸ The exact geographical territory of the Tartessians likely encompassed western Andalucía (including Huelva, Sevilla, Cádiz, and Córdoba), Extremadura (including Badajoz and Cáceres), and southern Portugal (the Baixo Alentejo and the Algarve). It is in these areas that around 90% of the Tartessian objects have been recovered (Chamorro 1987: 203–206). The famous El Carambolo Treasure, a lavish collection of gold pendants, armbands, and a necklace, for instance was found in Sevilla, and is now stored in the Museo Arqueológico Nacional (Madrid). See also: López-Ruiz 2009; Aubet 2002b; Schulten 1922; Belén Deamos 2009; Pérez Macías 2007; Celestino Pérez 2008.

On the Mediterranean coast of southern Iberia, a group of small settlements were established, stretching a distance of about 170 kilometers between ancient Abdera (Adra) and Malaka (Málaga), in the modern day provinces of Almería and Málaga, Spain. These settlements included Cerro de Villar, Malaka, Toscanos, Morro de Mezquitilla, Chorreras, Sexi (Almuñecar), and Adra—all of which have been the subject of archaeological investigations (Aubet 1997; Niemeyer & Schubart 1969; Niemeyer 2002; Schubart 2002; Aubet et al. 1995; Aubet et al. 1999; Delgado Hervás 2011; Gran-Aymerich 1991). These settlements were usually between one and three hectares in size, and often located on low-rising coastal promontories either on small peninsulas or on islands at the mouth of rivers. Aubet has suggested that that these settlements functioned primarily as commercial ports since they usually lacked “institutional, architectural, and religious elements of the large urban colonies of the central Mediterranean” (2002a: 86). Warehouses and various kinds of industrial installations for metal smelting, pottery production, and fish-related industries have been discovered that all attest to the commercial nature of these early settlements (Aubet 2010).

This combination of productivities definitively proves that the Phoenicians were not seeking metals exclusively, but indeed sought out a variety of commercial goods in Iberia. Although many of the rivers on which these colonies were established provided access to the metal-rich landscapes of the interior, Dietler has rightly pointed out that “metals were by no means the only resources of interest to Phoenician traders, nor can the location of metal sources explain the origin of all, or even most, Phoenician colonies in Iberia” (2009: 7). The multiple varieties of productive activities, such as the fisheries at Sexi (Almuñecar) and the pottery production workshops at Cerro de Villar, attest that

metal was but one of many important economic activities—and it should perhaps not be considered the primary or only reason for initial colonial involvement in the region. These and other items such as timber, salt, slaves, agricultural products, and murex for purple dye were likely all part of economic interaction between Phoenicians and indigenous populations in Iberia (Dietler 2009: 7). Metal was an important but not singular commodity of the region.

From the 6th century BCE,⁹ the Phoenician colony of Carthage in North Africa, located on the coast of modern-day Tunisia, began to dominate the political and economic domain of the Phoenicians in the west. Scholars now refer to this as the Punic period. This caused a major shift in settlement patterns and economic activity in the Iberian Peninsula. Some of the trading posts were abandoned, while others grew in size and power, and still others were founded. Malaka and Ibiza both became large urban centers, and the new colony of Carthago Nova (Cartagena)—or *Qart Hadasht* in Phoenician—was founded in 229 BCE on the southeastern coast of Spain. This was the culmination of an extensive Barcid expansion in southern Iberia, partly in response to the loss of other territory, including Sicily, in the 1st Punic War. Near to the important mining district of the Sierra de Cartagena, the *Qart Hadasht* became a key place of export for

⁹ This was also the period of initial Greek colonization on the northern Mediterranean coast of Spain and southern France. Prior to Greek colonization, Etruscan merchants had frequented this area and also southern France from at least the late 7th century BCE. It was under the Greeks, however, that the major settlement of Emporion (Ampurias/Empúries) was founded, and Greek trade flourished in the region (Dietler 2009: 9–10). Although Greek colonization did have a large role to play in the colonial history of the Iberian Peninsula in the 1st millennium BCE, the geographic areas they came to were not particularly rich in metals. Thus, any discussion of Etruscan and Greek colonial encounters in Iberia (and southern France) is limited in this dissertation, but addressed thoroughly in the work of other scholars (e.g., Dietler 2010; Dietler 1995; Lowe 2001; Rouillard 2009; Aquilué et al. 1998; Ridgway 1992; Graham 1971; García y Bellido 1948a; García y Bellido 1948b; Marcet & Sanmartí 1990).

lead ingots as well as silver, among other commercial products, from the time of its establishment.

It was during this period that Rome and Carthage began to vie for power in the Western Mediterranean, eventually fighting the Punic Wars beginning in the mid 3rd century BCE. Despite various Carthaginian treaties with Rome in 509 and 348 BCE, as well as the brief establishment of the Barcid Empire in southern Iberia from 237 to 206 BCE, the Carthaginians were unable to hold onto power in the peninsula. Rome eventually took political and economic hold over their former territory in Iberia, including the mines that had already been in operation there for centuries (Dietler 2009: 8; Quinn & Vella 2014; Gracia Alonso 2008: 890–896), but certain aspects of Phoenician language, culture, and identity did persist in parts of southern Iberia for the several centuries that followed (López Castro 1995).

In sum, economic and industrial activity during the Phoenician- and Carthaginian-dominated epochs of Iberia's history had a long lasting effect on mining and metallurgy in the peninsula. Certainly, mining during these earlier periods contributed to the fame of the mineral-rich landscapes of Iberia, and it also conditioned the manner and the speed with which Rome became enmeshed in mining and metallurgical activity in the southern part of the Iberian Peninsula.¹⁰

The Roman Conquest of Iberia

Although the Iberian Peninsula was declared a Roman province, Hispania, in 218 BCE at the beginning of the Second Punic War (218-202 BCE), it was not until nearly

¹⁰ Various volumes discuss archaeological and historical evidence for Phoenician and Punic Iberia in greater detail. See especially: Neville 2007; Dietler & López-Ruiz 2009; Bierling & Gitin 2002; Delgado Hervás 2008; Aubet 2001.

200 years later that the Romans came to fully control the territory of modern-day Spain and Portugal. Initially, the Roman senate needed justification for fighting the threat of Hannibal's invasion of Italy and did so by declaring that Hispania—which served as Hannibal's route to Italy—was theirs. The final expulsion of the Carthaginians from Iberia happened in 206 BCE, but in the intervening years, the Romans had taken an interest not just in fighting the Carthaginians who occupied Iberia, but in gaining access to the existing trade connections and resources there. The region was already known for its various commodities—especially metals—that had been targeted and distributed throughout the Mediterranean during the periods Phoenician and Punic colonization.

In 197 BCE, the senate created the provinces of Hispania Citerior and Hispania Ulterior, and their territory—which at first stretched only along the Mediterranean coastal regions—was expanded westward in the Lusitanian War (155-139 BCE), and the Celtiberian War (153-133 BCE) (Richardson 1996: 39–43; Curchin 1991). The Romans were not able to annex northwest Iberia until the Augustan campaigns and subsequent uprisings in the region lasting roughly from 26 BCE to 16 BCE,¹¹ though finds of Campanian ware and Italian amphorae do indicate that the indigenous populations had some contact with Roman products prior to conquest (Orejas et al. 2000: 113). Under Augustus, Hispania was divided into three new provinces—Baetica in the south; Lusitania in the west (roughly the territory of modern Portugal below the Duero River); and Tarraconensis in the north, which eventually incorporated the northwestern extent of

¹¹ The Augustan campaigns in northwest Iberia began in 26 BCE,¹¹ and the final rebellions were not quelled until 16 BCE. Augustus himself fought in 26 and 25 BCE, and his efforts are recorded in his own *Res Gestae*, as well as by the historians Florus, Dio Cassius, and Orosius (Orejas et al. 2000: 113). Several major uprisings among indigenous populations are recorded in 24 BCE, 22 BCE, and 19 BCE, the final one of which required Agrippa to step in and intervene on behalf of the emperor (Jones 1976: 46). After 16 BCE, northwest Iberia appears to have been firmly under Roman control, and no other major rebellions are recorded. It was at this time that gold mining in the region began at a grand scale.

the peninsula. Both Tarraconensis and Lusitania were controlled directly by the emperor, but Baetica was a senatorial province (Richardson 1996: 134–137). Following the Augustan conquest, the entirety of the Iberian Peninsula was under Roman control.

Ensuring access to metal rich-landscapes were important motivating factors of Roman conquest and colonization of Iberia, alongside other political and economic drivers, from the earliest moments of Roman presence there in the late 3rd century CE. Metal extraction took place on a near-industrial scale in four different mining districts between this period and the 2nd century CE, with continued exploitation at lower levels of production in the centuries that followed. These four areas serve as case studies in the later chapters of this dissertation, and are outlined chronologically here (Figure 2.3). First are the lead and silver mines of southeast Iberia in the districts of Cartagena-La Unión and Mazarrón, which were heavily exploited from the late 3rd century BCE through the early 1st century BCE. These were located in the landscapes surrounding the city of Carthago Nova in what was Hispania Citerior and became Tarraconensis in the imperial period. Second are the lead, silver, and copper mines in the expansive region of the Sierra Morena mountain range in present-day Andalucía in south-central Spain. In antiquity, these mines were first in Hispania Ulterior, and later incorporated into Baetica (though some of the northern-most mines lie in the territory of Tarraconensis). Third are the mines of the Iberian Pyrite Belt in southwest Iberia, which contained copper and silver with lesser quantities of gold and other metals. Copper was exploited at a massive scale from the late 1st century BCE through the 2nd century CE in this region, which spans the modern Spanish-Portuguese border and the ancient border between Roman Lusitania

and Baetica.¹² These three case studies are discussed together in comparative, thematic chapters in Part 2 of this dissertation. Finally, gold was heavily exploited in northwest Iberia, the final region of Iberia to be incorporated into the Roman Empire. In antiquity, these mines were operated on a grand scale from the late 1st century BCE through the 2nd century CE. They were located in Hispania Tarraconensis, today encompassing northern Portugal and the Spanish provinces of Galicia, Asturias, and Castilla y León. This case study is discussed in Chapter 4.

While mining was but one of many economically significant industries in Roman Iberia, the exploitation of metal resources soon after the conquest of each region, the subsequent increase in scale and distribution of metals, and the clear significance of metal in the imagination of ancient authors clearly attest to the connection between mining and empire in Iberia.

State of the Field: Mining and Metallurgy in Roman Iberia

Despite the clear relationship between metal extraction and colonial endeavors in ancient Iberia, scholarship on Roman mining in the Iberian Peninsula has been included only rarely in larger narratives of the overall economic and political development of the Roman Empire. Roman mining is a marginal focus of study in classical archaeology and ancient history, although important scholarly accounts of mines do exist dating back at least a century and rich local and regional archaeological studies have been carried out in many parts of Iberia. Divides in several different spheres—linguistic, academic, and

¹² In addition to metallurgical production, both the garum and oil industries became increasingly important in Baetica. Many thousands of oil-filled Baetican amphorae were shipped to Rome as part of the *annona*, and similarly oil was sent to Germania and elsewhere to supply the Roman army (Blázquez Martínez & Remesal Rodríguez 1999; Rodríguez Almeida 1984; Remesal Rodríguez 1989; Blázquez Martínez 1992).

disciplinary—have created persistent obstacles to the synthetic study of Roman mining in Iberia, and its role in larger social and economic processes. These are divides, however, that current scholarship can and should transcend, and my aim is to do just that in this dissertation. When put into cross-disciplinary conversation, data from wide-ranging fields provide a wealth of information that can be used to address historical questions about the logistics of empire and its impact on local communities and landscapes.

In the following pages, I outline the historical development of studies of Iberian mining and metallurgy and the major contributions from fields as diverse as engineering and technology, archaeometry, ancient history, classics, archaeology, anthropology, and environmental studies. This review is not meant to be comprehensive, but rather to outline key contributions of these disciplines over the past c. 150 years and comment on the “state of the field” of Roman mining and metallurgy studies on Roman Iberia. As noted the previous sections noted, scholarship on colonial encounters in ancient Iberia is often enmeshed with the story of mining at a superficial level, but the vast quantity of scholarship on mining in the Iberian Peninsula is rarely incorporated into these historical narratives in a comprehensive way.

Early Twentieth Century Traditions: Early Collection and Recording History

Many of the earliest scholars of Roman mining were engineers with the technical expertise necessary to undertake rigorous analysis of the ancient archaeological evidence, but who were also educated in the classical tradition according to the standards of their day (Dietler 2010: 27–53; Dietler 2009:15–20; Dietler 2005). Scholarship from the late 19th century and early 20th centuries often reveals engineers’ deep admiration for the histories of the landscapes in which they lived and worked. Beyond this, many of the

earliest discoveries of Roman-era findings in the mining districts, especially across southern Spain and Portugal, were made by engineers in the process of modern opencast mining (Pérez Macías & Delgado Domínguez 2011).¹³ Nineteenth and 20th century open-air mining projects—many of them neo-colonial enterprises in themselves, organized by British ventures—revealed various traces of Roman-era mining, such as underground shafts and galleries, and tools such as picks, hammers, and water wheels. Thus, it is thanks to the diligent work of engineers that many of the Roman and prehistoric mining artifacts known from Iberia today are available for study. Conversely, of course, the haphazard and untrained collection methods employed by miners and engineers in these centuries does mean that valuable information about the provenience of many items has been lost.

Work on mining and metallurgy from this period often focuses on the history of the development of mining in specific locales or on the place of mining in the *longue durée* (*sensu* Braudel) of world history. Nash's history of the Riotinto mines in southwest Spain (1904) and Checkland's account of the mines of Tharsis nearby Riotinto (1967) are both ambitious records of the history of each site from antiquity to contemporary times. In the latter category, is T.A. Rickard's seminal two-volume work, *Man and Metals: A History of Mining in Relation to the Development of Civilization* (1932), to name one example. Rickard was an Englishman from a family of mining engineers who spent most of his career in the US working in the same profession. It was not until his retirement in 1922 that he took up an academic interest in the history of mining, eventually writing a

¹³ These are not always published in accessible formats, but often stored in the archives of these modern mining districts. The Archives of Riotinto (Huelva) are an especially rich collection of such notes from mining engineers.

book on mining in America, as well as *Man and Metals*, which focused on the deep history of mining in the Old World (Young 1969). Notably, he wrote one of the earliest English language articles on Roman mining in Spain, including a range of historical accounts of classical authors and archaeological findings from throughout the region (Rickard 1928).

This scholarship from the late 19th and early 20th centuries, as well as the history of collection in and around modern mines, ensured the survival of material evidence for Roman mining in Iberia at a time when there was not a great deal of interest in the subject on the part of Roman or classical archaeologists. (Indeed, while engineers uncovered traces of Roman mining in Iberia, the majority of Roman archaeologists in Spain and Portugal were occupied with studies of all things urban and elite: monumental architecture in urban environments—theaters, amphitheaters, imperial *fora*, temples, aqueducts, and the elite *villae* of the Roman countryside with their paintings and mosaics. These trends can be observed in the pages of the most prominent publications of these previous centuries, including the *Archivo Español de Arqueología* in Spain and *O Arqueólogo Português* in Portugal.¹⁴) This early work has made a lasting impact on our understanding of site-specific, histories of mining as well as the development of mining and metallurgy in world history broadly conceived. Further, it paved the way for archaeological and historical studies to make use of the wealth of information recorded during these early years.

¹⁴ *Archivo Español de Arqueología* is a long-running journal in Spain founded in 1940 by Antonio García y Bellido, while *O Arqueólogo Português* is a journal founded by José Leite de Vasconcelos in 1895 in connection with the Museu Nacional de Arqueologia (then the Museu Ethnológico de Belém) in Belém, Lisbon.

Contributions of Archaeology and Ancient History

Scholarship in archaeology and ancient history in the Anglophone and Spanish, Portuguese, French, and German traditions has made valuable contributions to our understanding of the major locations of mining in Roman Iberia and elsewhere in the Greek and Roman Mediterranean, as well as to the history of labor, technology, and engineering in the classical world. Generally speaking, archaeological evidence of the mines (and of mining-related objects) has been used to trace the development of the technology and scale of mining. Conversely, classical literary traditions have been employed most frequently to interpret the composition of labor and other topics relevant to the social history of Roman mining districts in Roman Iberia.

History and Technology of Roman Mines from an Anglophone Perspective

Just a few years after Rickard's aforementioned volumes were published, archaeologist Oliver Davies wrote *Roman Mines in Europe* (1935). Although Davies, also an Englishman, spent most of his career studying Africa and Ireland (Maggs 1986; Evans 1987) his book on mining became the first major synthesis of mining sites in the Roman Empire, though his focus on Europe meant that he excluded North Africa and the Levantine coast. Davies collated an enormous amount of existing scholarship, provided fairly comprehensive maps of mines for the first time, and wrote descriptions of mines based on personal visits to places he wrote about. He lamented: "the evidence for ancient mines is in all cases poor, and archaeologists must not demand so strict a standard as in other branches" (Davies 1935, preface). Davies included a substantive section on Spain divided regionally as well as a subsection on Portugal, an endeavor that is considered the

first comprehensive treatment of the region, even in Spanish and Portuguese academic circles.

Many years later, classical archaeologist John F. Healy published *Mining and Metallurgy in the Greek and Roman World* (1978), with the ambitious goal of documenting the technological development of mining in both the Greek and Roman contexts through time as well as recording the geographic distribution of metal exploitation in the Mediterranean. Significantly, he also delved into social issues such as administration and labor composition in mines, mostly as demonstrated through classical sources and epigraphic evidence,¹⁵ and examined the use of metal in various professions including its agricultural, military, and medical applications. In that same vein, Robert Shepherd's work, *Ancient Mining*, remained focused on engineering and technology and the locales of various important mines in antiquity, though published years later (1993).

Aside from these more descriptive and historical accounts, scholarship from the subdiscipline of the history of engineering and technology in the classical world has also provided a wealth of information on Roman mining. Contributions of various scholars on this topic, most notably John Peter Oleson (e.g., Oleson 1984; Oleson 2000; Oleson 2008), have contributed to our now detailed understanding of many of the mechanical devices and other technologies used in mining (indeed, those first discovered and discussed by the mining engineers mentioned above). The subject of "mining and

¹⁵ Scholars have often relied on the accounts drawn from classical sources, especially Pliny, Diodorus, and Strabo, to hypothesize about the composition of the labor force and the conditions in which miners lived. It is my contention that an over-reliance on these classical sources has led to an underestimation of the role of indigenous mining traditions and labor in many mining districts in Roman Iberia as well as a skewed view of the prevalence of chattel slavery and convict laborers in mines during the Roman domination of Iberia. The archaeological record from mining settlements and the mines themselves can be used to temper these perspectives, a topic discussed further in Chapter 7.

metallurgy,” notably, received its own chapter in the recent Oxford Handbook of Engineering and Technology in the classical world (Craddock 2008).

The key volumes mentioned, perhaps with the exception of selections from Healy and Shepherd’s work, take a descriptive approach to employing archaeological evidence: they document shaft-and-gallery mines, the extent of opencast mine workings, the aqueducts and other water sources used for processing ores, and the various tools and mechanical devices discovered in mines. Rarely are mines themselves contextualized in their wider landscapes, or in relationship to other key elements of mining infrastructure such as mining settlements and houses, cemeteries, or even roads. These studies demonstrate the locations and methods of Roman mining, if focusing little on the archaeological and epigraphic information necessary to begin to understand the social and organizational aspects of metal extraction.

Recent work in Roman history and archaeology has begun to fill in these lacunae in our understanding of ancient mining: scholarship is now delving deeper into the social and organizational aspects of both mining and quarrying,¹⁶ and the many ways that extractive activities contributed to the Roman economy.¹⁷ Of particular note is historian Alfred Michael Hirt’s volume, *Imperial Mines and Quarries in the Roman World: Organizational Aspects 27 BC – AD 235* (2010). His work is invaluable, as it draws on historical, legal, and other epigraphic sources as well as archaeological evidence to provide a broad synthesis of the organizational measures devised to govern Roman

¹⁶ In the Roman world, these two extractive technologies are often examined alongside one another, in part because of the obvious similarities in the techniques of large-scale extractive operations, and in part because of the Roman imperial management of both industries under the administrative umbrella of *metalla*, a term used to refer to both mining and quarrying districts in Roman administrative texts (Hirt 2010: 6–7).

¹⁷ See, especially, the databases on mining and quarrying, as well as conferences and forthcoming publications of the Oxford Roman Economy Project (Bowman & Wilson 2015).

imperial mines and quarries from the time of Augustus to the 3rd centuries CE. As a Roman historian dealing with imperial administrative practices, however, Hirt takes a top-down, Rome-centered approach. His questions are about the organization of empire, but not the local impact of it. His restricted chronology does not allow for a clear view of practices during the Roman Republic, which—especially in the Iberian Peninsula—was a time when the Romans encountered indigenous miners and mines that had been in operation for centuries, and began to develop areas into what later became imperial mines. In order to gain a more diachronic, and material-centered approach to mining in the Iberian Peninsula, it is essential to employ the rich body of archaeological scholarship produced in Spain, Portugal, and France.

Archaeological Work on Roman Iberia

The archaeology of mining has a long and rich history in the Iberian Peninsula.¹⁸ It has become something of a niche discipline, with specialized conferences occurring on regular intervals with institutionalized support in places like the Consejo Superior de Investigaciones Científicas (CSIC/National Spanish Research Council) and the Universidad de Granada, among others. For many regions, this has created a rich dataset from which to work, but one that does not often go beyond the descriptive (ie: when and where did mining happen?) to inform more complex social and economic questions related to the formation of empire.

In 1970, the first major conference on ancient mining was held (*I Coloquio Internacional sobre Historia de la Minería*) in León. This conference brought together an interdisciplinary group with the aim of understanding ancient mining from a more

¹⁸ For a more thorough treatment of this long history of scholarship see (Orejas et al. 1999).

humanistic perspective than had been previously the case. The papers presented signaled a change on two major fronts. Participants articulated a need to use archaeology rather than just the classical sources as a tool for understanding ancient technology and other aspects of ancient mining. Additionally, an emerging interest in using archaeometric methods for more than just dating, but also for proveniencing objects and understanding technological processes also came to the fore, trends also seen in British and American scholarship of that era.

Other such conferences have become regular occurrences, providing opportunities for collaboration and interaction among scholars who otherwise tend to maintain fairly strict regional and topical specializations. Their resulting publications serve, in part, as markers for the evolution of the discipline. Take, for example, the 1985 *Coloquio Internacional de Minería y Metalurgia en las Antiguas Civilizaciones Mediterráneas y Europeas*, which was divided into eight sessions: 1) The beginnings of mining and metallurgy, 2) Iron, 3) The Iberian Peninsula, 4) Greece, Etruria, Gaul, 5) Gold, 6) Mining and Metallurgical Techniques: Historical Texts and Archaeology, and 7/8) Social and Administrative Aspects (Domergue 1989). Here, international collaboration and comparative work was most prevalent in the first session on prehistory, whereas other sessions tended to be confined to topics on particular metals or particular geographic locations in the prevailing cultural historical European tradition. The proliferation of a rich scholarship on mining and metallurgy studies in the Iberian Peninsula is clear in the fact that an entire session was dedicated to it, whereas other Mediterranean regions were grouped at random, or not discussed at all.

Finally, by the mid-1980s a more developed interest in going beyond the technological and looking at social and organizational aspects of mining had taken root, and was discussed in no less than two sessions, which were mostly focused on Roman-period mining. The editor of the proceedings for this particular conference was Claude Domergue, a French scholar whose work would come to play a key role in the archaeology of Roman mining in the Iberian Peninsula. While this and later conferences have continued to be important venues for advancing mining studies within Spain and Portugal, Domergue's individual scholarship has had, in many ways, a transformative effect on the discipline, in particular with reference to Roman-period mining. Prehistoric mining, on the other hand, has taken a rather different trajectory: the role of mining in diffusionist models of technological change in prehistory is a subject that has brought scholars together on an international level. The assumed connection between social and political development and the emergence of metallurgy has caused studies of mining and metallurgy to always stay in the fore, if used somewhat problematically in discussions of the development of hierarchy and complex societies.

The proliferation of work on mining in Roman Iberia in the past 25 years is in large part thanks to the foundational work of Domergue, who wrote his doctoral thesis on the subject at the Sorbonne, finishing in 1979. That thesis, was transformed into several important tomes, including a two-volume set cataloging 750 mining and smelting sites in Spain and Portugal (Domergue 1987). Domergue visited and studied most of these mines first hand in the absence of previous scholarly research. Although he is credited with locating many of the known Roman and prehistoric mines, he also gleaned information from the records of mining engineers (or indeed collaboration with them) of the more

recent mining operations in the Iberian Peninsula as well as amateur and scholarly publications (Orejas et al. 1999: 266).

Domergue's second volume, and seminal work, is *Les Mines de la Péninsule Ibérique dans l'Antiquité Romaine* (1990). The book provides a synthetic study of Roman mining in the Iberian Peninsula, examining both technological and social aspects of the industry. It serves the invaluable purpose of gathering virtually all published material on the subject prior to 1990, and identifying in a unified place, the major geographic regions of importance. Because his study examined both pre-Roman and Roman evidence for mining, it became possible to see clearly the transformative effect on the scale of mining in certain districts of the peninsula for the first time. Although, as the distribution of mining sites shows, mining at least at a domestic or community level existed in most corners of the peninsula, Domergue was able to identify those regions on which the Roman conquest had the most profound impact. Not coincidentally, these are the same regions that make up the case studies for this dissertation: northwest Iberia, southeast Iberia, the Sierra Morena region in central Iberia, and the Iberian Pyrite Belt in southwest Iberia.

During his career, Domergue went on to excavate and publish many of these sites in greater detail, and held a special interest in gold mining in the northwest of the peninsula, though he worked in nearly every region at one time or another. In his fieldwork, he brought together interdisciplinary teams, and has championed important aspects of scholarly investigation such as the use of archaeometric techniques including carbon-14 dating and lead isotope analysis alongside more traditional archaeological and epigraphic studies (Orejas et al. 1999: 263–298). His work sparked an interest in the

subject and the elaboration of many local and regional investigations into specific mining histories, which is still the dominant mode of analysis today.

In addition, Domergue created a precedent or even tradition of foreign (albeit non-Anglophone¹⁹) mining scholarship in both Spain and Portugal, which has been continued through the Casa de Velázquez—the French school in Madrid—as well as the German Archaeological Institute in Madrid (and formerly also in Lisboa). Institutional interest in mining from both the French and German side has served, in part, to maintain funding and support for occasional meetings and conferences that bring together scholars across traditional political divides. Both institutes hold conferences that have helped to create and maintain broader communication networks among scholars—Spanish, Portuguese, and foreign alike—though the absence of Anglophone scholars working on this subject is still notable.

Despite these open communication networks, however, most scholarship remains locally and regionally focused, divided along modern political borders rather than ancient mining regions (conceived of either by the geographical distribution of the ores or by ancient political boundaries). Nevertheless, Domergue's published work as well as that of his students and collaborators has continued to promote interdisciplinary, archaeometric, and especially archaeological studies of Roman mines and their products. His legacy will be long lasting in studies of Iberian mining, even as new archaeological research adds to the corpus of known mining sites that he was instrumental in producing.

¹⁹ The major exception to this is Jonathan Edmondson's work on mining in Lusitania (1987).

Scientific and Archaeometric Contributions: Tracing the Scale of Mining and Provenience of Objects

Alongside these major contributions from classical archaeology and ancient history, there has also been a strong tradition of scholarship on mining and metallurgy using scientific perspectives and techniques since the 1970s. Scholarship in this vein—often published in scientific rather than archaeological journals—has contributed to our understanding of the techniques and scale of metallurgy, as well as the distribution of metal objects from Iberia in antiquity. It was in this period that the use of archaeometric techniques such as lead isotope analysis²⁰ and X-ray fluorescence, among others, became widespread in of studies mining and metallurgy. This expanded the possibilities for analysis and spurred interest in these fields. Much of the research that emerged from this decade onwards was specifically focused on the technological processes used in mining and metallurgy, and an attempt to understand these processes through the application of scientific methods (Killick & Fenn 2012: 559–561). The use of these methods and the questions asked were, of course, driven by and a part of the broader trends in archaeology in the processualist paradigm (Trigger 2006: 386–483).

Scientific analyses—both in archaeology and also in other disciplines including environmental science and chemical geology—have helped to clarify ancient processes

²⁰ Lead isotope analysis (LIA), developed in the early 1960s, compares the isotopic ratios of the four stable lead isotopes that can be measured in metal objects, paints, pigments, and deposits in ice cores and peat bogs with those of known isotopic ore signatures from particular regions (Budd et al. 1996: 168). The method, though not without its uncertainties and drawbacks, is valuable in ascertaining the proveniences of archaeological metals that contain traces of lead. These metals include not only lead itself, but also lead traces from silver extracted from argentiferous lead ores through a process called cupellation, and lead traces from copper objects smelted from impure copper ores (Pollard et al. 2007). Although the use of LIA was hotly disputed during the 1980s and into the 1990s (Wilson & Pollard 2001; Stos-Gale 1989; Budd et al. 1995), advances in the technique have lead to increasing accuracy and confidence in the data in more recent studies. When lead isotopic signatures show ambiguous origin, copper isotope analysis can be used with LIA in order to more precisely provenience copper artifacts.

for smelting ore and producing objects (e.g., Craddock 1995), estimate the scale of mining during different periods in antiquity in Iberia, and to identify the source of metals used in ingots, coins, and other metal objects and subsidiary products. This has been possible, in part, because the database of lead isotope signatures for the Iberian Peninsula has been greatly expanded in recent years. Writing in 2004, J.F. Santos Zaldegui *et. al* noted, "...in spite of their obvious significance, such isotope data[bases] are remarkably scarce for the Spanish archaeological realms" (2004: 625). The published research of this group sought to rectify this problem with respect to the Alcudia Valley in southern Spain, and other studies have, likewise, attempted to record the lead isotopic signatures of Spanish ores (Klein et al. 2004; Klein et al. 2009; Marcoux 1998; Pomies et al. 1998; Díaz-Somoano et al. 2007). These studies are invaluable, since lead-containing objects can only be provenienced accurately when there is a sufficient database of signatures in a region for proper comparison. As a result of this foundational work, archaeometric studies of coins, ingots, and pigments have begun to help us reconstruct the distribution of ore and metal products from Iberian mines to distant places in the Roman Empire, a topic discussed in detail in Chapter 8.

Many of the recent lead isotope analyses demonstrate the high level of pollution that can be traced to mining in classical antiquity. This has been done through analyses of Greenland ice cores and European peat bogs, with the remarkable results mentioned in the previous chapter. Specifically, the period from 500 BCE to 300 CE revealed lead concentrations in the Greenland ice cores four times higher than normal levels before or after. As many as 80,000 metric tons of lead and silver were mined per year during the early Roman period in the 1st century CE (Hong et al. 1994: 1841–1842). The findings of

this initial study paved the way for the 1997 LIA work conducted to provenience this lead, which indicated that around 70% of the pollution could be traced to the Riotinto region of southwest Spain between 366 BCE and 36 CE. Lead from Cartagena and Mazarrón in southeast Spain was also a large contributor to heavy metal pollution (Rosman et al. 1997: 3413–3416). Analyses of bogs in both Spain and France have yielded results that corroborate this information (Martínez Cortiza et al. 2002: 34; Alfonso et al. 2001: 3602), again pointing to the massive scale of mining even in the earliest stages of Roman rule in Spain and Portugal (and indeed the increase in mining activity even prior to Roman conquest).

Transcending Disciplinary Divides and Bridging Disparate Datasets

While it is clear that aspects of ancient mining have long been investigated under the auspices of diverse humanities, social sciences, and science disciplines, the topic has rarely been studied from an integrated, interdisciplinary perspective. The fragmented nature of disciplinary traditions, data collection, and research dissemination has hindered innovative, cross-disciplinary fertilization between these rich fields. First, there is an entrenched separation between academic traditions in Anglophone academia and those in the Iberian Peninsula and France, which arise not only from linguistic differences but also from deep separations in avenues of communication and publication.²¹ This has resulted in largely independent traditions of studying Roman mining and the processes surrounding Roman imperialism in each of these academic spheres. Further, the tendency

²¹ These separations are not only linguistic but based on the history of archaeology in each geographic locale. On the history of archaeology in Spain and Portugal, and especially the impacts of the dictatorships of Franco and Salazar on archaeological practice, see: Díaz-Andreu 1997; Díaz-Andreu 1995; Díaz-Andreu 1994; Díaz-Andreu & Ramírez Sánchez 2004; Lillios 1995; González-Ruibal 2007; González-Ruibal 2011. On the history of archaeology from an Anglophone perspective see: Trigger 2006.

towards regional or indeed local specialization in many parts of both Spain and Portugal has often hindered comparative research and broad-scale analyses that consider the Iberian Peninsula or the Roman Empire as a whole.²² Finally, temporal specialization on both sides of the Atlantic—especially divisions between studies of the prehistoric and classical Mediterranean world—has impeded diachronic examination of both mining in Iberia and elsewhere. Those studying Bronze and Iron Age mining are, in America, often housed in anthropology departments, while those studying the Roman period are much more likely to be appointed in departments of classics. Similarly, prehistorians and those who study the Roman period are institutionally separate in Spain and Portugal, and Phoenician and Punic studies normally fall within the purview of prehistory. These divisions have the effect of impeding studies that span the Iron Age-Roman “divide” and therefore often prevent meaningful analysis of the social and economic impacts of the Roman conquest of Iberia, and particularly of its mining landscapes.

In bridging these various divides and putting the diverse information derived from disparate disciplines and academic spheres into conversation, it becomes clear that we already know a great deal about the locations, methods, and chronology of mineral extraction throughout the Roman Empire and especially in Iberia. Further, the enormous scale of metal extraction in classical antiquity in Iberia as well as the Mediterranean-wide distribution networks of metal ores and products derived from them are now well understood.

The way forward is to integrate this information, and embed it into a larger discussion of Roman imperialism and its localized effects. Nowhere is a study of mining

²² There are many exceptions to this trend. See especially the work of Domergue, Pérez Macías, Sanchez Palencia, and Orejas, among others.

and empire better undertaken than in the Iberian Peninsula, both because of the historical significance of mining there and because of the existence of rich and diverse data that has gone largely unexamined in studies of Roman imperialism. In the following section, I discuss the unique contributions that a socially oriented study of mining in Iberia can bring to our understanding of the impacts of Roman conquest on the people and landscapes of the Iberian Peninsula.

A Social Approach to Iberia's Industrial Past: Mining Communities

Few, I suspect, would argue against the connection between Roman imperial expansion and a desire to access coveted natural resources, including metals. Increasingly, scholars of the Roman Empire are making use of material evidence to discuss the diverse strategies for extracting resources in the provinces, such as marble and other stones (e.g., Russell 2013; Russell 2009; Sekedat 2012; Virginia 2012; Nogales Basarrate & Beltrán Fortes 2008), for exploiting the many kinds agricultural landscapes in the Roman Empire (e.g., Bowman & Wilson 2013; Fentress & Docter 2003; Blouin 2014), for the exploitation of other resources such as salt, salted fish products, and other marine resources (Marzano 2013), among others (Mattingly & Salmon 2001). The present study of the mining industry in Roman Iberia, like these works, has the potential to illuminate Roman imperial strategies for the extraction of metals and the contribution of this industry to the Roman economy, an issue I address in more detail in Chapter 8. More specifically, however, the unique combination of extant material, historical, epigraphic, and environmental evidence available to us—if only placed into conversation—has the potential to illuminate the localized social and economic impacts of empire in this corner of the Roman world.

Why does this matter? Scholars of the Roman Empire have grappled for years with how to approach the process of “Romanization.” (e.g., Freeman 1997; Haverfield 1912; Woolf 1998; Woolf 1992; Webster 2001; Versluys 2014; Keay & Terrenato 2001; Mommsen 1885). The earliest works saw the adoption of Roman culture in the provinces as an inevitable, unidirectional civilizing process. In Iberia, in particular, the emergence of Roman cities and infrastructure, numerous *villae*, and the adoption of various funerary customs and the practice of euergetism have come to be seen as signs that Iberia was becoming Roman. Without engaging with the extended history of Romanization—or “beating a dead horse” as Alcock (Mattingly & Alcock 1997) has called it—I believe it is useful to focus on the diverse, local responses to Roman conquest and colonization in different parts of the Roman empire in order to understand the many ways that people experienced imperialism at this time.

Studying the local communities involved in the mining industry, then, can serve as a particularly compelling case study for local responses to the Roman Empire, one which bridges some traditional divides and dichotomies in scholarship on Romanization. For instance, there has long been a focus on elite populations at the expense of understanding the everyday experience of empire by non-elite populations. Mining communities in Roman Iberia were composed primarily of people who, in many respects, are considered “marginal” populations such as poor laborers and slaves. I argue, however, that mining provided a context for the creation of communities composed of people from many walks of life such as Roman imperial officials, members of the Roman army, indigenous populations, and Italian immigrants, in addition to those servile and poor laborers. Participation in the mining industry is increasingly understood as an

opportunity for upward mobility—at least for some—within emerging economic and social spheres of Roman Iberia. A study of mining in Roman Iberia, then, can illuminate the ways that people from diverse backgrounds came together—by choice and by force—to support the mining industry, and the social impacts that this had on the formation and transformation of communities in mining landscapes. In effect, this provides an avenue for a more nuanced study than simply looking at elites vs. non-elites or Romans vs. indigenous.

In addition to this, studying the industrial landscapes in which mining communities lived and worked has the potential to link scholarship on urban and rural landscapes. In Roman Iberia, there has been an overwhelming focus on the development of Roman cities, with their theatres, amphitheaters, baths, imperial *fora*, aqueducts, and other architectural features that are often considered to be part of an “urban package” demonstrative of Roman imperial power. As the example of Potosí well attests, the transformation of mining settlements in otherwise rural landscapes can lead to the creation of large, well connected centers. And even when urban centers do not emerge in mining landscapes, these landscapes often become connected to urban centers through economic and social ties. Mining communities are often highly dependent upon their connections to nearby urban centers, not only to facilitate transportation of metal ore out of mining districts, but also to facilitate the movement of food and other necessary material goods into these locales. Thus, a study of mining landscapes illuminates the ways that imperial power could impact local communities who lived outside the urban setting, but who were nevertheless connected with social and economic networks created and reinforced by the Roman power.

How, then, can we go about studying mining communities? In the following chapter, I propose a multi-scalar approach to understanding mining communities thorough an investigation of their daily practices and interactions attested by archaeological, epigraphic, and historical documentation.

Conclusions

This chapter began by highlighting the frequent connection between the formation of empire and the extraction of natural resources in world history. Across time and space, foreign colonizers and international corporations alike have traveled to near and far corners of the earth, annexing territory and gaining control of natural resources for financial gain. Metals, in particular, have often played an important role in colonial and imperial endeavors. It follows that studying the communities involved in mining is one way to understand the local, human impacts of conquest and subsequent political and economic domination of metal-rich landscapes. The Iberian Peninsula is an ideal place in which to interrogate the complex relationship between empire, metal extraction, and local communities. There is strong connection between various episodes of colonization—and especially the Roman instance—with the extraction of metals, a relationship frequently addressed by contemporary historians and their ancient counterparts. I argue, however, that the precise impacts of this relationship are frequently left unquestioned. The aim of this dissertation, then, is to examine the impact of Roman conquest and colonization on local communities who lived and labored in the metal rich landscapes of the Iberian Peninsula. In the following chapter, I establish a theoretical framework for conceiving of mining communities and a multi-scalar, practiced-based methodology for understanding the formation and transformation of mining communities through archaeological inquiry.



Figure 2.1 Seventeenth Century German map, which shows Potosi in a prominent position. ("Ebbe und die Fluth auff einer Flachen Landt-Karten fůrgesteltt," Eberhard Werner Happel, *Mundus mirabilis tripartitus*, vol. 1, Ulm, 1687.) (copyright John Carter Brown Library).

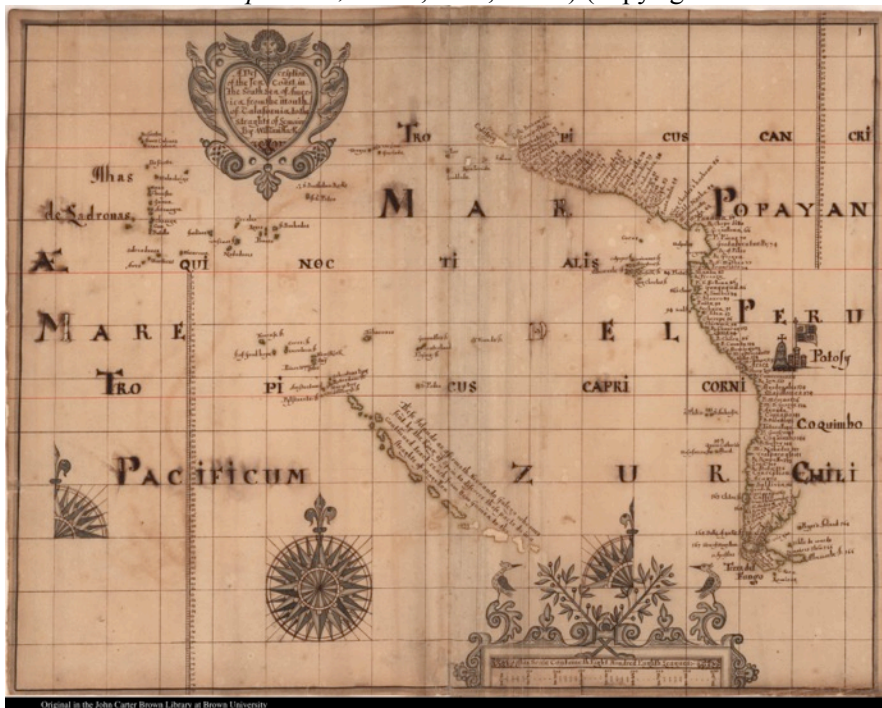


Figure 2.2 Map by British cartographer William Hack from a collection of Spanish charts seized in 1681 from a Spanish ship, Rosario. (London, 1698). (coyright John Carter Brown Library).

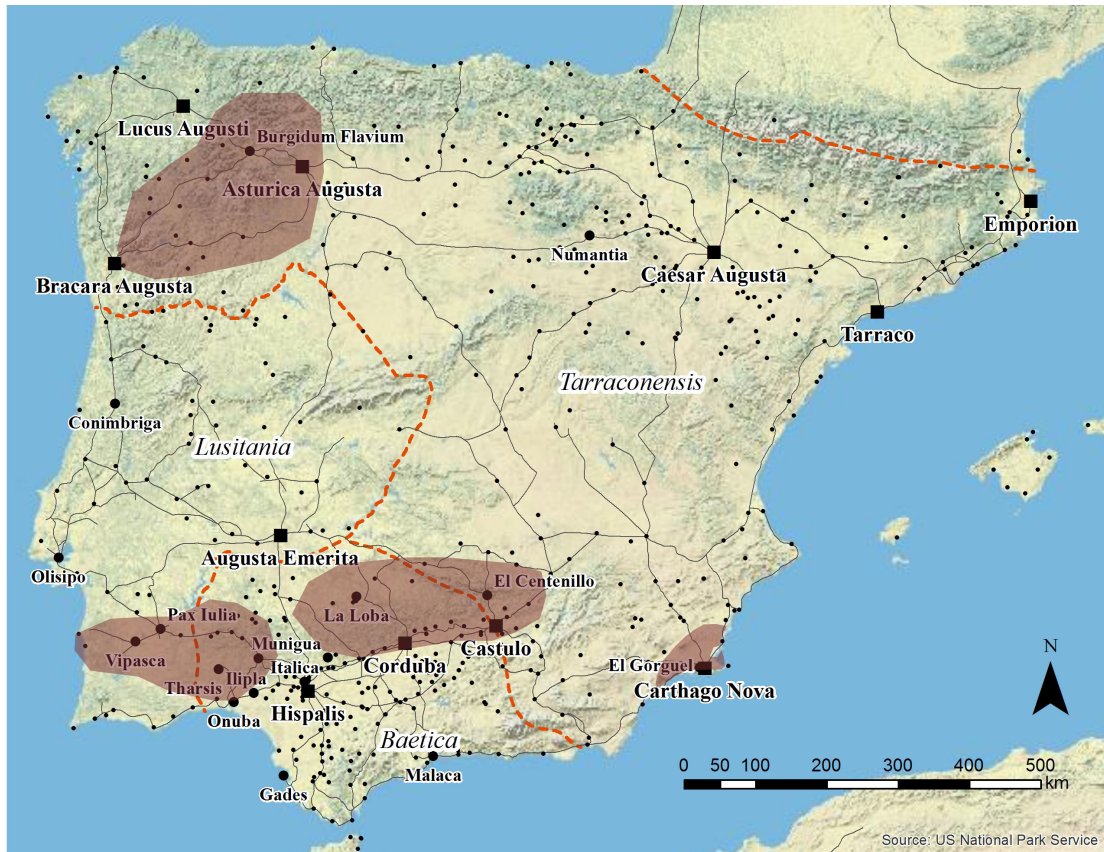


Figure 2.3 Highlighted are the four main mining centers in the Iberian Peninsula during the period of Roman domination. This map shows the location of major mines, cities, and roads within the provincial divisions of Hispania established under Augustus (map by author).

CHAPTER 3

THE ARCHAEOLOGY OF MINING COMMUNITIES

Quintus Artulus
Four Years Old
Let the Ground Be Light Upon You

Q. Artulus
an(n)oru(m) IIII si(t)
[tibi] te(r)ra le[vis]

-Tombstone of Quintus Artulus, a young miner, 1st century CE²³

Around 2000 years ago, a four-year-old boy named Quintus Artulus died and was buried somewhere in *Hispania Citerior* near the modern day town of Baños de la Encina (Jaén, Andalucía, Spain). His death was commemorated with a modest tombstone inscribed with this text in Latin and a relief carving of his small figure wearing a miner's tunic, carrying in one hand a chisel and in the other a basket woven from local esparto grass for hauling ore (Figure 3.1). Through this small piece of material evidence, we learn about the life of one young child who labored and died in a mining district in Roman Spain. The complexity of the carving on his tombstone suggests that he was buried with great care and at some expense. We know that his life and work were valued and his death mourned, but the tombstone of Quintus Artulus leaves us with more questions than answers.

How many children worked in the mines? How many slaves? How many women? How many paid laborers? Criminals? How did these people come to be miners—by choice or by force? What was their relationship with Roman imperial officials, the

²³ See: *CIL* II 3258, *HE* 9397. Currently on display at the Museo Arqueológico Nacional in Madrid.

Roman army, or merchants who transported the products of their labors? How did those involved in mining contribute to the Roman economy, and how did this impact their daily lives? In this chapter, I propose a method for answering these questions and assessing the social and economic impacts of mining through an approach based in the anthropology and archaeology of communities. I then outline ways that we can examine mining communities in Roman Iberia through archaeological investigations of industrial landscapes, settlements and households, labor and technology, and economic interactions.

Extracting the Social: Intersections between the Archaeology of Iberian Mining and the Archaeology of Communities

An interdisciplinary, synthetic study of mining in Roman Iberia can make a significant contribution to studies of Roman imperialism, to investigations of ancient labor organization and economic strategies, and to studies of colonial interaction of Roman and indigenous populations. These themes intersect with investigations of slavery, gender, and migration. Despite disparate and sometimes incongruous datasets for various metal-rich regions in Spain and Portugal, an approach based on social interaction through the concept of communities provides a new lens with which to reimagine and illuminate this data in a meaningful way. It gives an opportunity to build from narrowly focused studies of the archaeology of the mines themselves towards a more comprehensive archaeology of mining that considers this industry in its wider social, cultural, and economic context.

In the previous chapter, I discussed the problematic—or at least incomplete—manner in which the Roman conquest and incorporation of the local inhabitants of the Iberian Peninsula into the Roman Empire have been studied traditionally. The

overwhelming focus on all things urban and elite has left vast holes in our understanding of the social and economic interactions in the rural landscapes of Spain and Portugal after Roman conquest that have only begun to be filled. A more recent scholarly focus on rural landscapes, their inhabitants, and the economic activities that took place in them during the Iron Age, especially in the context of Phoenician and Punic colonization and trade (e.g. Aubet 2001; Aubet 2010; van Dommelen 2005; Bierling & Gitin 2002), points to the potential significance of evaluating the role of these oft-forgotten people and places in understanding the impact of Roman imperial domination in Iberia. A study of mining in Roman Spain and Portugal based on questions about social and economic change provides an opportunity to expand and refine our understanding of Roman Iberia, especially in non-elite and non-urban contexts.

Although many productive activities took place in the rural landscapes of the Iberian Peninsula, from agriculture to ceramic production, the mining industry is ideally poised to help us better understand Roman imperial economic strategies in this region, as well as their lasting social and physical impacts on local communities and landscapes. The proliferation of mining and metallurgical studies in the Iberian Peninsula have demonstrated the antiquity and scale of mining in many parts of Spain and Portugal, and especially the dramatic increase in mining activity after Roman conquest in the northwest as well as the southern portion of the peninsula from the Iberian Pyrite Belt in the southwest to Cartagena on the Mediterranean coast, regions I will examine closely in the following chapters. Although data from these places—ranging from archaeological to historical to archaeometric—is abundant, studies have often been relegated to the pages of regional or specialized scientific journals. These data have thus not been used to their

full potential in studies of Roman imperialism and indigenous/colonial social and economic interaction. In short, social and cultural interpretations of this vast dataset are lacking.

The approach I offer draws inspiration from two main sources: the archaeology of communities broadly conceptualized, and anthropological and ethnographic studies of mining communities in particular. I show how the interactions that occurred in the processes and practices of daily life in the context of mining in Roman Iberia could have incited the transformation of existing communities and formation of new ones. Further, these interactions can be detected through the archaeological, archaeometric, historical, and epigraphic sources that are already available to us, but have not yet been conceptualized in this way.

Mining communities, along with other communities involved in extractive and destructive processes such as quarrying, were arguably more likely than any other kind of community to engage in daily practices and interactions that left material traces. By definition, these groups were brought together through physical, irreversible and often large-scale interactions with their local landscapes that resulted in material footprints and scars still visible today. From the marks of chisels and hammers on the walls of underground mining shafts and galleries, to the enormous pits of opencast mines, to the tons of slag (smelting refuse) discarded around mines, to the lingering effects of pollution and deforestation in mining districts, physical remnants of ancient mining are conspicuous to this day. It is worth noting that the condition of many surviving shaft-and-gallery mines in Iberia below the water table has also meant that organic artifacts from inside underground mines such as ropes, baskets (Figure 3.2), wooden waterwheels,

miners' sandals (Figure 3.3) have been preserved. Many mines also preserve non-organic artifacts including hammers, chisels, nails, stone tools, and metal buckets. Understanding these tools and technologies in context helps reconstruct patterns of labor organization and ways that people in the mines would have interacted with one another. In contrast to mining, other types of economic activities such as ceramic production, agriculture, and pastoralism that could also have brought communities together rarely leave as obvious archaeological or environmental footprints.²⁴

In addition to the material traces of mining itself, the location of many mines in remote or undeveloped areas has meant that often the archaeological traces of settlements, houses, cemeteries, roads, aqueducts, and other infrastructure are better preserved than those elements in their urban counterparts, many of which have been built and rebuilt into the present day.²⁵ In the Roman mining district of Carthago Nova (modern Cartagena, Spain), for instance, remarkable archaeological evidence is available from the rural landscapes that have not been densely settled in contemporary times (e.g., Antolinos Marín et al. 2010; Ruiz Valderas 1995). On the other hand, the city of Cartagena itself is a bustling modern town where archaeological remains are often hidden and inaccessible, many meters underground. Even the monumental Roman theater was

²⁴ This is not to say such activities do not leave traces; studies of ancient agriculture and pastoralism have become ever more common in recent years, but these activities are less visible to the naked and untrained eye, and often require advanced archaeometric techniques to properly be detected (for significant Mediterranean case studies, see, for example: Rathbone 1981; Barker et al. 1991; Forbes 1995; Gilbertson et al. 2000; Mientjes 2002; Koster and Chang 2009; Burke 2010; Arbuckle 2012; Bowman and Wilson 2013; Halstead 2013; Tereso et al. 2013; Orengo et al. 2014; Hammer 2014; Marston and Miller 2014).

²⁵ The clear exceptions to this are Roman mining districts that continued to be mined in the early modern period, contemporary past, and up to the present day. Many of the discoveries of Roman remains at mines were not made by archaeologists but by engineers engaged in mining for more ore. In these cases, archaeological remains are sometimes completely obliterated. This is more common in districts like Riotinto (southwest Spain) where the geological diversity of metals means that different metals have been targeted at different times using different technologies. In antiquity, Romans mined for silver in shaft and gallery tunnels, which have been discovered in the process of large opencast mining for copper in the 18th and 19th centuries.

not discovered until the 1990s, when construction in a densely populated neighborhood finally revealed the remains of theater seats under houses (Ramallo Asensio & Ruiz Valderas 2003). The archaeological investigation of places around the mines allows us to examine activities peripheral to actual mining but central to everyday life in mining communities such as cooking, domestic religion, funerary ritual, trade and transport, farming and pastoralism, among others. Finally, while the labors of daily life in mining landscapes necessitated social interaction of many types at a local level, they also connected rural populations to larger regional and imperial networks through the use and trade of the materials they extracted—networks that are also detectable archaeologically through examinations of trade routes of supplies, food, and the metal objects or ore itself.

In the following pages, I establish a working definition of mining communities and identify four “settings” in which the interactions that contributed to the formation of mining communities took place: 1) rural and industrial landscapes, 2) settlement and household, 3) technology and labor, and 4) local, regional, and imperial economies. I explain the use and scope of these analytical categories that I use to shed light on mining communities in Roman Iberia in the next chapters.

The Archaeology of Communities

The term “community” has the advantage of being intuitively understood and rarely problematized. Many scholars recognize the natural tendency for groups of people to form communities based on their own experiences and social interactions. As a result, they seem to use “community” almost colloquially to refer to certain kinds of groups with physical, cultural, or intellectual bonds without a need to define it further. There is a benefit, however, to establishing a working definition of “community” that is

anthropologically rooted and archaeologically traceable.²⁶ In doing so, community becomes less of an essentialist concept, and more of an analytical framework that can be used to better understand the social interactions of past people.

The concept of communities does not appear frequently in works on Mediterranean and classical archaeology, though important and theoretically informed exceptions to this rule can be found. These come in two categories: first, scholarship that is engaged with wider debates in anthropological archaeology about community formation, and second, scholarship tied more closely to work both in archaeology and ethnography on peasant communities and rural landscapes.²⁷

Of particular note in this first category—although hidden within a much larger BAR volume—are the contributions to the proceedings from a 2003 conference for Italian archaeology on the subject “Communities and Settlements from the Neolithic to the Early Medieval Period” (Attema et al. 2005), which occurred soon after the Yaeger and Canuto volume discussed below came out (Canuto & Yaeger 2000). In a section on the archaeologies of community and landscape, a broad range of papers together emphasize the role of practices and daily experiences as well as landscape and spatial organization in community formation (van Dommelen et al. 2005). These papers

²⁶ Scholars have critiqued the positivist and vague definitions often utilized. Early on, Stacey questioned whether the concept “refers to a useful abstraction at all” (Stacey 1969), while Cohen later lamented the lack of theoretical engagement with the “community” in the social sciences generally speaking (Cohen 1984: 11). Even more recently, van Dommelen and colleagues wrote that “in both popular and academic usage, the term ‘community’ seems hopelessly vague, diluted and used to describe diverse entities at many different scales and levels of meaning” (van Dommelen et al. 2005: 55). It is in response to such critiques that a solid definition of community is elaborated here.

²⁷ A third strain of community studies can be found in scholarship on the development of religious communities, which tend to rely heavily on the written record. Nicholas Howe’s edited volume, *Visions of Community in the Pre-Modern World*, for example, highlights different ways that Christianity and Islam shaped communities through visual material culture and institutions (Howe 2002); despite Howe’s mention of ‘imagined communities’ in his introduction, many of the chapters tend to view the formation of religious communities as a foregone conclusion, focusing more on material or literary evidence for their existence than how these could be mechanisms for community formation.

document a wide range of Italian case studies that focus on ways to examine communities through funerary evidence (Riva 2005; Hodos 2005; Cuzzo 2005; van Rossum 2005), festivals (Smith 2005), ethnographically-attested rural settlements and landscapes (Mientges 2005), and settlements, and material culture (Perkins 2005). Aside from this collected work using only Italian case studies, Mac Sweeney's more recent volume examining community and community identity in Aphrodisias and Beycesultan (Turkey) not only provides a useful review of community studies through the decades, but skillfully employs anthropological concepts to elaborate nuanced ideas about the formation of community identity in western Anatolia based on archaeological evidence (Mac Sweeney 2011). Despite these examples, Gerritsen's recent assessment that, in European archaeology, "community discourses have only haphazardly entered settlement studies" (Gerritsen 2006) is appropriate.

In the second category are studies that engage with the idea of "peasant communities" primarily situated in rural landscapes, a concept which has been elaborated in anthropological studies both in the Mediterranean and many other parts of the world (see: Kearney 1996). Recently, in *Constructing Communities in the Late Roman Countryside*, historian Cam Grey has written of peasant communities through this lens, discussing the ways that families and households managed their primarily agrarian lives within the context of the politics and economics of the later Roman Empire (Grey 2011). Archaeologists have also engaged with peasant communities in rural contexts, especially the Roman Peasant Project (Bowes 2010; Ghisleni et al. 2011) which investigated diet, economies, and land use in the late Roman Republic and late antiquity in Italy. While these projects are more recent, there is a relatively long and diverse history of studying

peasant communities in the Mediterranean (e.g., Dyson 2003; Dyson 1992; Pettegrew 2001; van Dommelen & Gómez Bellard 2008), most of which target rural agricultural communities. However, such anthropologically informed work is by no means a universal in Mediterranean or classical archaeology.

In contrast to the Mediterranean, there is a consistent—if underrepresented and under-read—body of literature on the archaeology of communities in other areas of the world that has valuable cross-cultural applications. Two key volumes on the subject of community include *The Archaeology of Communities: A New World Perspective*, edited by Marcello A. Canuto and Jason Yaeger (2000) and the more recent, *The Social Construction of Communities: Agency, Structure, and Identity in the Prehispanic Southwest*, edited by Mark D. Varien and James M. Potter (2008). While both works rely explicitly on archaeological examples from the New World, each propose new, parallel definitions of “community” that advance our theoretical and methodological understanding of the concept for use in archaeological investigation of other regions and cultures.

In New World archaeology, there has been a long history of studying community in the context of archaeological surveys that assessed settlement patterns beginning with Gordon Willey’s famous Viru Valley survey project in Peru (1953; see also: Ashmore 2007). Early work in this region defined communities simply by the spatial nearness of sites or settlement clusters. Inhabitants of such settlements were assumed to have formed community groups because of the face-to-face interactions that necessarily took place as a result of their physical proximity (Murdock 1949: 79). This interpretation took the physical closeness of sites and the similarities of materials found in them as evidence of

the presence of a community group that was socially significant to the inhabitants of such places. The clear problem here is that there is not always a direct correlation between “etically defined patterns in the material record and emically meaningful groups” (Yaeger & Canuto 2000: 9). In other words, just because archaeologists in the present believe they can identify a community through common material culture (etic) does not mean that a community necessarily existed for those who produced and used that very material in the past (emic). Varien and Potter provide one solution to this. While acknowledging that, at least in the southwestern United States, the available data does lend itself well to studying settlement patterns, they suggest that archaeologists should take data of this variety an intellectual step further. They write, “the spatial propinquity of settlement does not produce any set type of interaction...the nature of that interaction and how it leads to the social production of communities is the empirical problem that archaeologists should be trying to solve” (Varien & Potter 2008b: 3). Significantly, the focus becomes the *how* and *why* of social interaction; there is no longer a one-to-one correlation between material patterns and the formation of community groups.

A second great barrier to conceiving of past communities is that they have often been conceptualized as static and unchanging. The idea of the “natural community” dominates earlier scholarship, in which the understanding of community was drawn from ethnographic studies of groups at moments in time and sociological studies of urban groups (Suttles 1972). Natural community has been defined as “internally homogeneous, externally bounded, and characterized by a collective consciousness shared by all affiliates” (Isbell 2000: 243). Isbell suggests that this problematic definition of communities was shaped by ethnographic work beginning in the 1930s and extending

into the 1960s. Participant observation during constrained periods in physically isolated places caused many ethnographers to conceive of community groups as stable, consistent, unchanging, and divorced from their larger regional contexts (Isbell 2000: 245–248). Of course, these interpretations were shaped more by the manner of observation than the reality of the situation on the ground. Cross-pollination with writing in sociology further solidified anthropological perspectives on natural communities from at least the 1940s (Suttles 1972: 9). Borrowing from sociologists, anthropologist George Murdock suggested that “community and the nuclear family are the only social groups that are genuinely universal. They occur in every known human society, and both are also found in germinal form on a sub-human level” (Murdock 1949: 79). That human communities were considered analogous to natural communities seen in the plant and animal kingdoms (Suttles 1972: 13–16) is troubling; human agency and individual decision making are stripped from the process of community formation in this conception of “natural communities.” The centrality of human agency to community formation becomes especially important in culture contact situations like the Roman colonization of Iberia, where multiple, competing actors came together and individuals had to negotiate how they would fit into new, emerging social formations.

These problems began to change with the advent of the concept of the “imagined community” popularized by Benedict Anderson in his 1983 work on the roots of nationalism (Anderson 2006 [1983]) as well as Anthony Cohen’s concept of the “symbolically constructed community” (Cohen 1984). While Cohen’s work has not often been incorporated into archaeological studies (though see van Dommelen et al. 2005; Mac Sweeney 2011) the way that Anderson’s legacy has, his anthropological

investigation de-emphasized the village or geographical setting of community in favor of recognizing the symbolic boundaries of communities formed by collective consciousness and interaction. He wrote:

This consciousness of community, then, encapsulated in perception of its boundaries, boundaries which are themselves largely constituted by people in interaction. It is in part this process, the symbolic constitution of boundaries, that is referred to in the title of this book. But, in addition to recognizing the symbolic constituents of community consciousness, we also have to reveal the essentially symbolic nature of the idea of community itself, again essentially enshrined in the concept of boundary (Cohen 1984: 13–14).

Cohen's work brought the idea of community away from structuralist interpretations, focusing on interaction and process as well as understanding "community" as a relational idea, where community members understood their own group in contrast to others.

Contrary to the "natural community" and similar to the "symbolic community," the "imagined community" was envisioned as a dynamic, impermanent social construction. While Anderson intended his vision of community to apply to the modern nation state, where mass media and communication play central roles in the formation of communities, aspects of his ideas have been adapted to archaeology and the more remote past. Isbell, who advocates this re-conception of community among archaeologists, emphasizes that the idea of a natural community is an ideal type, whereas communities seen in the real world are made up of a "correspondence between a socially interacting group, a bounded territory, economy, politics, reproductive pool, intergenerational education, desires and sentiments," (Isbell 2000: 249). This rather nebulous definition is useful in the sense that it emphasizes the multiple elements that can shape perceptions of community in the past, and allows for human agency and action within the bounds of certain structures, such as territory. It acknowledges that the idea of community is to a large degree a cognitive phenomenon: "the imagined community can exist only in the

individual mind of each person doing the imagining” (Varien & Potter 2008b: 4). On the other hand, it is hard to pinpoint precise archaeological, material correlates to these more abstract ideas that can help us reconstruct the way that people imagined their communities in the past.²⁸ Isbell notes that the idea of natural community has persisted in archaeological research simply because it seems easier to study materially than the imagined community; many continue to liken sites to communities with lists of attributes and material correlates (2000: 252). Archaeologists must find a way to make more nuanced interpretations of archaeological data, and I argue that the way forward begins with proposing definition of community that can be related to the archaeological record in a direct way.

Indeed, the new definitions of community proposed by Yaeger and Canuto and Varien and Potter significantly advance the study of communities because they avoid many of the scholarly pitfalls outlined above. Their definitions are no longer based solely on the socio-spatial units of settlements and settlement clusters. Nor do they espouse the commonly held assumptions that communities are conservative, unchanging units of analysis based on kingship, ethnicity, occupation, or religion. Rather, Yaeger and Canuto propose that the community is formed by the ever-changing combination of people, place, and premise:

[Community] is an ever-emergent social institution that generates and is generated by suprahousehold interactions that are structured and synchronized by a set of places within

²⁸ When historical documents and inscriptions are available, these can sometimes help archaeologists better understand how people conceived of their role in communities in the absence of direct archaeological evidence. But over reliance on documents can be problematic. In the Roman world, only those of a certain status could erect honorific monuments, tombstones, and public building projects bearing inscriptions. Even fewer could write more lengthy literary and historical documents. Relying on these kinds of texts can reinforce the scholarly bias towards studying elites in Classical archaeology, and prevent marginal, poor, and subaltern populations from having a voice in how we understand the communities that they were a part of in the past.

a particular span of time. Daily interactions rely on and, in turn, develop shared premises or understandings, which can be mobilized in the development of common community identities (Yaeger & Canuto 2000: 5).

Similarly, Varien and Potter envision communities as dynamic social groups in which “individuals, as strategic actors, exhibit agency and construct their social identities” (Varien & Potter 2008b: 1) within the confines of certain structures. Like Yaeger and Canuto, Varien and Potter rely on concepts drawn from practice theory and structuration theory (Bourdieu 1980; Bourdieu 1977; Giddens 1984), which provide useful theoretical frameworks for studying daily life and habitual actions.

Drawing from these definitions, I consider communities to be dynamic groups of people brought together over time through the repeated interactions of their daily lives, interactions that happen within the confines and limits of certain physical, geographical, and/or conceptual structures. Further, these interactions form the basis for social understandings that can lead to the formation of common group identities. Breaking somewhat from previous work on the archaeology of communities, I contend that meaningful interactions can involve multiple actors including people and things. Beyond person-to-person interactions, the interactions of people with places and objects can also shape community. This is especially true when people come into contact with dynamic places and movable objects that, in turn, come into contact with other people. In this way, communities can become larger than the small groups of people who engage in daily, face-to-face interaction. Communities need not be imagined exclusively as people living together in a settlement or village, but can be composed of those engaged in interactions with each other, objects, and landscapes beyond the confines of settlements or settlement clusters. Further, while many places can function as a structuring element or setting rather than as actors in community formation, certain places including dynamic, mining

landscapes could have functioned more as actors in the formation of community. This is because of the material way that people engaged with them and because of their physical instability, impermanence, and unpredictability.²⁹ After all, in certain cultural contexts, landscapes are imagined to have lives of their own.³⁰ Here, I draw more from Ian Hodder's entanglement theory than from the anthropology of communities. He writes:

I justify the separation of humans as a particular type of things because I am interested in how the human dependence on things leads to an entanglement between humans and things that has implications for the ways in which we have evolved and for the ways in which we live in societies today (Hodder 2012: 10).

In sum, I do not believe humans, places, and objects have equal roles to play in the formation of community. I am not going so far as to give inanimate things complete agency, but I contend that dynamic places and objects can function as actors in the formation of communities in certain cultural contexts, and we need to keep this in mind when searching for archaeological evidence for social interactions.

This definition provides the most fruitful avenue for archaeological research on communities in Mediterranean and classical archaeology, because it helps bridge significant boundaries in current scholarship, especially those found in writing on culture contact and colonialism in these sub-disciplines. First, it provides a useful framework with which to study the often-debated and criticized concept of identity within the more socially meaningful context of community. Second, this definition allows the concept of community to function at multiple scales of analysis both in terms of time and space.

²⁹ Mines across time and space have been considered dangerous places, prone to disasters such as erosion and collapse that make the mining profession a dangerous one.

³⁰ One particularly vivid example of this is an ethnographic case study from Bolivia, where June Nash illustrated the ways that indigenous miners maintain offering shrines to the indigenous deity Supay in their underground tin mines, believing that the deity and his association with the underworld (and the underground) needs to be appeased for their continued safety as they labor in underground tunnels (Nash 1979: 122).

Diachronic, multi-scalar studies, I argue, are key to understanding cultural interaction, imperialism, and colonialism. And finally, the focus on interactions, practices, and human agency I use here allows us to examine the interactions of daily life through their surviving material correlates, which provides significant flexibility in terms of what kinds of archaeological data can be applicable. These foci also ensure that analyses recognize the agency of both colonizers and colonized in culture-contact situations without underrepresenting the actions of either group, and without presupposing that there are only two socially and politically meaningful groups in culture contact situations.

Identity

Although the term “identity” comes with a great deal of scholarly baggage—just the kind that “community” seems to bypass—the definitions outlined here show how the concepts of identity and community are not mutually exclusive. Cohen provides a useful conceptual link between the two calling community a “resource and repository of meaning, and a referent for identity” and going so far as to say “community is the compass of individual identity” (Cohen 1984: 119, 110).

Studying community archaeologically can provide a useful methodological link between archaeological data and our conceptual analysis of “identity,” essentially bridging the gap that is so often missing in studies of identity that link, for instance, the

production of a specific pottery style to group or even individual identity.³¹ Community is a meaningful category of analysis because it is based on practices and actions that can leave tangible traces. Identity, on the other hand, is much less tangible and more problematic to access because of its situational, fluid, and usually self-conceived nature. Singular definitions of identity are difficult to encounter, though the term is often connected with the similarly nebulous concept of personhood. In the volume, *Archaeology of Identity*, Díaz-Andreu and Lucy emphasize that “identity in the present is fluid and contingent (within certain constraining structures)” and this needs to be considered in our conception of identities in the past (Díaz-Andreu & Lucy 2005: 12). Here, the archaeology of community can function as a middle-range theoretical concept—one that can link data to theory in a straightforward and understandable way. In other words, we can detect communities only by examining data (e.g., archaeological, epigraphic, historical, or scientific data) that provides evidence for social interaction in the past. Only by understanding these social interactions through material evidence can we make informed hypotheses about group and individual identities. Understanding communities functions as the intermediate step between understanding the objective evidence and its relationship to the identity of those who created this evidence.

The very act of being part of a community is often directly connected to how individuals perceive their own identity, or at least aspects of their identity. Therefore, the archaeological study of communities can help us hypothesize about identity on different

³¹ This kind of cultural historical approach is still quite common in archaeology in both Spain and Portugal, where typologies of objects including pottery and metal tools have dominated debates in culture change and cultural identity. The introduction of archaeological theory has come late to the archaeology of historical periods, though it has become more common among the younger generation of scholars who have received their education after the fall of the Franco and Salazar regimes in Spain and Portugal, respectively. This is in part due to patterns of studying abroad in the UK and occasionally the US, where social theory is more commonly used in archaeology, as well as internal changes in academic tradition in each country.

scales and levels, from how community members would have perceived the identity of the group as a whole to their own individual identities in the context of group membership. Of course, people inevitably are a part of multiple, concentric, or even competing communities, and it is important to keep in mind exactly which aspect of identity—and on what scale—we are trying to access when imaging how individuals formed their identities in the past. In studies of the Roman Empire, where questions of shifts in identity among newly-conquered inhabitants of provincial regions have been common for several decades,³² employing this concept of community can produce more nuanced interpretations of the precise impact that “becoming Roman” (to borrow Woolf’s terminology from his 1998 book) had on local populations.

Scales of Time and Space

The archaeology of communities has the potential to successfully bridge archaeological studies at multiple spatial and temporal scales. First, it can connect evidence from different units of analysis, from the household on the small end of the continuum, to regional, and empire-level or international studies at the larger end of the continuum. In early scholarship, face-to-face interaction was imagined as an integral part of community formation, and it is this type of interaction that Varien and Potter emphasize in the context of the Prehispanic southwest. On the other hand, these kinds of communities are also called first-order communities (Lipe 1992: 3; Varien & Potter 2008b: 5–6), implying, of course, that there are higher order communities that operate at

³² Identity was an especially hot topic in Roman archaeology in the 1990s and early 2000s, but is continuing to be used today, often as a keyword in the titles of books. Community, on the other hand, is virtually absent as a concept in Roman archaeology. See, for example: (Roymans 2004; Pitts 2007; Mattingly 2004; van Dommelen & Terrenato 2007; Howgego 2005; Roth 2003; Woolf 1994; García Sanjuán et al. 2008).

different scales. Varien and Potter, for instance, attempt to resolve this issue of scale by situating communities in what they term a “larger community of interests” (Varien & Potter 2008b: 6), or the historical or political structures outside of the first-order community bounds that impact individual groups. While this terminology is unnecessarily complicated, I agree that communities must always be considered in their larger geographical, cultural, and historical/political contexts, which necessitates inquiry on multiple scales. The definition of community I have laid out above accommodates this; communities can expand beyond their geographic locus, and people can be members of multiple, overlapping communities imagined on different scales.

In addition, we must also consider the mobility of people in and out of the geographical locus of certain communities. I argue that, especially in the context of economic activities such as mining, the interactions of people, and also of people with landscapes and material goods could have extended the perception of community membership far beyond the group that engaged in regular, face-to-face interaction. In the context of Roman Iberia, miners themselves could be quite mobile. Mining *procurators*, for instance, who served as administrators for mining districts could be assigned and reassigned to work in mines or quarries in geographically distant Roman provinces (Hirt 2010; Edmondson 1987). Likewise, Italian immigrants are known to have come from Campania in Italy to work in the mines at Carthago Nova (Diodorus Siculus, *History* 5.36; Stefanile 2009). Their names appear on stamped ingots (Figure 3.4). Additionally, epigraphic evidence from gravestones shows that there was great mobility within the Iberian Peninsula, and miners sometimes died far from where they were born (Orejas & Beltrán Ortega 2010; Domergue 1990). For these reasons, the communities that miners

imagined themselves to be a part of could have grown to include traveling merchants and traders, army personnel, and slaves—all of whom would have had varying degrees of face-to-face interaction with each other.

Second, the archaeology of communities, by necessity, examines the formation and reproduction of community over time. On a basic level, archaeology has the potential to shed light on the chronology of interactions that contributed to communal solidarity; this allows us to consider the potentially significant relationship of these patterns of interaction to larger historical and political chronologies or events, including episodes of colonization and other kinds of cultural interaction. Large-scale consideration of material patterns can be correlated with community formation over the *longue durée*.

Archaeological analysis with attention to temporal scales can also help to pinpoint periodic or cyclical activities (Ingold 2012; Gosden 1994), such as the correlation of seasons with work cycles and patterns of labor organization, or the presence of periodic rituals and their associated practices that could have brought communities together.

Finally, at the smallest scale, archaeology—like history known through documentary evidence—can give us a glimpse into specific moments of time, for example, death and the moment of burial or the moment of abandonment of a house. These moments, too, can help us understand continuities or breaks in community practices.

It is worth noting that the very idea of time is culturally and historically contingent; diachronic studies of communities must take this into account. How did community members perceive the relationship of their present and past actions, or others' actions in the more remote past? Were community interactions colored or patterned by culturally specific perceptions of time, or culturally specific understandings of material

things from the past? It is in this context that studies at varied scales of time and space can come together and bolster one another. Material things ranging in scale from landscapes to settlements to houses to objects can accumulate meaning or social memory over time (e.g., Schnapp 1997; Nora 1989; Van Dyke & Alcock 2003; Lillios 1999; Mills & Walker 2008). Archaeology is in the unique position of being able to interrogate the relationship of place or object, repeated or singular action,³³ and the creation of social memories that could incite or reinforce the formation of communities.

Examining evidence at different spatial and temporal scales can prove especially illuminating in community studies where culture contact or colonialism plays a role. Though archaeology can provide data at multiple scales, this kind of data has not been well integrated in many lines of scholarly investigation on colonial interactions. For example, core-periphery models drawn from world systems theory (Wallerstein 1974) have often examined larger scale data to propose unidirectional models of cultural change, in which those in the periphery adopt traits from the dominant core in a process of acculturation. This line of thinking was especially prevalent in the 1970s and 1980s, but studies of the Roman world—whether intentionally drawing from this theoretical body of evidence or not—often continue to perceive cultural and economic changes in the provinces through this lens.

³³ Repeated or singular actions have often been treated separately in memory studies. For example, Connerton in *How Societies Remember*, differentiates between inscribed memory and embodied memory. Inscribed memory can include singular actions, events, and practices such as monuments, texts, and representations; embodied memory can include bodily ritual or behavior (Connerton 1989). Others have treated inscribed memory practices as “materially manifested activities” as opposed to incorporated memory practices, which are impermanent actions that do not necessarily leave material traces. See Van Dyke & Alcock 2003: 3–4 for discussion. In community studies, looking at both kinds of memories can prove useful since they can occur at different time scales.

Because core-periphery studies have tended to ignore the agency of the colonized, some more recent scholarship has instead relied on a postcolonial framework to analyze local situations at a smaller scale, thereby identifying situations in which local populations exhibit agency in their reactions to colonial activities. Although concepts from postcolonial theory have been drawn from the work of scholars outside of archaeology such as critical theorist Homi Bhabha,³⁴ “postcolonial archaeology” has become well established as a theoretical framework in its own right. It has been the subject of both edited volumes and journals, most notably the *Handbook of Postcolonial Archaeology* (Lydon & Rizvi 2010) and a volume of *World Archaeology* edited by Peter van Dommelen called “Postcolonial Archaeologies” (2011). Still, many of these studies are focused on archaeologists as practitioners in the present day avoiding top-down, colonial research. But, as van Dommelen has pointed out, “Much less effort has been spent on alternative and fresh interpretations of the colonial contexts in the past themselves” (2011: 1). It is this latter category that is most helpful in my current analysis.

In Roman archaeology, postcolonial archaeology in this vein has gained some traction, for example, in the volume *Roman Imperialism: Post-Colonial Perspectives* (Webster & Cooper 1996). But explicitly postcolonial studies in Classical and Mediterranean archaeology are still not common. Some scholars, however, are finding increasingly fruitful ways to reinterpret multi-scalar archaeological material from ancient colonial contexts. These include various strategies: examining consumption practices (Dietler 1990; Dietler 2010), mimesis in architectural forms (Jiménez 2010), and hybridization of objects and practices (Tronchetti and Dommelen 2005; Antonaccio

³⁴ For a discussion of the development of postcolonial theory see: Dietler 2010: 50–53.

2010; Jiménez 2011; Cañete and Vives-Ferrándiz 2011). Dietler's studies of consumption patterns in Iron Age France after Greek colonization (Dietler 1990; Dietler 2010) as well as Peter van Dommelen's analyses of trends in ceramic production and rural settlement in Sardinia after Punic colonization (van Dommelen 2005; van Dommelen 2007) are two good examples of small-scale analyses that are successfully being contextualized in larger regional and Mediterranean-wide archaeological and historical trends.

As Lightfoot and Martinez rightly point out in their article on approaches to frontiers and boundaries:

What is needed are multi-scalar approaches that enable us to address not only macroscale issues in archaeology such as world systems, technological development, social evolution, and ecological adaptation, but also the microscale issues of individual intentionality and social action, cultural construction of gender, and other ideologies (1995: 477).

The multi-scalar framework for analysis, they argue, allows us to re-consider the idea of colonial/indigenous boundaries altogether and recognize “diverse and overlapping segmentary or factional groups” (Lightfoot & Martinez 1995: 471). These groups, I argue, could have interacted in such ways as to form communities that transcend traditionally imagined colonial bounds. Therefore, analysis at a range of temporal and spatial scales can prove especially illuminating not only in the archaeology of communities broadly conceived, but especially in cases where culture contact and colonialism played a role in the ruptures and continuities of community formation.

Interaction, Practice, and Agency

Central to this concept of community is the focus on social interactions in the form of daily, habitual practices that are enacted by people within the constraints of certain structures. In their definitions, Canuto and Yaeger (2000) as well as Varien and

Potter (2008) draw heavily on language and concepts from practice theory and structuration theory, enabling them to leave behind the problem of interpreting communities as static. Rather, they conceptualize communities as dynamic, continually changing and socially-reproducing groups within the larger structures of societies. Usefully, this approach also presupposes multi-scalar analysis. It integrates the analysis of “microscale processes (the dispositions and actions of individuals) with the macroscale (the structuring principles of society)” (Varien & Potter 2008b: 6). This approach links the concept of community with the interactions and practices of everyday life, which I believe can be well connected to archaeological evidence that survives from household activities, trade networks, and production practices of past people, among other things. Further, a focus on practice allows for a discussion of agency in the context of both individual and group actions, which can be useful in disentangling the complications of actions and community formation within colonial situations.

Bourdieu’s practice theory examines the practices of everyday life, and attempts to explain how such human practices are structured and reproduced over time within a set of social and cultural norms. Central to this is the concept of *habitus*, which refers to the traditions that structure people’s thoughts and actions. He defines *habitus* as:

...systems of durable, transposable dispositions, structured structures predisposed to function as structuring structures, that is, as principles of the generation and structuring of practices and representations which can be objectively “regulated” and “regular” without in any way being the product of obedience to rules, objectively adapted to their goals without presupposing a conscious aiming at the ends or an express mastery of the operations necessary to attain them and, being all this, collectively orchestrated without being the product of the orchestrating action of a conductor (Bourdieu 1977: 72).

Commenting on this notion, archaeologist Willeke Wendrich has pointed out that *habitus* emphasizes both the *modus operandi* (the ways of doing and creating) and the *modus operatum* (the created work) (2012: 3). While the idea of “natural community” does not

immediately lend itself to looking at the archaeological material record, practice theory and the concept of *habitus* readily link the behaviors and practices of people with the materials they create. This is because, especially with activities such as pottery, glass, and metal production or even household activities such as cooking, we can find material traces that help us to reconstruct the ways that people made things in the past. In addition, we often have the products that people created through such processes. The combination of these two lines of material evidence allows us to reconstruct past daily practices, practices that became the building blocks for communities.

Especially key to archaeological investigations of community is the concept of “communities of practice,” which was developed out of Bourdieu’s work for use in sociology and anthropology (Lave & Wenger 1991; Wenger 1998) to refer to the groups of people who share common practices and traditions (or *habitus*). In communities of practice, individuals learn group practices through observation, performing limited tasks, and imitation. Such practices are usually learned on an ongoing and informal bases, “based on the sharing of knowledge and experience within a social group” (Wendrich 2012: 5). The concept does well with linking practices to place, such as production of objects in workshops or houses. Thus, examining such places archaeologically can help us to materially recover the locus of learning for communities of practice, and sometimes reconstruct the methods for how such practices were passed down. The idea of “communities of practice,” which does rely fundamentally on practice theory, has been used successfully in archaeology and ethnography to look at the production of pottery (e.g., Dietler & Herbich 1998; Stark 2006; Sassaman & Rudolphi 2001); I believe it can

prove especially useful in understanding changes in labor and technology practices and the relationship of such changes with community formation.

Bourdieu was not an archaeologist, but a French ethnographer and sociologist who conducted his research in French Algeria observing Berbers. His own research was set in a colonial context, and the Berber society he was attempting to study had already been damaged—or at least irrevocably changed—by 130 years of colonial occupation (Goodman & Silverstein 2009: 7). He was living and writing in a time and place where he could visibly observe changes in ruptures in “social practices and cultural doxa (rules) in context of extreme upheaval” (Goodman & Silverstein 2009: 7). However, the theory was not developed specifically for studying practices in colonial situations, and Bourdieu himself did not discuss the great potential of practice theory in illuminating ruptures or continuities in local practices in colonial contexts.

Practice theory, and the concept of *habitus* in particular, have been employed and expanded within archaeological studies of colonial encounters with some success. Of particular note is Steven Silliman’s study of lithic production at a Franciscan mission site of Rancho Petaluma in northern California. In his work, Silliman coins the term “practical politics” to refer to the negotiation of politics of social position and identity in daily practice. He argues that the practices of daily life take on explicit political significance for those conducting them (Silliman 2001: 194); I would argue that they take on social significance as well. Silliman found that, despite the availability of metal tools and glass of superior quality to local stone, indigenous workers at the mission site made the conscious decision to make lithic tools out of stone as they had done in their pre-colonial past.

He writes, "colonialism bestowed social agency on indigenous individuals because, before 'contact,' people had blindly followed cultural prescriptions and norms" (2001: 196). The decision to continue producing tools in their own tradition, even when confronted with other options in this particular colonial context, transformed what had been a habitual practice into one imbued with political and social meaning. This same methodology can be used to understand production practices and decision-making in other colonial contexts. Because the local inhabitants of Iron Age Iberia had long been engaging in mining and metallurgical production, the decision to continue to use local technologies, tools, vocabulary, or labor organization after Roman conquest could have had a particular social meaning in the context of a changing political world. This issue will be examined further in the chapters that follow.

This small case study highlights the significance of human agency in the interactions and practices of everyday life in colonial contexts. Bourdieu's practice theory has sometimes been criticized for the way—in his own words—human practices occur “without being the product of the orchestrating action of a conductor” (Bourdieu 1977: 72). For Bourdieu, people have agency to act as they please, but only within the limited confines of the structured societies in which they live. Routinized actions and practices can often happen without the actor necessarily being aware of the structures that limit these actions. Anthony Giddens, in his theory of structuration (Giddens 1984), offers a somewhat different perspective on agency. He views “social practice as far more mutable and believes that there is room for creativity and innovation” (Dornan 2002: 308). For him, people can act with a “practical consciousness” within the structure, or rules and resources, in which they live. Varien and Potter add that agency can be both collective

and individual: agency is fundamentally relational, and it can entail acting in concert with others, including acting with others against others (Varien & Potter 2008b: 8). I believe that it is useful to look at agency on a continuum—human actions can range from those executed without any particular awareness of their social meaning to those purposefully enacted for social or political reasons. And individuals, even when acting alone, perform practices that, collectively, can help form (or subvert) the construction of communities. Looking at human agency and decision making at moments in time when the rules and resources are changing, including during episodes of culture contact, can provide an important window into how such changes impacted communities.

The Archaeology of Mining Communities

In order to study mining communities, we must first question whether a mining community is categorically different from the kind of “community” that is defined above in more general terms. I have argued that communities are formed by daily interactions between people within a set of limiting structures, either actual geographical limits or conceptual boundaries. Further, these interactions ultimately enable the construction of community solidarity and identity. I contend that mining communities are extremely well poised for studies of community in precisely these terms because social interactions among community members are easily traceable; in fact, studies of mining communities can provide fascinating cross-culturally, and cross-disciplinarily relevant examples of community because mining and metallurgy have formed “a major aspect of production and social reproduction over the past six thousand years, and have employed millions of people throughout the Old and New Worlds” (Knapp 1998: 1). Further, as noted above, the processes and practices of mining and related activities often leave material traces and

scars in the landscape that survive remarkably well, and lend themselves to archaeological investigation.

Despite this, any developed notion of “mining community” has, traditionally, been entirely absent from archaeological studies of mining and metallurgy, especially in classical and Mediterranean archaeology, in which scholars have focused much more on the technological processes involved in these activities (e.g., Craddock 2008; Healy 1978) than on the human actors who performed them. With the possible exception of historical archaeology, this has often been the case in the archaeology of other times and places as well. Historical archaeology, which investigates the contemporary past, has the advantage of written records and documents to accompany the archaeological record. The accounting associated with mining enterprises in more contemporary times, especially the 18th and 19th centuries, has often left detailed records about employment, worker health and hospitalization, supply of food and other commodities, and housing development and infrastructure planning that can be used to reconstruct the social history of mining communities.

One particularly relevant example of this more archive-based work is Esteban Ruiz Ballesteros’ study of the contemporary mining industry in the Cuenca del Riotinto, Huelva, Spain and the towns of Riotinto and Nerva (Ruiz Ballesteros 2002), a region that was mined nearly continuously from at least the 4th millennium BCE (Salkield 1987; Rothenberg & Blanco-Freijeiro 1981) and that makes up one of the Roman-period case studies discussed in the coming chapters. Ruiz Ballesteros, using vast historical records from the British Rio Tinto Company, Ltd. and the Spanish government in the Riotinto Archive, discusses how the hegemonic mining industry shaped internal power dynamics,

labor organization both inside and outside of the mining industry, and social structures in both Riotinto and Nerva in contemporary times (Ruiz Ballesteros 2002: 48). While historical studies such as this can be fascinating, and indeed, can signal key issues in mining such as power, labor, and gender that we should keep in mind for studies of the more remote past, my approach using archaeology of mining communities has the potential to obviate the need for such detailed written material by studying social aspects of mining of the more remote past primarily through the material record. Or, at the very least, this approach can elevate the material record to be used beyond a supporting role for epigraphic and historical documentation.

Douglass has pointed out that “there are logical explanations for anthropology’s relative neglect of the mining community” (Douglass 1998: 9). Because the concept of community has been historically so tied to the notion of territory and to the archaeological idea of settlement clusters, the impermanence of many mining communities and the mobility of miners themselves have prevented them from being studied using the same anthropological framework. Further, the fact that mining camps or settlements were often made up of heterogeneous, constantly changing groups of people meant that these groups were harder to categorize in terms of kinship, friendship, religious ties, or other more stable social groupings that had been typically used to define the bounds of communities. However, it is this very heterogeneity and instability that makes mining communities interesting from the perspectives of social history and anthropological archaeology. The fact that, historically, many mining camps were occupied for short periods of time further solidified the perception that communities would not have had the stability or time to engage in the social interactions necessary to

foster their development. Of course, the intense interactions that took place even in short periods in mining camps would, and did, easily lead to the formation of communities. Some have considered mining a “community of occupation, not a community of place” (Muhly 1998: xvi) and without that tangible connection to place, archaeologists have avoided studying mining communities altogether. This idea of “communities of occupation” is derived from what Pfaffenberger calls the “myth of the isolated ‘mining’ camp, in which are found—putatively—the rude cabins and tents of temporary residents, exclusively male” (Pfaffenberger 1998: 291), camps which disappeared as quickly as they arose, as soon as the metal resources were depleted. In some ways, this is ironic, since mines—irrevocably tied to place—always provide the reason for miners to live where they do and engage in the practices and labors that they do.

In recent decades, however, the work of ethnographers and social historians on issues such as labor history, power and resistance, and poverty among mining populations has brought social aspects of the mining industry to the fore, and studies of “mining communities” are becoming increasingly common. The 1998 edited volume *Social Approaches to an Industrial Past: the Archaeology and Anthropology of Mining* was a major catalyst for studies of the mining community as an analytical unit (Knapp et al. 1998). The book brought together ethnographers, historians, and archaeologists to explicitly focus on social approaches to studying mining and bring disparate theoretical and material approaches into conversation with one another. Contributors to the book agree that miners across space and time often feel a sense of solidarity and community with the people living and working under the same circumstances (Douglass 1998: 97–98). Here, the actions and interactions of those who come together to live in mining

settlements and labor in the mines or supporting activities ultimately contribute to the formation a sense of community. Mining communities, then, are formed by the same interactions and patterns as any other type of community, but they are arguably more connected to their landscapes and to processes and places of production than many other types of communities, making them easier to study archaeologically than communities that engage in actions and interactions that are less connected to and dependent upon the material world around them. Writes Knapp, “the materiality of the mining experience is a major factor in the social construction of a mining community, and by extension of the mining landscape” (Knapp 2000: 236). Practically every step of mining and metallurgy leave physical traces from the initial extraction of the ore, to the primary processing of the ore, to the eventual formation of finished ingots or products for local use or transport elsewhere. During each of these steps, people interact with metal ores and metal products, the industrial landscape, and with each other in socially significant ways.

Social Approaches to an Industrial Past is a pioneering volume in the study of mining communities in general, and in particular because of the editors’ efforts to bring together illuminating case studies from the Old World and New World and from remote history to the present day. Usefully, they do not separate mining before and after the Industrial Revolution, as has often been the case in anthropology.³⁵ The volume’s section focused on prehistory and protohistory, however, completely bypasses mining in the Roman Empire—a major gap in the otherwise varied and comprehensive coverage. Ancient mining studies in the volume include studies of the Alps in the 2nd millennium

³⁵ See, for instance, Godoy’s call for anthropologists to consider the economies, social organization, and ideologies of mining, which was focused explicitly on post-Industrial revolution mining activity (Godoy 1985a).

BCE (Shennan 1998), prehistoric copper mining in Thailand (Pigott 1998), small scale mining in ancient Cyprus from 600 to 150 BCE (Kassianidou 1998), Pharaonic-period mining in the Eastern Desert of Egypt (Shaw 1998), and Byzantine gold mining at Bir Umm Fawakhir (Meyer 1998), also in Egypt's Eastern Desert. The vast amount of archaeological evidence from Roman mining in many parts of the Mediterranean makes a focus on Roman-period mining communities a worthwhile endeavor, especially given the connection of Roman mining with cross-disciplinarily relevant topics such as imperial economies and colonial interaction.

More than this, I believe that the near-industrial scale mining in Roman Iberia can provide case studies that help to bridge our conception of mining before and after the Industrial Revolution. As described in Chapter 1, lead isotope analyses attest to the high level of pollution attributable to Roman lead and copper mining.³⁶ This points to the massive scale of mining even in the earliest stages of Roman rule in the Iberian Peninsula, and it is worth considering what social and economic factors contributed to the development of mining at this near-industrial scale in antiquity, and in turn how these factors impacted the formation of mining communities.

In order to study just these issues through the archaeological evidence that we have available, alongside epigraphic and historical records, it is necessary to frame this evidence in a way that is socially meaningful and comparable across the diverse geographic, geological, and cultural landscapes that made up the Iberian Peninsula during the Roman-period. I have pinpointed four basic “settings” that could be loci for the kinds of interactions that formed mining communities: 1) rural and industrial landscapes, 2)

³⁶ Specifically, see analyses of the Greenland ice cores and European peat bogs (Hong et al. 1994; Rosman et al. 1997; Boutron et al. 2004; Martínez Cortizas et al. 2002).

settlements and households, 3) technology and labor, and 4) local, regional, and imperial economies. Dividing the extant archaeological, epigraphic, archaeometric, and historical data from Roman Iberia according to these categories can help frame it in analytically useful categories that are materially grounded and which attack mining communities from a wide range of scales and diverse categories of evidence (Figure 3.5). I argue that these settings were universal aspects of life for all mining communities across time and space; employing them allows my own study to be of utility in comparative studies of mining communities. In the following pages, I illustrate the significance of these designations and the kinds of archaeological evidence that fit into each category, though both the archaeological evidence and the frameworks for examining these settings will be elaborated in Chapters 4 through 8.

Landscapes

The setting of landscape is perhaps the most important place to start, because it is in the landscape that mining communities are firmly rooted: their daily lives take place against the backdrop of, and in interaction with, the mining landscape where community members live, work, and ultimately perish or move on. It is in this landscape that the mines themselves are located, as well as the settlements and households that provide the locus for daily activities that lead to the formation of communities. Mining landscapes offer a particularly engaging set of circumstances for the archaeological study of community formation because of the diverse set of inhabitants they often attract as productive, economic centers and because of the range of material traces they preserve. However, many communities aside from those centered around mining are firmly

connected to the landscapes they inhabit, and it is perhaps useful to begin with a more broad affirmation of the ways that communities and landscapes can be intertwined:

Because people who live in a community build, modify, and re-shape their physical surroundings through their daily activities, values and beliefs in order to preserve memory and experience, and to endow their community with a meaningful sense of time and space, they mark their occupational spaces in distinctive and patterned ways, in their households, and in their modes of subsistence, production, and consumption. As a consequence, meaningful 'places' are created throughout the landscape the people inhabit, 'through which people's life histories are threaded' and through which their lives and relationships 'can be traced in the textures of the land'. It can indeed be argued that 'it is only by virtue of his belonging to the community that a person acquires a relation to a determinate portion of natural space' and thus takes root in his or her landscape (van Dommelen et al. 2005: 57).

Following this, there are several key aspects of the mining landscape that can be potentially significant for understanding the interactions that lead community formation, both the interaction of people *in* the landscape and the interaction of people *with* the landscape. Mines often become part of larger political and economic landscapes that expanded the possibilities of interaction for those who live close to the mines. Further, mining landscapes, though they are often situated in otherwise rural areas, frequently become loci for interactions that revolve around their transformation into industrial landscapes. Finally, in the process of becoming industrial landscapes, the communities change and modify the earth in ways that can impact the community's ideational understanding of their surroundings. Mining landscapes must be viewed from both a top-down and bottom-up perspective if they are to be of use in the study of mining communities, and understating the landscape from the prospective of these categories offers ways to examine the concept of landscape at various scales and from various internally and externally rooted perspectives.

Mining Landscapes as Political Landscapes

Mining landscapes are often targeted by political or corporate entities because of their perceived value to wider economic networks. Through the incorporation of these landscapes into these wider political and economic spheres, the land is often assigned new legal or territorial status. This was just as true for miners staking claims outside of San Francisco in the American gold rush as it was in the Roman Empire, when mines were incorporated into provinces as separate legal territories, *metalla*. Examining the mining landscape in its political context can help situate its position in wider political, economic, and social networks and better help us understand the ways that the inhabitants of mining districts would have interacted with those outside of their immediate spheres of daily interaction. From an archaeological standpoint, material traces that can help shed light on these issues include the position of the mines and mining settlements in relation to roads, cities, and other infrastructure that is organized by imperial or corporate interests. Conceptualizing the landscape at this broad scale informs our understanding of the kinds of interactions that would have been possible or probable between those living in the mines and others, such as those involved in administration, transport, and trade of resources in and out of mining centers. Textual sources that outline the status of mining settlements in the political sphere can also shed light on the ways that those in mining communities understood their connection (or not) to political interests.

Mining Landscapes as Rural and Industrial Landscapes

Moving from the broad political landscape to a more localized scale of analysis, examining the placement of mining activity in its immediate landscape can aid in recovering the kinds of interactions that would have transformed rural landscapes into productive centers of industrial activity, and how these interactions—both social and

economic—could have led to the formation of particular mining communities. Ores are often located in remote areas of the landscape, and it is imperative to retrace archaeologically, and through written evidence, the ways in which communities involved in mining survived in and off their immediate surroundings. For instance, how did communities access and distribute a host of necessary non-human resources, such as fresh water, agricultural produce, either wild or domestic animals, and other resources such as clay, for instance? In what ways did mining impact the quality and quantity of these non-metal resources, with its often destructive effect on local landscapes in the form of deforestation, pollution, and simply physical transformation? Further, how did the landscape shape when and where people could interact for social and economic activities, such as where people lived and how this could have impacted ways that labor was mobilized or where people gathered for rituals? Concrete evidence for answering these questions can be found in topographical analysis of distribution of resources, as well as environmental studies of archaeobotanical remains and indicators of pollution in air, water, and soil.

Ultimately, putting explicit studies of mining landscapes into conversation with the growing body of scholarship on rural landscapes, and industrial landscapes in particular, will help this and other studies contribute to wider examinations of the social and economic histories of rural lands. At the same time, it will show the potential of mining landscapes to facilitate increased interaction that could transform the kinds and extent of communities in such rural landscapes.

Mining Landscapes as Ideational Landscapes

As a final note, it is clear that the interactions that took place in the context of mining landscapes were not purely economic, focused on the end goal of extracting raw materials. Instead, both the political and physical transformation of landscapes into mining landscapes could deeply impact the way that people not only interacted with each other, but also the way they conceived of their landscapes. As Ashmore and Knapp have noted, “[Landscape] is the arena in which and through which memory, identity, social order, and transformation are constructed, played out, re-invented, and changed” (1999: 10). Physical transformation of landscapes through mining could potentially erase or destroy places of deep-seated cultural memories or religious significance. It is key, then, to examine ways that mining could have altered communities’ ideational understanding of landscape and how this played out in various practices connected to place, such as rituals. Archaeologically, this is of course the most difficult aspect of landscape to access, but I suggest that examining archaeological evidence for ritual or religious activities associated with places in the landscape (such as burials, landscape monuments, or religious structures) can be revealing of how communities reacted ideologically to landscape transformations caused by mining.

Settlements and Households

If landscapes, with their natural metal resources, are one essential element in the formation of mining communities, then the settlements and houses within them are another. Although I have argued above that communities need not be confined to the physical constraints of settlements and houses, however such locales remain loci for the formation of communities that are often the most archaeologically accessible resources

for examining interactions that happened in the context of everyday life and face-to-face encounters.

While settlement studies and household archaeology are sometimes considered separately in archaeology, it is useful here to evaluate both categories of evidence alongside one another. This allows us to access the interactions of the often heterogeneous mix of individual community members within a mining community at the smallest level of the house, but contextualized in a middle-scale analysis of the wider settlement. As Grey has pointed out,

Ethnographic case studies interestingly blur the distinction between house and village as they focus of the sense of belonging and underscore the interdependence of the house and the village as important ‘living spaces’ in which people interact and socialize on a daily basis” (2011: 32).

A focused look at these locales together can help us better interpret the ways that people living within mining settlements interacted in their everyday lives to form their communities, shedding light on topics such as the diversity of people living in settlements and households, the internal and external choices behind the layout of settlements and houses within them, and the logistics of daily practices from production and consumption to religion and ritual.

Mining Settlements: Economics, Politics, and Community

Studies of mining settlements connect the broader investigations of mining landscapes discussed above with analyses of houses and households. They serve as an avenue for asking similar but more targeted, site-based questions about the impacts of external political factors on the internal social and economic organization of communities living within settlements, and the role of individual settlements in larger political, social, and economic networks. We can draw from a rich body of archaeological literature on

settlement studies (e.g., Fletcher 1986; Trigger 1967; Parsons 1972; Kowalewski 2008) to inform our understanding of how mining settlements fit into wider settlement patterns in the landscape, examining, for instance, how the size and distribution of settlements impacts interaction and communication between and within them, and what any patterns can reveal about the political arrangements of communities. Archaeologically, mining settlements are not always well preserved at the site level, so looking broadly at settlement patterns detected through survey data is one way to access information about how mining communities interacted.

On the other hand, the physical organization of specific mining settlements—including both their layout and the kinds and diversity of buildings—can tell us a great deal about the demographic makeup of communities (including issues of age, gender, and status), and the ways that settlements facilitated or constricted the types of social and economic interactions people could have within their immediate communities. Through archaeological or textual sources, we can examine settlement plans, including the diversity or homogeneity of housing structures and their division of houses into neighborhoods; the placement of houses in relation to communal resources such as workshops, stores, places of worship, hospitals, schools, burial grounds,³⁷ and public spaces; and the level of development of infrastructure, including roads and access points to mines themselves.

³⁷ It is worth noting, that osteological data from burial grounds of mining communities also has the potential to shed light on many issues such as the health and diet of workers and their families, the age, sex, and gender of those living in mining communities, and even the origin of migrants. This kind of data is rarely available, especially from Roman-era sites, but this bioarchaeology is one avenue of future research that could greatly contribute to the study of mining communities.

Mining settlements often fall into two general categories—organically developed or purpose built—and the structure of settlements and modifications to them over time can indicate the degree to which external political or social forces impacted the way that communities were formed, or at least tell us something about how interactions between residents were facilitated or limited and how community needs were met. Further, the economic organization of settlements is something that can be considered by investigating activities that took place at the settlement level, or ways that settlements accessed and distributed goods. This might include, for instance, looking for the presence of a central distribution point for imported goods (like the proverbial company store of historic mining settlements) or, conversely, evidence of subsidiary activities including agriculture and animal husbandry to sustain the community.

Mining Households: Intimate Details and Daily Life

Examining households within settlements offers a more intimate prospective on social and economic interactions in mining communities at the smallest archaeologically accessible scale. Household archaeology has a long history of inquiry (e.g., Wilk & Rathje 1982; Parker & Foster 2012; Blanton 1994; Allison 1999); in their foundational article on the subject, Wilk and Rathje, define the household as “the most common social component of subsistence, the smallest and most abundant activity group, ” (1982: 618). Their conception of the household encompasses social, material, and behavioral components, which allow household level inquiries to link material culture with theories of social and cultural change more readily than other sub-disciplines in archaeology. The clear connection between domestic structures, their contents, and their surroundings—all material—also enables us to archaeologically trace the practices and interactions of daily

life that contributed to the social production of mining communities at the smallest level. After all, “somewhere between household and empire lies the community” (Marcus 2000: 231), and the link between mining households, communities, and empire is often historically quite strong when metal extraction is imperially or politically motivated, as it often was in Roman Iberia and elsewhere.

Investigating the material traces of households to look at behavior—or daily practice—and social reproduction can be an especially illuminating way of understanding the contribution of individuals and household groups to the social formation and economic success of mining communities. Many studies have shown that household production, though underrepresented in larger economic models, could be a major part of the wider economy. Looking at production and consumption practices evident in the material record in and around the house—including in faunal, botanical, and ceramic remains—can help us reconstruct subsistence strategies within households and cooperation among them at mining settlements. Further, investigating household activities and practices can shed light on gender and family dynamics in mining settlements, where the contribution of women and children is not always assumed (but see: Moynihan et al. 1990; Pfaffenberger 1998: 308; Velasco Murillo 2013). Further, it is at the household level that we are perhaps most likely to see the persistence of certain cultural practices or the maintenance of a material connection to the past (Gillespie 2000: 12–14), even in the face of drastic political and social change observed at wider scales of analysis. Investigations of architectural techniques, food preparation practices, and household religious practice, for instance, can help shed light on cultural continuity and

change, migration, and cultural interaction among populations living and working in mining settlements.

Though in depth, and explicit understandings of settlement and household organization is not always possible in investigations of more ancient settlements and domestic structures that are poorly preserved or simply under-investigated, keeping in mind the ways that peoples' status, gender, and age can be visible through settlement and household evidence can help provide additional evidence to corroborate or complicate evidence from other written or material sources. In sum, investigating mining settlements and households can tell us a great deal about who was interacting in the wider community, what social and economic activities focused in the settlement contributed to the formation of the community, and the relationship of these communities both with external political forces and their response to locally specific or organically developed needs.

Technology and Labor

Although I have criticized many mining studies in the Iberian Peninsula—and in general—for being focused on technological development at the expense of the social and even economic dimensions of mining, the bottom line is that technology is indeed central to the practice of mining and should not be ignored. Technological practice was not separate from, but in fact integral to human interactions with each and with their landscape in the processes of laboring in mines. I follow Pfaffenberger's assertion that,

Just as a fixation on technology and machines obscures the human and social dimensions of mining communities, so too does a sharp distinction between technology and society obscure some of the factors that give mining communities their distinctive dynamics (1998: 308).

It is clear then, that no analysis of mining communities can be complete without looking at technological practices employed in the extraction of minerals, and the close tie of such practices with the systems of labor organization that enabled them to be carried out. Technology is inherently social (Pfaffenberger 1992; Dobres 2000; Dobres & Hoffman 1999). Fortunately, the material traces of technological practice in mines are those that are most often preserved archaeologically or recorded historically. So, even in cases where evidence of settlement, household, and landscape is lacking, it is possible to say a great deal about how technology and labor practices contributed to the formation of mining communities.

Technology as Practice and Process

It is now widely recognized that in most technological endeavors, there are multiple options for achieving the same result, and the choices that are made at every step of the process can reveal significant subtleties about the transmission of knowledge and skills among mining communities (Pfaffenberger 1998: 294; Knapp 2013: 55). Studies of the *chaîne opératoire*, examining each step of production and looking for patterns that exemplify conventionalized or learned technological sequences in production practices can be an especially fruitful way to investigate technological choice (Leroi-Gourhan 1943; Lemonnier 1992; Lemonnier 1986; Lemonnier 1983); such studies can demonstrate, on the one hand, intention and agency in technological choices, or, on the other hand, the imposition of external practices and standardization—all of which have sociocultural implications.

Depending on the scale of the mining industry and the kind of ore being targeted, any number of options were available in antiquity, as today, for extracting and processing

ores. Archaeologically, the mines themselves leave traces of the kinds of technologies employed in shaft-and-gallery mining or open cast mining, and in many cases tools survive for the removal of water, the extraction and transportation of ores, and the secondary processing and smelting of ores. Close archaeological investigation of these sites and tools of extraction can reveal ways that local knowledge was passed on or, alternatively, disruptions to local practices as a result of political, social, or economic changes. The patterning observed can also reveal aspects of temporality and seasonality in the rhythms of labor in mining communities. Returning to the idea of communities of practice (see page 67), a case can be made that the interactions that happened in the transmission of knowledge about how to mine and the choices of tools and methods employed in the process of mining served to create or reinforce a sense of community among those who labored in mines.

Aside from material evidence, the language and vocabulary used to describe the processes employed in mining can sometimes be suggestive of the social, cultural, or ethnic affiliations of those who carry them out. In colonial-era Peruvian mining, for instance, many words employed to describe the technologies were derived from European treatises on mining techniques but still others were derived from words in the native Quechua language, giving an indication that—while directives for mining may have come from colonial administrations, some processes and the languages that laborers used to describe them were derived from local tradition (Bigelow 2015). When textual sources are available, then, they can provide an additional window into examining labor practices, especially in circumstances where mixed cultural communities came together in the context of mining.

Laborers and Labor Organization

There is an obvious link between technology and labor in mines—the technology employed to mine dictates the number and kinds of laborers necessary, and the organization of production that they follow for achieving maximum (or desired) output. An archaeological investigation of the organization of production, informed whenever possible by complimentary studies of settlements and households, can provide a baseline for hypothesizing the kinds of labor used, including the role of skilled laborers, tribute laborers, slaves, migrants (who arrived by choice or by force), women, children, and various cultural or ethnic groups in mining communities. Ethnographic studies, at least, have shown time and time again the central role that such underrepresented groups played in the extraction of metal resources and in the sustainability of mining communities. Such studies have also underscored the ways that corporate, colonial, and political powers have manipulated ethnic affiliation to increase competition among laborers and, conversely, how such affiliations could also serve to unify for the purpose of resistance to oppression (Killick 1998: 301–302). While it is notoriously difficult to examine judicial status archaeologically, a close examination of mining processes, coupled with data from the other settings described here, does begin to provide a picture of how labor was organized and what the quality of life was for those who lived in mining communities. Further, such studies can illuminate variations in class and status among mining communities, highlighting ways that mixed populations came together for the common purpose of resource extraction and the ways that people negotiated unequal power situations within such communities.

It is clear that an archaeological and historical investigation of mining technologies and labor practices does not detract from but contribute to studies of mining communities. It adds an additional material dimension for inquiry into such communities, one that makes them unique among other kinds of communities, and sets them apart as communities that can be investigated through archaeological evidence.

Local, Regional, and Imperial Economies

Turning finally to the setting of economies,³⁸ no study of mining communities is complete without an explicit analysis of the role of mining communities in their wider regional and long-distance/imperial networks as well as the reciprocal impact of becoming a part of these wider economic networks on local economic practices. It is evident by now that economic practices play a role in each of the settings that have been discussed so far, including landscapes, settlements and households, and technology and labor. However, it is worthwhile to consider “economies” as a setting on its own. In my initial conception of communities, I argued that community groups could be expanded well beyond those who engage in face-to-face interaction through the movement of people and objects in wider networks of interaction (see page 50). Following this, a close examination of economic practices including trade and exchange at all scales can reveal significant ways that miners interacted with those people and objects beyond their immediate spheres of interaction, and how such interactions could transform the sense of community and belonging among groups of people involved in mining.

³⁸ Here, I am deliberately using economies in the plural because of the distinct nature of economic activity at various scales of analysis (see, for instance: Cartledge 2002).

Mining communities, because of their specialized association with materials often perceived as important far beyond the local level, are often much more strongly connected with wider economic networks, and it is key to consider the social implications that these connections can have. Speaking of the long-term history of mining on Cyprus, for instance, Knapp writes,

The relationship between mining, settlement, and landscape varies according to the scale and organizational level of production...Whenever copper production exceeded the local or regional scale, mining communities were forcefully linked into interregional, national, or global networks of communication and exchange (2000: 237–238).

Thus, we must ask questions such as: What were the uses and distribution of goods produced from the metal ores extracted at mining sites? Who was involved with the distribution of these goods, and what kinds of social interactions might these people have had with the producers and consumers of such goods? What kinds of products did local communities around mines have access to as their sites of residence became increasingly connected to wider networks? Archaeology is well suited to address such inquiries through material evidence; we can often trace the origin of metal objects or components of metal objects to specific local or regional origins in order to reconstruct trade networks. Similarly, pottery and other utilitarian and luxury material goods could be traded along the same routes as a part of the same economic systems. Careful analysis of the places of origin, routes of distribution, and locales of consumption of such objects can illumine many economic interactions that could have fostered communities.

Considering such questions links studies of mining communities with investigations of the nature of the ancient economy (e.g., Scheidel 2012a; Scheidel et al. 2008) and the relationship of technological and economic progress in the ancient world

(e.g., Greene 2000; Finley 1965), as well as in investigations of political economies across time and space (e.g., Feinman & Nicholas 2004).

Conclusions

I argue that the interactions that occur in the context of each of these four settings help to structure all mining communities across time and space and, further, these interactions shape the way that such communities are continually reproduced, altered, and regenerated over the course of their existence. Close analysis of each category can reveal key subtleties in the ways that communities were maintained or changed that are more easily glossed over in broader analyses. Unfortunately, the archaeological reality is that—in many cases—there is not always well-preserved surviving evidence to provide a clear picture in each of these four categories. This is certainly the case in many of the mining landscapes of Spain and Portugal where there is not only an uneven level of preservation of ancient mines, but also an uneven tradition of scholarly exploration of many of these mining districts. Even still, each category can provide a different, nuanced window into understanding the subtle complexities of mining communities on its own. When taken together, these categories can help us form a fuller picture of all the defining aspects of any mining community.

In order to demonstrate the utility of using these four settings to structure analysis of mining communities, then, I will first turn to the singular case study in Roman Iberia where all four lines of evidence for interaction are both well-preserved and sufficiently studied to allow for a fluid analysis of the formation and transformation of communities before and after Roman conquest. In the chapter that follows, I investigate the gold mining communities of northwest Iberia, and in particular those who lived and worked

around Las Médulas, the largest gold mine in the Roman Empire in the first two centuries CE. While these communities were certainly exceptional in their development and experience (and I will argue that it is easier to discover differences than similarities in mining communities across the Roman Empire), this case study demonstrates the utility of my framework in a place where there are fewer archaeological unknowns and a more straightforward history of colonialism and conquest than in other parts of Iberia. This analysis of Las Médulas serves as a model for the more complex, comparative analyses of mining communities in southern Iberia in Chapters 5 through 8.



Figure 3.1 Tombstone of Q. Artulus, a young miner holding a basket and a hammer (author photo, Museo Arqueológico Nacional, Madrid).

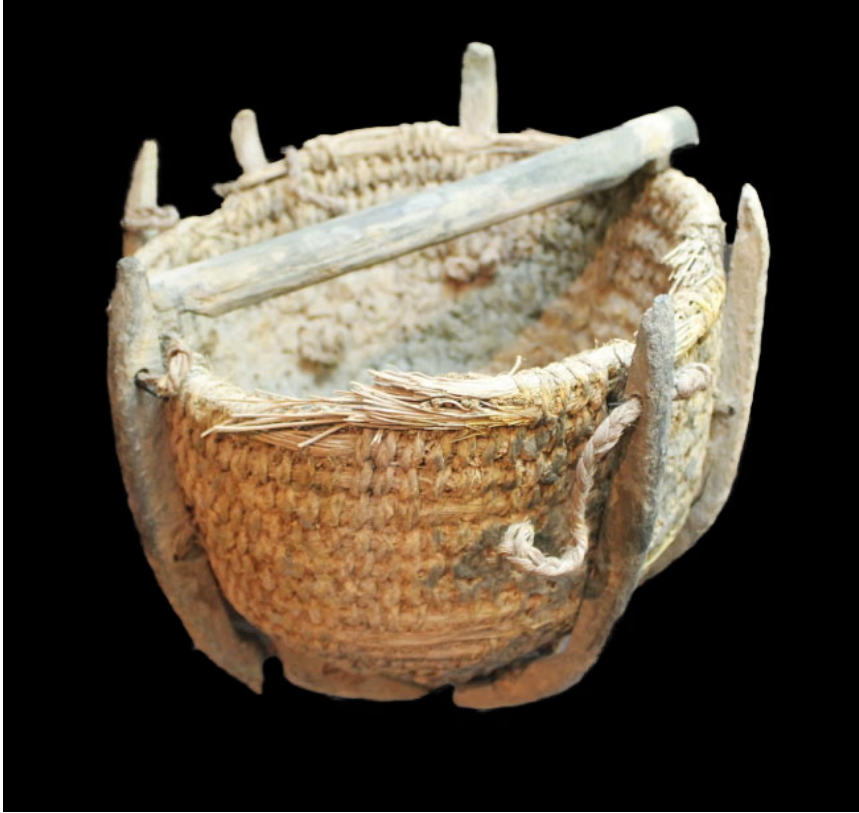


Figure 3.2 Miners' esparto grass basket from a Republican-period mine in southeast Spain (author photo, Museo de Arqueología, Cartagena, Spain).



Figure 3.3 Sandal from a Republican-period mine in southeast Spain (author photo, Museo de Arqueología, Cartagena, Spain).



Figure 3.4 Close up of the inscription on a lead ingot from the Carthago Nova with an Italian name, possibly that of an Italian immigrant, stamped on the surface (author photo, Museo de Arqueología, Cartagena, Spain).

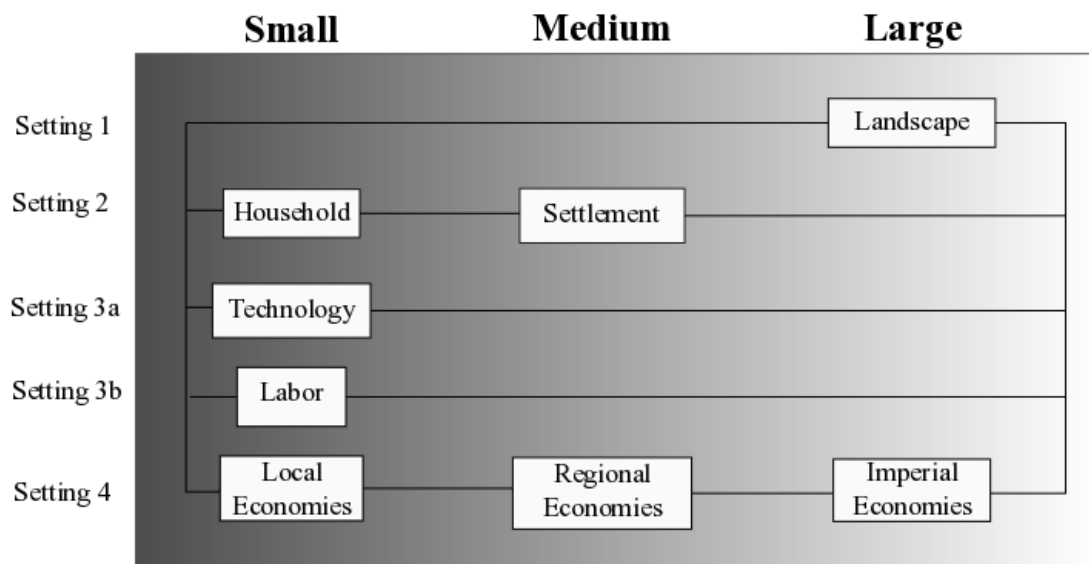


Figure 3.5 Chart shows the scales of analysis (from small at the left to large at the right) covered in each setting utilized to study mining communities. Setting 1, landscape, can cover a broad range of topics but is generally considered at a larger scale than Setting 2, household and settlement. Setting 3, encompassing labor and technology, is a way to envision local situations at a small scale. Setting 4, economies, spans scales from local (small), to regional (medium), to imperial (large).

CHAPTER 4

GOLD MINING COMMUNITIES IN NORTHWEST IBERIA

Introduction: Las Médulas as an (exceptional) model

During the final years of the 1st century BCE, Emperor Augustus and his army marched over the Pyrenees into the northwest corner of Iberia, what was the last unconquered territory of the Iberian Peninsula, where their successful campaigns finally brought the whole of this territory under Roman political control and catalyzed dramatic changes in the social and economic organization of the region. From one perspective, this was a political move to solidify the westernmost boundaries of the Roman Empire and give the young emperor a victory in war necessary to support his developing image in the early years of his reign. But from an economic standpoint, this conquest brought one of the most gold-rich landscapes of the wider Mediterranean region under Roman control and immediately gave the imperial *fiscus* access to the gold ore necessary to support the growing economy and Augustus' new gold standard based on the *aureus*. Accordingly, almost immediately following the Roman conquest of this region, gold mining began on an unprecedented scale. Along with this shift in the scale of gold production came notable changes to the indigenous way of life in the region—new systems of labor and technology were introduced and striking alterations can be seen in settlement patterns and land use, as well as in the organization of household subsistence within indigenous settlements. Further, with the incorporation of the region into the wider Roman world and

the addition of new roads and cities came changes in economic practices and trade connections.

While many of these shifts can be seen throughout the mountainous region encompassing northern Portugal, Galicia, Asturias, Cantabria, and parts of Castilla y León, nowhere are these trends more prevalent—and pronounced—than at Las Médulas, the largest gold mine of the Roman Empire and the most heavily exploited in the first two centuries of the Principate. The archaeological zone of Las Médulas (Zona Arqueológica de Las Médulas or ZAM, hereafter) is located in present-day León, Spain near Ponferrada, an area that was formerly part of Hispania Tarraconensis after the Augustan-period reorganization of the Roman provinces (Figure 4.1).³⁹ At the heart of the archaeological zone are the large-scale placer or alluvial gold mines, which today rise from the landscape as striking cliffs of red, rocky conglomerate dotted with verdant shrubs and chestnut trees. Aside from the mines themselves, ZAM is comprised of the surrounding infrastructure, such as water basins, channels, and dams as well as deposits of tailings, or waste, that resulted from the hydraulic mining processes. Included in the zone are settlements predominantly dating to the first two centuries CE and associated with the height of gold mining at the site, as well as several settlements dating to the latter half of the second Iron Age immediately preceding Roman conquest, or the 2nd and 1st centuries BCE. In 1997, Las Médulas was given a UNESCO World Heritage designation based on the fact that it is “an outstanding example of innovative Roman technology, in which all the elements of the ancient landscape, both industrial and

³⁹ After the land of the northwest was initially annexed following Cantabrian Wars of the 20s BCE, the territories of Astures and Calleci were initially assigned to Lusitania, while the area of the Cantabri to the east was assigned to Tarraconensis. At some point not long after Asturia and Callecia were re-assigned to Tarraconensis (Richardson 1996: 137–138).

domestic, have survived to an exceptional degree” (UNESCO 2015). As a result of its ancient significance, remarkable archaeological preservation, and potential contribution to cultural heritage tourism, many aspects of the ancient gold mining zone have been subject to extensive and ongoing investigations, primarily carried out in recent decades by the landscape archaeology research group of the National Spanish Research Council (CSIC), “Estructura y Territorio. Arqueología del Paisaje”⁴⁰ (e.g., Sánchez-Palencia et al. 2000; Orejas et al. 2008; Sánchez-Palencia 2000).

Las Médulas is an ideal site for an investigation of gold mining communities because it is one of the few mining landscapes in Iberia, and indeed the whole Roman Empire, where many lines of archaeological evidence are preserved and studied (including settlements, households, *and* the remains of the mines themselves), accompanied by abundant epigraphic and historical documentation. Because no major mining activity has taken place at the site since Roman times when the major deposits were exhausted, Las Médulas is much better preserved than areas such as Riotinto or Mazarrón, where early modern and contemporary industrial activity has often obliterated the ancient material record. Further, the late conquest of this region and relative isolation of the indigenous castro culture populations from outside cultural or colonial influences prior to Roman conquest—including Phoenician, Punic, and Greek—make the case of northwest Iberia a *relatively* simple situation to disentangle. This is especially true when we compare the case of northwest Iberia to other imperial mining landscapes of Roman Iberia in the south of the peninsula, which were significantly more connected to Mediterranean colonial influences prior to Roman conquest. While the second half of this

⁴⁰ Though this group has various ongoing projects into the present day, the specific research campaign at Las Médulas was carried out between 1988 and 1996 under the direction of F. Javier Sánchez-Palencia.

dissertation examines other mining communities in these complex places in southern Spain and Portugal, Las Médulas here provides a vivid model on which to demonstrate the utility of the analytical framework for mining communities outlined in Chapter 3.

In this chapter, I first consider the development of the indigenous culture of northwest Iberia, castro culture, in the first and second Iron Ages leading up to Roman conquest, contextualizing the area of Las Médulas in its wider cultural setting both geographically and chronologically. I outline pre-Roman modes of community formation and argue that there was a conceptual shift from a community identity based in the settlement, or castro,⁴¹ to one based on a connection to the mining landscape and the constellation of settlements that it encompassed. Following my approach using four thematic settings for understanding mining communities laid out in Chapter 3, I examine the lines of evidence for such a shift in community identity after the Roman conquest of the region. These range from 1) landscape use and settlement shifts in the wider region, to 2) local developments in settlement patterns and shifts in household structure around the gold mines at Las Médulas, to 3) innovation and persistence in gold mining technology and labor organization, and finally to 4) economic connections in the local, regional, and imperial economies. This analysis demonstrates the potential of this four-pronged approach to investigating and conceiving of mining communities in a place where evidence is ample and compelling. Las Médulas, with its extraordinary preservation, serves as an ideal locale to examine the phenomenon of the emergence of

⁴¹ Castro translates roughly to “hillfort,” and some Anglophone scholarship uses this term instead. I have chosen to use castro because of the relationship of the castro with the term for the culture itself across all local languages: cultura castreña (Spanish), cultura castreja (Portuguese), cultura castrexa (Galician), cultura castriega (Asturian). Some scholars prefer to use the term “castros culture” in the plural to reflect the interregional variation and heterogeneity of the culture (Urbanus 2013: 2; Queiroga 2003: 1); while I agree wholeheartedly with the sentiment, I have chosen the more prevalent terminology in this chapter.

mining communities alongside the creation of industrial landscapes after Roman conquest. Finally, it illuminates, on the one hand, the dramatic effect that Roman imperial practices could have on indigenous communities and landscapes. And on the other, it shows the subtle ways that pre-Roman traditions and lifeways could impact community organization even in a mining district tightly controlled by imperial policies.

Transitions at the Edge of Empire: From Castro Communities to Mining Communities

In order to better understand the formation of communities around Las Médulas in the 1st and 2nd centuries CE, it is first necessary to examine the ways that indigenous communities were formed prior to Roman conquest and how resources, including arable land and water, played much larger roles than did gold in settlement patterns and social organization. The pre-Roman Iron Age castro culture of northwest Iberia developed in relative isolation from other parts of the Iberian Peninsula and other Iron Age Iberian and Celtiberian cultures. Generally speaking, Iron Age castro settlements can be characterized as unplanned agglomerations of houses that were built inside substantial fortification walls, terraces, or trenches, and commonly situated on hilltops, housing no more than 150 to 200 people (Figure 4.2; Sastre 2004b: 101). These sites visually dominated their surrounding landscapes, where farming and animal husbandry took place (Figure 4.3). They usually had access to nearby water sources, especially the rivers and streams so common to the region, though some are near the Atlantic coast also had ready access to the ocean. Castros were, for the most part, self-sufficient and depended very little on trade, either local or long-distance.

Castro settlements were geographically confined to the land between the Canero River in Asturias and the Duero/Douro River in Portugal, or the territory of present day Galicia, Cantabria, Asturias, the northwest part of León, and the northernmost district in Portugal, Trás-os-Montes (Cerdá 1984: 7). This cultural isolation was due, in part, to the dramatic landscape of mountains punctuated by river valleys that hindered land-travel and communication with other parts of the Iberian Peninsula and—conversely—encouraged connections by sea with nearby Atlantic Iron Age cultures in Britain and France, especially in coastal regions. This was not a typical landscape of the Roman Mediterranean. In fact, it was a place that—save for its richness in gold—the Romans would have had little interest in from a purely economic perspective. This sentiment is reflected in ancient attitudes towards the region, which were, on the whole, negative, as can be seen in Strabo’s 1st century CE description of the environment:

Northern Iberia, in addition to its ruggedness, not only is extremely cold, but lies next to the ocean, and thus has acquired its characteristic of inhospitality and aversion to intercourse with other countries; consequently, it is an exceedingly wretched place to live (3.1.137; trans. H.L. Jones).

Fortunately, northwest Iberia is unusual in that it has been examined in a way that more frequently crosses academic, regional, and diachronic barriers so often present in archaeological scholarship in other areas of Spain and Portugal. The relative geographic isolation of the cultural landscape has inspired many studies that transcend modern political boundaries and analyze the region as a whole, even if such analyses are not widely read outside of specialized circles.⁴² More recently, however, archaeological evidence from Bronze Age and Iron Age northwest Iberia has often been compiled and

⁴² Because it is considered beyond the geographical confines of much Mediterranean scholarship, castro culture is all but absent from Mediterranean-wide studies including Cyprian Broodbank’s *The Making of the Middle Sea* (2013).

used to support larger arguments about the emergence of social complexity in prehistory (e.g. Sastre 2004b; Ontañón 2013; Sastre & Sánchez-Palencia 2013; Sastre 2002), which are necessarily more all-encompassing than local and regional studies of the Roman Empire.⁴³ Although certain regional gaps in analysis do exist, scholars have a relatively firm understanding of the chronological development and regional differentiation of castro settlements in the Iron Age.

When the Roman army entered the scene in the 1st century BCE, the castro communities they encountered had already undergone nearly a millennium of development that led to regional differentiation, which is useful to summarize as background for understanding the pre-Roman cultural landscape in which Las Médulas was situated. For the sake of brevity, this summary glosses over arguments and specificities that are discussed in greater detail in other works.⁴⁴

Chronological Development and Regional Differentiation in Iron Age Castros

The first castro settlements emerged around the 10th century BCE in northern Portugal, around the same time as the initial appearance of iron in the archaeological record, which marked the transition from the final Bronze Age to the first Iron Age in the region. By the end of the 9th century BCE or the beginning of the 8th century BCE, small castros had become prevalent in northern Spain along with the spread of iron metallurgy.

⁴³ Almudena Orejas has pointed out, for instance, “it is remarkable that probably the most intense and fruitful debates on these themes [of peasant communities, segmentary societies, and ‘non-triangular societies’] are currently developed in Britain and in the Northwest of Spain” (Mattingly and Orejas 2009:131). One example of scholarship along these lines is the recent edited volume, *Atlantic Europe in the First Millennium BC, Crossing the Divide* (Moore & Armada 2011).

⁴⁴ See, for example: González-Ruibal 2008; de Blas Cortina & Villa Valdés 2002; Parcero Oubiña & Cobas Fernández 2004; Urbanus 2013; Hipólito Correia 2001; Coelho Ferreira da Silva 1986; Coelho Ferreira da Silva 1996; Fernández-Posse 2002. Though not exhaustive, this list includes recent works with detailed bibliography in Spanish, Portuguese, and English.

The first truly fortified settlements appeared in the north of Portugal and the south of Galicia, and while evidence is lacking for this early period further inland, some suggest that a similar situation is likely to be eventually uncovered (González-Ruibal 2008: 901). During this early period, fortifications or at least features delimiting the castro area could take the form of trenches, terraced walls, or stone walls.

This situation grew more complex around 400 BCE, the initial phase of the second Iron Age, as regional diversity increased, which can be observed in emerging differences and local patterns in settlement forms, house structures, as well as other aspects of daily life such as subsistence patterns (González Álvarez 2011). In some areas, many of the castros situated on prominent hilltops of the early Iron Age were abandoned and new settlements arose in valleys closer to water, presumably for ease of access to resources. Curiously, the opposite pattern can be observed in parts of Asturias, where hilltop settlements became increasingly common (Camino Mayor 2003; Camino Mayor 2002; González-Ruibal 2008: 905; Villa Valdés 2007).

Inés Sastre has grouped some of these regional developments into two basic types: “developed zones” and “zones outside the process of social hierarchization.” (Sastre 1998: 20).⁴⁵ In the former, hierarchal relations of interdependence between different

⁴⁵ Other scholars have noted similar regional distinctions, but termed them differently. Alfredo González-Ruibal, responsible for many theoretically-driven regional studies of northwest Iberia, identifies terms that have emerged in scholarship for different regional groups including “heroic societies,” “house societies,” and “deep rural societies” (González-Ruibal 2008: 919). Parceró Obuiña terms “heroic societies” those castro groups where accumulation of wealth in the form of precious objects among a dominant portion of the population occurred (Parceró Obuiña 2003; Parceró Obuiña 2002). Drawing from Levi-Strauss, González-Ruibal himself uses the term “house societies” for those castros in which there is significant differentiation in the scale of houses within each site, and the largest houses are thought to have housed the dominant portion of the population (González-Ruibal 2006). Finally, González-Ruibal’s “deep rural societies” are those castros that do not clearly exhibit any form of social hierarchy—either in the accumulation of wealth or house size within settlements or between settlements (Fernández-Posse & Sánchez-Palencia 1998; Sastre 2001; Sastre 2002).

castros seem to have developed at least by the end of the 1st century BCE, either in reaction to increased foreign contact and the growing Roman power in neighboring regions of Iberia or simply as a local development (Braz Martins 2010b: 63). This zone includes northern Portugal and the coastal and southern Galicia, where large castros called *citanías* emerged, and exerted some degree of dominance over other settlements in their surrounding regions. These settlements, including Sanfins, Briteiros, Santa Luzia, Ancora, Romariz, for instance, were large and complex in ways unmatched in neighboring areas farther inland (Figure 4.4). The other developed zone at the time was located in the meseta, or flat plains, of the Asturian territory, where large *oppida* emerged as the region became more connected to and influenced by neighboring Celtiberian tribes to the east (Figure 4.5; Sastre 1998: 20).

In contrast to these regions with clear site hierarchies, others—including Trás-os-Montes, western Zamora, and southwest León—contain a distribution of sites with no clear social stratification. Typically, castro sites of these regions, of which Las Médulas is a part, appear to have been situated in areas and at distances from each other that allowed them to remain largely self-sufficient, avoiding inter-castro warfare or hierarchies (Sastre 2008: 1021). Castro sites had access to land for agriculture and pastoralism, and generally produced ceramics, lithics, metals, and other goods at the site level rather than trading such products between sites. At these non-hierarchical sites, the basic economic and social unit was the house, and household members were responsible for producing and storing many of their own goods, as nearly every domestic unit contains a room for storage of food supplies. Certain tasks, however, appear to have been maintained at the

community level and among these were metalwork, which will be discussed further in the context of local economies below (Sastre 1998: 21–22; see page 154)

While there is not always consensus on the terminology or the exact geographic limits of different kinds of castro sites in the second Iron Age, it is clear that at the time the Roman army entered the scene it was possible, apparently even for contemporary historians, to distinguish between certain regional, cultural trends. Roman authors including Florus, Cassius Dio, and Strabo described three different sub-groups among these indigenous inhabitants: the Callaeci, Cantabri, and Astures, from which the modern districts of Gallecia, Cantabria, and Asturias derive their names (but certainly not precise geographical boundaries) (see: Florus *Epitome* 2.33; Cassius Dio *Roman History* 53.25; Strabo *Geography* 3.3.7).

The castros occupied immediately prior to Roman conquest in the region around Las Médulas fit squarely into Sastre's non-hierarchical society category (González-Ruibal's deep rural category)—as will be described in more detail in the context of household and settlements around Las Médulas. Perhaps ironically, the castros in this region that later became the focus of Roman gold mining did not amass a great deal of metal wealth or prestige objects. Since there was not any apparent hierarchy within or between castros, there was no strong motivation to either produce or accumulate objects like golden torques found in the larger castros of Galicia (García Vuelta 2007; González-Ruibal 2004). So while there was an indigenous castro tradition of gold extraction in the northwest (see page 139), metal objects discovered at the sites around Las Médulas were largely utilitarian in function and often made of bronze or copper rather than of precious metals like gold. Gold resources did not dictate where castros were constructed or the

way that power was negotiated within them prior to Roman conquest.

Communities Transformed: From Iron Age Castros Communities to Mining Communities

Despite the multitude of regional differences in castros of the second Iron Age, a number of commonalities can be observed that give a sense of the modes of community formation in place in castro society prior to Roman conquest. Most importantly, there was a general increase in the monumentality of both the castro sites and the kinds of fortifications in which they were built. As castros developed during the Iron Age, more emphasis was placed on creating fortifications to frame and bound each community, both physically and conceptually. It is possible and probable that *one* function of these fortifications was defensive, perhaps most especially for those sites in the regions where competition among elites and increased hierarchy between settlements became predominant in the second Iron Age. But it is more likely that in the context of the daily lived experiences of community members, such fortifications served to delimit the physical and conceptual space that each castro community occupied (e.g., Fernández-Posse & Sánchez-Palencia 1998: 138–139; Haselgrove & Pope 2007: 12; Parcero Oubiña et al. 2007: 187–188). This is especially true in the context of rural sites where warfare and competition were more limited, and walls rarely needed for defensive purposes.

With an emerging sense of community based on co-residence within a castro came the desire to monumentalize the limits of that space (e.g., Braz Martins 2010a: 8; Lemos & Cruz 2008: 13–14). Thus, walls surrounding castros created a visually recognizable territory both for community members and outsiders. These physical limits of the castro and its surrounding territory demarcated the space in which daily interactions took place. Additionally, these limits conditioned the manner and spatial arrangement in which

activities such as resource exploitation, craft production, and domestic tasks happened. In effect, the survival and success of the inhabitants were dependent upon daily interactions that occurred within the physical and conceptual bounds of the castro, which would have in turn created a sense of community belonging, co-dependence, and identity at the castro level. Fortifications, then, served an essential symbolic purpose for each castro community.

While the castro was the locus of community formation in Iron Age northwest Iberia, beginning with the first major military incursions of the Romans into Cantabrian and Asturian territory in the 20s BCE, this traditional, indigenous social construction of communities began to disintegrate. Roman conquest of the region ruptured Iron Age society on many levels, and this is particularly visible when we look closely at the regions most targeted and transformed by the Romans following conquest: those with the largest Roman gold mines, and Las Médulas in particular. Indigenous populations were reorganized into new settlements in the landscape to support the developing mining industry, and their traditional ways of life ruptured, especially in terms of labor, technology, and economic organization. I argue that—as a result of new patterns and networks of interaction—indigenous populations living and working around Las Médulas were transformed into mining communities. In other words, fundamentally different patterns and networks of interaction created an environment where a sense of community could not have been limited to the site or castro as it was in the past, but expanded more widely to encompass those living in and around the industrial landscape. Using the approach described in Chapter 3, the following sections of this chapter examine precisely how the Roman conquest and reorganization of this landscape impacted local

communities. Starting from the broadest scale, let us first turn to the level of the wider landscape.

Becoming an Imperial and Industrial Landscape

In the final years of the Roman Republic, northwest Iberia remained independent from the Roman Empire, while the rest of the peninsula had long since been annexed and governed as a senatorial province divided into Hispania Ulterior in the south and Hispania Citerior in the north. While finds of Campanian ware and Italian amphorae do indicate that indigenous populations had some contact with Roman products prior to Roman conquest (e.g., Orejas et al. 2000: 113), it was not until the Augustan campaigns in Cantabria and Asturias that the region was brought under Roman control. The campaigns began in 26 BCE, after the newly named Augustus marched across the Pyrenees into Spain. He had just entered his seventh consulship together with M. Vipsanius Agrippa, and the Roman senate had afforded him unlimited control over the military provinces, including Hispania. The campaigns in northwest Iberia, then, had two functions—to demonstrate Augustus’ military prowess while he was young and consolidating his power and to expand the *limes* of the Roman Empire to encompass the entire Iberian Peninsula and to give the Romans access to the rich gold mining landscape (e.g., Pitillas Salañer 2010: 16–19). As David Mattingly has put it, “emperors sought not only military glory but also to fulfill their responsibilities to keep an expensive show on the road” (Mattingly 2011: 128). According to Cassius Dio (Roman History 54.5),⁴⁶ Augustus was present for the military campaigns of 26 and 25 BCE but later fell ill and

⁴⁶ Florus also records a record of the wars (*Epitome* 2.33), which essentially corroborates this account.

retreated to Tarraco (Tarragona, Spain), the capital city of Hispania Citerior, while the legions kept fighting on his behalf. The campaigns of 26 and 25 BCE were thought initially to be a decisive victory and the doors of the Temple of Janus in Rome were closed, signaling peace in the empire (Richardson 1999: 134). However, several major uprisings among indigenous populations are recorded in 24, 22, and finally in 19 BCE, when Agrippa stepped in on behalf of Augustus to repress the Cantabrians. The wars were hard fought; this was the first time that the Roman legions confronted the Cantabrians and Asturians in their own territory,⁴⁷ where the rough terrain and wet weather created inhospitable and unfamiliar circumstances for the troops (Richardson 1996: 133–134; Santos Yanguas 2011: 79–126; Santos Yanguas 2009: 49–100; Rodà 2006; Syme 1934; Le Roux 1982).

After the conquest, the landscape and its inhabitants continued to present unique challenges as they were integrated into the Roman Empire. Northwest Iberia was different from many typical Roman landscapes and even from the rest of Hispania in that the land retained its extremely rural character in the centuries after Roman conquest. Land was not centuriated into typical divisions of ownership for agriculture or dotted with agricultural villas with easy access to roads and other Roman infrastructure, as was more often the case in places such as Italy and North Africa, or indeed other areas of Hispania, especially Baetica. Further, typical patterns of urbanization and monumentalization of cities observed elsewhere in the empire were much more limited in the northwest. Instead, this far corner of the Roman Empire became what Mattingly and

⁴⁷ There had been previous campaigns in present-day Gallecia in the then-territory of the Gallaeci up to the Minho river basin including one in 139–136 BCE led by D. Junius Brutus and another in 61 BCE led by C. Julius Caesar. These campaigns brought this coastal territory into contact with Rome earlier than the inland territory (Rodà 2006: 53–54).

Orejas have termed a “less obvious imperial landscape,” one in which natural resources created a dynamic where the “direct interests of the Roman state were important and the involvement of imperial administration and army strongly marked the interaction with local communities” (Mattingly & Orejas 2009: 120). As a result of this peculiar situation where rural settlement remained the norm over urban centers and the distribution of coveted natural resources heavily influenced settlement patterns, imperial changes to the landscape (namely the extreme modifications to landscapes and resettlement of local populations) are difficult to trace effectively at a large scale using traditional means, such as mapping Roman cities, towns, villas, centuriation, roads and other infrastructure. Using only these designations as signs of this area becoming a Roman imperial landscape would produce a picture that comes up short, especially given the limitations of the data available through the Tabula Imperii Romani (Hoja K-29, K-30), The Barrington Atlas of the Greek and Roman World, and Pleiades⁴⁸ that—as a group—underrepresent indigenous settlements that persisted into Roman times and ineffectively portray areas of natural resource exploitation (see: Plácido 1993a; Plácido 1993b; Talbert & Bagnall 2000; Bagnall & Talbert 2015). Instead, closer attention needs to be paid to those “less obvious” aspects of the landscape, namely the relationship of resource distribution and rural settlements to the placement of infrastructure and cities as well as the impacts of large-scale mining on the local conception of the landscape itself.

Constructing the Political Landscape: Mechanisms for Control and Surveillance

The conversion of this landscape into an imperial and, soon after, an industrial

⁴⁸ Pleiades is an online mapping resource for the ancient world that bills itself as “a community-built gazetteer and graph of ancient places” that is open access and continually updated (Bagnall & Talbert 2015).

landscape involved a multifaceted strategy. It is essential to examine the imperially driven political and administrative changes to the landscape, including “typical” signs of these changes such as military camps, cities, roads, and other infrastructure. On the other hand, we must consider the atypical role that these features could have played in shaping the landscape. While cities and other elements of urban infrastructure have often been portrayed as mechanisms for spreading Roman culture and values in provincial regions, in northwest Iberia they appear to have remained largely instruments for control and surveillance of both indigenous populations and natural resources in the centuries following Roman conquest. These wide-scale political transformations affected how people and goods moved through the landscape, and which places served as nodes for controlling and facilitating this communication, movement, and interaction.

Beginnings: the Implantation of the Army in the Landscape

The Cantabrian Wars required substantial military force to finally succeed and seven legions are attested in the region at the time of conquest.⁴⁹ An unusual number of these troops appear to have remained in the region after the conclusion of the wars and the last documented rebellions by around 15 BCE. Many have long suspected a correlation between where they were stationed and the gold mines that were opened following Roman conquest (e.g., Jones 1976: 60; Morillo 2011). The Roman army must have been heavily involved in both policing the indigenous labor force and providing the

⁴⁹ These include the *Legio I Augusta*, *Legio V Alaudae*, *Legio IX Hispania*, *Legio II Augusta*, *Legio IV Macedonia*, *Legio X Gemina*, and *Legio IV Victrix*. Jones (1976) provides a more in-depth record of the actions and locations of each of these legions as well as an appendix of epigraphic evidence that attests to the presence of each in northwest Iberia. The edited volume that resulted from a meeting of the XX International Congress of Roman Frontier Studies provides a more comprehensive account of archaeological evidence for the Roman army in Spain and Portugal (Morillo & Aurrecochea 2006).

engineering skills for the advanced hydraulic technology employed in gold mining (see page 146).

Aside from direct involvement in gold mining, the army became essential to the creation of Roman cities and roads in the wider region that facilitated communication and control as the area was incorporated into the wider Roman world. At the close of the war, the troops that remained in the northwest were dispersed strategically throughout the region in what Morillo has termed “a *limes* without a frontier,” referring to the situation where, although the area had been conquered, the army’s presence was necessary for control of the wider landscape. The *Legio IV Victrix* and *Legio X Gemina* were posted at Legio (León) and Asturica Augusta (Astorga) (González Fernández 1996; Vidal Encinas & García Marcos 1996), respectively, while the *Legio IIII Macedonia* was situated at the southern frontier of Cantabria at Herrera de Pisguera (Palencia) (Pérez González 1996). All three of these locations, and later also the site of Rosinos de Vidriales from about 15 CE (Morillo 1996: 78), became permanent military settlements under Augustus, and were key to solidifying Roman control and preventing further rebellion of indigenous communities.⁵⁰ They also became important nodes of communication and trade via new roads (Morillo 2011: 18–19; Morillo 2006: 98; Fernández Ochoa & Morillo 1999: 41–48).⁵¹ While it is entirely expected for the army to be involved in the conquest of new Roman provinces, their prolonged presence in the political landscape of northwest Iberia following conquest and their potential connection to mining labor and landscapes are notable.

⁵⁰ Archaeological evidence for non-permanent military encampments is also known from the period of the Cantabrian wars (e.g., Peralta Labrador 2002).

⁵¹ All three of these cases are archaeologically confirmed, and this situation is described in Strabo (3.3.8) and Tacitus (*Ann.* 4.5.1).

Roman Roads: Creating Pathways of Communication and Control

The legions were responsible for the construction and elaboration of a permanent road network (Solana Sáinz & Sagredo San Eustaquio 2006: 15; Vega Avelaira 2001). Although there are gaps in our understanding of the chronology of certain roads, many appear to have been developed in the Augustan period or immediately after, contemporary to the development of the Roman *conventus* capitals in the region. These routes were well established by the time that the Antonine Itinerary was recorded at the beginning of the 3rd century. The main road networks connected the three new *conventus* capitals to one another, to secondary cities in the region, and to existing Roman cities in Hispania including Olisipo (Lisboa, Portugal), Tarraco (Tarragona, Spain), and Emerita (Mérida, Spain) (Fernández Ochoa 1993: 227; Moreno Gallo 2006).

The location of these new roads in the landscape is significant for several reasons. First of all, they connected both military camps and emerging cities to wider networks and linked the region to empire-wide networks to which it had formerly not been connected. This greatly expanded the potential social and economic networks of communities following Roman conquest. Secondly, the relationship of the placement of roads alongside major areas of gold exploitation is unmistakable; the products of mining could easily have been transported by road from these areas to major cities and back to Rome. This is certainly the case with Las Médulas, which is located along *via XVIII* (see page 137), the placement of which made the large mines accessible on the route from Asturica Augusta to Bracara Augusta as well as secondary settlements such as Bergidum Flavium (Cacabelos y Villafranca del Bierzo, León, Spain) and Aquae Flaviae (Chaves, Portugal) (Figure 4.6).

Finally, aside from their economic function, it is likely that these roads had a disruptive effect on the local perceptions of the landscape. Although fluvial and terrestrial transportation routes certainly existed in the region prior to the Augustan period, the Roman roads had a distinctly different character. Local inhabitants of the region must have connected these newly constructed *viae* with the imposition of Roman political power in the region both because they were constructed by the army that had been responsible for the initial conquest and because they connected emerging urban centers with gold resources, thereby disrupting Iron Age patterns of movement and communication among castro communities.

The very construction of Roman roads and bridges also served as physical markers of imperial domination of the landscape. Significantly, while public inscriptions were extremely rare even in the cities of northwest Hispania, milestones were one of the few kinds of epigraphy in the region intended for public consumption (Le Roux & Tranoy 1973: 181), and in fact a higher concentration of milestones have been found in northwest Iberia than in any other region of the Roman Empire. These milestones were inscribed in Latin with information including the reigning emperor and the distance or position in relationship to locations of Roman towns and cities. For instance, one example from Bracara Augusta (Braga, Portugal), reads:

Aug(usto)
[pontif(ici)] max(imo)
trib(unicia) p(otestate) XIIIX
co(n)s(uli) III p(atri) p(atriae)
a Bracar(a) Aug(usta)
Asturicae m(ilia)
p(assum) CCXV (*CIL* II 4747 = *EE* VIII, p. 456).⁵²

⁵² This translates roughly to “(dedicated) to Augustus Maximus, with tribunician power for the 18th time, consul for the third time, father of the country, by Bracara Augusta in Asturia, the 215th mile.”

Although it is unlikely that many of the castro inhabitants learned Latin well or even at all, the physical marker along the road inscribed in the language of the Romans served as a potent sign of imperial power in the landscape, and one which clearly marked new physical, political divisions of territory.

The Development of Roman Cities

Alongside the development of roads came the establishment of Roman cities in the region. The three *conventus* capitals included Asturica Augusta (Astorga, Castilla y León), Lucus Augusti (Lugo, Galicia), and Bracara Augusta (Braga, Portugal); occupation of secondary settlements and some castros with continued occupation into the Roman period, however, remained the norm throughout northwest Iberia (Sastre 1998: 25). Sastre has argued that even the capitals themselves lacked typical Roman urban elements such as large monuments and public inscriptions⁵³ (Sastre 1998: 33). Even if these cities did not display a “typical” Roman urban package, their strategic placement from an administrative and economic standpoint is clear, especially when visualized in relation to the Roman roads and gold resources; the cities and roads geographically encompass the highest density of gold mines exploited in the first two centuries C.E.

Asturica Augusta was particularly important with relation to Las Médulas—it was the closest Roman city to the mining area and likely developed *ex novo* from a military encampment with no previous indigenous occupation (González Fernández 1996;

⁵³ Most Latin inscriptions, instead, can be found on private funerary inscriptions or hospitality pacts. Many of the epitaphs and votive inscriptions belong to members of the army or veterans from elsewhere in the empire. Others represent a local elite who adopted certain Roman customs for political or economic gains, but the epigraphic habit did not bleed into the public realm to any substantial degree in this region (Sastre 2004a).

Mañanes 1983: 36–39). The city served as the residence of the procurator and other Roman officials who were responsible for administering the tax system in the *conventus*, as well as monitoring the flow of gold ore from the mines back to Rome. Excavations show that it was adapted to an orthogonal plan with *insulae*, public baths, and a number of houses with Roman features such as *opus signinum* mosaics and painting (Figure 4.7). Large public monuments, on the other hand, are lacking; the striking city walls date to medieval times, although evidence of walls dating as early as the 3rd century CE and *fossae* from the original military occupation in the 1st century CE have been recovered (Fernández Ochoa & Morillo 1999; Mañanes 1983; García Marcos & Vidal Encinas 1996).

Both Lucus Augusti and Bracara Augusta were situated in key positions for economic and administrative control of the territory, forming a triangle with Asturica Augusta in the northwest corner of the peninsula. Lucus Augusti is thought to have begun also as a military camp (Morillo 2006: 98; Rodríguez Colmenero 1996: 129), though some scholars have argued—on philological rather than archaeological grounds—it was given the name *lucus* because it was a sacred location for indigenous populations (Tranoy 1981). The city was installed with *insulae*, houses with mosaics, a potters quarter, baths, and a sewage system (Rodríguez Colmenero 1996: 130–131). Bracara Augusta, located further south in now-Portuguese territory, had many similar features including an orthogonal plan, peristyle houses with mosaics, and a developed water management system from the time of its foundation; other urban elements such as a theater and possible amphitheater distinguish the city from its neighbors, though these elements were

probably not added until the Flavian or Antonine periods (Figure 4.8; Reis Martins & Abreu de Carvalho 2010: 285–287; Martins & Delgado 1996: 121–128).

Modern occupation has inhibited our full understanding of each of these urban centers, especially with respect to chronology⁵⁴ and full urban plan. What is clear, however, is that these cities remained small in comparison to their southern Iberian counterparts, and that they probably developed from military encampments to serve clear administrative and economic purposes. Asturica Augusta played the most significant role in connection to Las Médulas. While Lucus Augusti is situated in a position further from the mines and most productive agricultural land, the city must have facilitated communication and trade to the Atlantic coast. Finally, Bracara Augusta connected the northwest with roads leading south through Lusitania and along the Atlantic coast and through urban centers, including Conimbriga (Condeixa-a-Velha, Portugal).

When examined in relation to the exploited gold deposits, it is clear that the placement of military camps, cities, and the roads that connected them were no coincidence (Figure 4.6). These new elements allowed the freshly opened gold mines and the indigenous inhabitants who lived and worked near them to be closely monitored, and for the products of their labor to be efficiently transported by road out of the region and eventually to Rome to be minted into coins. These overarching political changes to the landscape completely transformed the social networks throughout the region by

⁵⁴ The Augustan name associated with each local has often led their foundations to be dated to the time of Augustan conquest and provincial reorganization, however, the actual conversion of these centers from military encampments to towns likely came somewhat later (Fernández Ochoa 1993: 227), and many of the urban interventions (and the bestowing of *municipium* status) happened in the Flavian period, at least in the case of Bracara Augusta and Asturica Augusta (Andreu Pintado 2004: 141–144; Morais 2009: 17–22). Literary and epigraphic data for the juridical organization of many towns is lacking; it is unclear whether this is the result of the limited adoption of the epigraphic habit in the region, or, in fact, indicates a minimal extension of municipalization in the region (Rabanal Alonso 1998: 105).

expanding routine interactions beyond the castro. Even the smallest population centers, especially those associated with gold mines, were never very far from roads. As northwest Iberia became an imperial landscape, indigenous inhabitants had increasing opportunities for interaction with foreign people and goods—whether desired or not; these interactions contributed to ruptures in traditional modes of community formation, centered interactions within the castro and the immediate landscape.

Re-Conceptualizing Las Médulas as an Industrial Landscape

The major physical changes to the landscape observed in mining regions, and particularly at Las Médulas, significantly impacted the ways that people could interact with both the landscape and each other. As landscape features such as mountains and rivers were manipulated and changed into an industrial mining landscape, indigenous modes of understanding and interacting with their own surroundings would have been drastically transformed. Many castros were either destroyed or abandoned and populations were consolidated into existing and new castro sites, often in locations that were more easily monitored than the typical hilltop sites of the Iron Age. In the immediate area of El Bierzo in western León around Las Médulas,⁵⁵ many of the known Iron Age settlements were abandoned; of 90 known castro settlements in the region, only half persisted into Roman occupation (Mañanes 1988; Fernández-Posse 2002: 92–93), and even outside of Las Médulas many settlements with continued occupation became economically connected to mining including, for instance, Castro de Chano (Celis Sánchez 2002). Alterations in settlement placement in the landscape would have had a

⁵⁵ Although no detailed regional survey exists for this region, descriptions of settlements (castros, villae, vici, Roman towns) can be found in Mañanes' summary of lands surrounding Astorga (1983: 53–114) as well as Fernández Ochoa and Morillo's more recent volume (1999).

profound effect on traditional modes of interaction and community formation. It is nevertheless important to note also that, even during the wars, the situation was not black and white, Roman vs. indigenous. Historical and epigraphic documents indicate that some tribes were more sympathetic to the Roman cause than others, or at least more pragmatic in the face of the impending conquest of the region. The Bierzo Edict (Appendix I; Figure 4.9), an epigraphic document written on a bronze plaque dating from just four years after final conquest, grants *imunitas*—presumably immunity from paying tribute—to certain tribes in the Bierzo region in return for cooperation during conquest, with the implication that other tribes did owe tribute (Sanchez-Palencia & Mangas 2000; López-Melero 2002; Alföldy 2000; Castillo García 2009).⁵⁶ Such politics, in addition to the locations of existing castros, must have played a role in which settlements persisted and which were abandoned or destroyed.

Aside from these practicalities of where indigenous communities lived and how they figured into civic status and tribute systems is the question: how did they conceptualize their landscape? During the Iron Age, the absence of structures with a clear religious function or anthropomorphic representations of deities in settlements has led scholars to believe that aspects of the landscape were imbued with certain religious or spiritual meaning (Sastre 2004a: 7). Hilltop spaces that were commemorated with Roman altars or Christian churches in later times are often believed to have held earlier sacred significance. Lemos notes, for instance, that in a valley facing the summit of the Larouco Mountain in the Barroso region of Trás-os-Montes, Portugal, a sanctuary has been found

⁵⁶ Since the initial discovery and publication of the document, there has been some debate about its authenticity among leading scholars. Le Roux (2001) and Richardson (2002) express doubt, while Alföldy (2000) asserts that it is indeed an ancient piece.

with two Roman altars dedicated to Juppiter Optimus Maximus and Laraucus—perhaps an example of syncretism between Jove and the indigenous deity. Lemos believes that this high mountain served as a sacred territorial marker with an associated sanctuary pre-dating the altars themselves (Lemos et al. 2011: 198–199). Similar monumentalization or at least demarcation of indigenous sacred springs associated with natural water sources is also known. A prime example of this is the Fonte do Ídolo located in Bracara Augusta, a natural rock spring that was elaborated in the early 1st century CE with rock-cut reliefs and inscriptions⁵⁷ as well as an external surrounding pool to collect the water (Figure 4.10; Garrido Elena et al. 2008).

Especially in and around Las Médulas, the visual changes to the landscape as a result of mining were vast—whole mountains were literally collapsed and rivers were redirected (see page 139). If these changes ruptured the indigenous religious or ideological understanding of the landscape, local populations had to find ways to cope. It is clear that, in other areas of northwest Iberia, mountains and springs that already held religious significance were commemorated, often by the effort of local individuals who must have held a social memory of the importance of these places to their communities. At Las Médulas, on the other hand, places with similar significance were transformed or obliterated. Thus, at least in the initial years of gold mining, the destruction of the landscape must have, in turn, had a destructive effect on the local sense of community

⁵⁷ Two inscriptions refer to the man who ordered the construction, reading “[CEL]ICVS FRONTO/ARCOBRIGENSIS/AMBIMOGIDVS/FECIT” or “Caelius Fronto of Acrobrigs, Ambimogido, built (this monument),” and “CELICVS FECIT” (Celicus built it). Another inscription associated with a bust carved in relief in a niche reads TONGONABIAGOI, a dedication to a Lusitanian god by that name. A standing togate figure has been interpreted variously as Celicus himself or the indigenous deity Nabia. Regardless of the interpretation, this monument indicates a probable association of the spring with indigenous deities prior to its monumentalization by a private individual (Tranoy 1980; Leite de Vasconcelos 1905). For inscriptions: *CIL* II 2419 = *ILS* 6922 = *AE* 1986, 386 = *HEp* 1, 1989, 666).

and its place in the wider landscape. I argue that a new sense of community emerged as the landscape became an industrial one, which was based not on interactions within a castro in its immediate landscape, but on interactions that took place in and between the many settlements that emerged as embedded parts of the new industrial landscape. This is best addressed in the context of changes in settlement and households at Las Médulas in the following section.

Settlement, Household, and Daily Life at Las Médulas

The settlement patterns and organization of households within settlements changed dramatically after Roman conquest and reorganization of the local populations to support the rapidly growing gold mining industry at Las Médulas. In the first two centuries CE, the number and diversity of settlements increased dramatically, and their relationship to mining activity is unmistakable based on their placement in the landscape (Orejas & Sastre 2000: 253). When the indigenous populations were reorganized and late Iron Age castro settlements were abandoned or destroyed, new settlements emerged, the inhabitants of which performed a variety of activities both directly and indirectly associated with gold mining. These could include gold mining itself; maintaining the elaborate system of water channels, aqueducts, and basins needed for hydraulic mining; participating in the agricultural or pastoral activities necessary to feed the population directly involved in mining; and metallurgical production of mining tools, among other tasks. Thanks to a series of small-scale excavations that bridge the Iron Age-Roman divide, it is possible to examine the basic organization of settlements and households dating to both directly before and after the Roman conquest of Las Médulas. In the following pages, I examine the castro settlements in existence prior to Roman conquest

and the kinds of daily interactions that took place in them. I then examine ways that elements of indigenous life were at once altered dramatically but subtly perpetuated in Roman-period settlements in the region. Overall, it is clear that certain aspects of indigenous life were maintained such as domestic organization and basic consumption practices. But incorporation into the mining landscape fundamentally altered social and economic interactions at Las Médulas and influenced a shift in community formation processes at the settlement and household level.

Iron Age Settlements and Households at Las Médulas

Several settlements within the immediate vicinity of Las Médulas predate Roman conquest. These include El Castrelín de San Juan de Paluezas, Corona de Corporales, and El Castro de Borrenes. As is clear from their distribution in the landscape (Figure 4.11), these sites fit well within the pattern of non-hierarchical, deep rural castros of the second Iron Age: each settlement was located on a prominent hilltop in the region with easy access to the river valleys and nearby fertile land. Of the three, it is possible to examine the internal buildings and domestic space only at El Castrelín and Corona de Corporales. Borrenes, on the other hand, provides a vivid example of the rapid and intentional destruction of an indigenous settlement at the time of Roman conquest. Together these settlements underscore the independence and isolation of Iron Age communities prior to Roman conquest. Further, they demonstrate the key roles of the fortifications and the domestic units within each castro in maintaining the imagined community conceptually, and also in structuring the economic organization necessary for the very real survival of the community as a whole.

Some general patterns are attested in the houses at both El Castrelín and Corona de

Corporales. Although there is large diversity in the shape and size of excavated domestic units, all have walls constructed of local stone—primarily shale and quartzite—with local red clay mortar. This stone construction was supplemented with and reinforced by wooden elements including posts and roofs constructed from beams and other plant material that does not survive.⁵⁸ Separate houses do not abut one another or share party walls, even though they are tightly packed in order to fit within the castro perimeter or fortification walls. The space between domestic units is often so small that it is rendered functionally useless (Fernández-Posse 2000: 65), so it seems likely that the separation of individual units was a social choice, perhaps to spatially delineate family units. Within houses, there is often variation in the size and quality of individual rooms. Those of the finest construction with defined plans and paved floors are usually interpreted as storerooms, equipped to keep food dry in the damp environment. The living spaces are often secondary in quality to the storerooms and irregularly shaped, but can be identified by hearths, stone benches, and domestic equipment such as cookware. Finally, workshops and places for other auxiliary activity such as patios or animal corrals are the most poorly constructed of all the rooms, and likely left unroofed⁵⁹ (Sánchez-Palencia, Fernández Posse, et al. 1999: 27–31).

⁵⁸ Although there is some debate about the original appearance of castro constructions, most scholars agree that wooden beams and plant material would have been used to construct the roof and other non-permanent elements of the structure (Sánchez-Palencia, Fernández Posse, et al. 1999:27-31). Hypothetical reconstructions of houses can be seen at Santa Tecla (Galicia, Spain), Briteiros (Portugal), and Sanfins (Portugal) (e.g., Figure 4.4; Figure 4.12).

⁵⁹ Studies of castro settlements typically utilize this relatively rigid classification system for room functionality. While archaeological preservation and extant data make it difficult or impossible to get seasonal temporal resolution, it is worthwhile to question whether some of auxiliary activities would have been seasonal if they were confined to outdoor space or interior rooms were more multifunctional than this classification system implies.

El Castro de Borrenes

Borrenes was in its initial phases of construction at the time of Roman conquest of the region at end of the 1st century BCE and probably not yet permanently inhabited. The only surviving feature of Borrenes is the exterior fortification wall, four meters wide and two meters tall extending around the entire perimeter of the site, with a trench around the southwestern extension outside the wall (Figure 4.13; Sánchez-Palencia, Fernández Posse, et al. 1999: 39)⁶⁰ only two small dwellings and very little archaeological material were discovered inside the fortifications. This situation demonstrates that the castro walls were the formative and defining element of castro sites, so essential to the existence of the castro itself that the fortification walls were built before any major domestic structures on the interior, at least at this later point in time. The order of construction of settlement elements beginning with the wall, if this site can be taken as typical, also explains the unusual shape of many domestic units at other castro sites—built to conform to castro walls within settlements rather than the reverse situation. At Borrenes, however, the process of construction seems to have been cut short: the site was destroyed rapidly and never inhabited again after Roman conquest, as can be observed in the collapsed walls⁶¹ and absence of materials dating to the 1st and 2nd centuries CE. Borrenes serves as an important testament to the destruction of indigenous sites and re-distribution of

⁶⁰ The wall was still under construction, as demonstrated by the remains of oak beams against the excavated portion. The construction itself was made by collecting quartzite and shale from the surrounding area, including from the trenches excavated around the walls as it was being made. The exterior faces of the walls were made with the most regular stones, and the interior was filled with rocky rubble (Sánchez-Palencia, Fernández Posse, et al. 1999: 39).

⁶¹ This destruction appears intentional and rapid rather than as a result of gradual abandonment, since both sides of the wall collapsed outward and the collapse layers contain only material predating the castro (Sánchez-Palencia, Fernández Posse, et al. 1999: 43).

local populations that occurred in the wider region at the time of Roman conquest (Sánchez-Palencia 2000: 57).

El Castrelin de San Juan de Paluezas

El Castrelin de San Juan de Paluezas is located on a hilltop close to the Sil River from which all of the Bierzo Valley is visible. The settlement has two separate but adjacent walled enclosures that encircle a total area of about 2.5 hectares. The castro was occupied between the 3rd and 1st centuries BCE, after which it was gradually abandoned, but not violently destroyed like Borrenes (Fernández-Posse 2001). This is one indication that the new social and territorial organization of the region likely rendered such castros obsolete, and inhabitants could have been forcibly resettled or chosen to leave as a result of their new situation, even when their castros had not been physically destroyed.

Although the entire settlement has never been excavated, two sectors were excavated between 1990 and 1994 (Figure 4.14; Sánchez-Palencia 2000: 53). Evidence for seven discrete domestic units has been uncovered, each containing its own storeroom and sharing no party walls with neighboring houses; the excavators estimated that there were around 35 houses in total (Figure 4.15; Fernández-Posse & Sánchez-Palencia 1998: 133). Thus, even though agriculture was likely being carried out communally beyond the castro walls, products of these labors were divided and stored separately in each house.

Significantly, entrances and doorways were placed such that each domestic unit opened into a separate external area—there were no shared or public roads, paths, or open spaces.

The material record, consisting of predominantly locally produced objects, is demonstrative of the independence and isolation of Iron Age settlements prior to Roman conquest. No wheel-made ceramics or circular querns were discovered at El Castrelin,

though these objects were already common in other parts of the peninsula. Although no direct evidence for metal production at the household level was found at the site, studies of middens have helped to clarify questions about specialized production in metals. The majority of waste products from bronze production were uncovered in a trash heap outside of one group of houses in the southwest (midden G). Because of the arrangement of house doors, it is logical to conclude that middens likely belonged to the nearest individual house rather than multiple houses. Although the house associated with midden G remains unexcavated, it is possible that its residents were the primary producers of bronze products at the settlement. Refuse from iron smelting, on the other hand, was mostly discovered in another midden, and presumably associated with a different household (Fernández-Posse et al. 1993: 215). Although the fact that the houses in question are both unexcavated renders this hypothesis tenuous, it is clear that metals were produced on site and likely by specialists alongside and among a host of other activities including ceramic production and agriculture that would have been carried out by the various other households. Even if metal was the specialized task of the members of a single household or two households, members of the community as a whole would have conceived metallurgy as one of many quotidian tasks and certainly not as the defining element of the community.

La Corona de Corporales

La Corona de Corporales, a castro located outside of the official ZAM to the north on an isolated hill above the Eria River, was subject to the same systematic destruction—presumably at the hands of the Roman army—at the time of Roman conquest as was Borrenes. This settlement, complete with a surrounding wall and trench enclosing an area

of roughly 1.3 hectares (Figure 4.16), appears to only have been inhabited for a few generations during the 1st century BCE until its violent destruction. In form and organization, La Corona de Corporales is quite similar to El Castrelín, but its violent end meant that materials from the last phase of occupation were better preserved than those found at El Castrelín. Excavations in 1978 and 1983 revealed six house structures including a complete house that appears to have specialized in metallurgical production (Sánchez-Palencia 2000: 55–56; Sánchez-Palencia & Fernández-Posse 1985; Sánchez-Palencia & Fernández-Posse 1988), which corroborates the suggestion that most castro communities had the means to produce their own metal objects and that this work was undertaken as a specialized, not a communal, task. In total, there were likely between 25 and 30 houses at the settlement (Fernández-Posse & Sánchez-Palencia 1998: 133).

The house dedicated to metal production at Corporales consisted of three built spaces and a large outdoor area (Figure 4.17; House D in Figure 4.16). The ceramic assemblage and furnishing uncovered in the northernmost two rooms indicate that this was not just a workshop, but a domestic space as well. The third room appears not to have been a completely covered interior space, but the stone base for an organic superstructure that covered the two pits used for smelting metal; a third less formally delineated space below also contained a smelting pit. The exterior patio of these buildings, which is about twice as large as average, was littered with abundant slag, broken fragments of ceramic bowls used for smelting, and fragments of crucibles. The range of materials uncovered attests to the fact that bronze and iron were being smelted by the residents associated with one domestic unit, a distinctly different situation than that proposed for Castrelín, where each metal may have been worked by a different

household. Notably, this house contained no space that could have served as a storeroom, indicating that the inhabitants were dependent on trade with other households for access to food supplies. Fernández-Posse and colleagues have proposed that this house provides clear evidence that certain community members engaged in metallurgy as a full time occupation (1993: 205), again underscoring the economic interdependence of households within a castro as well as the pre-Roman role of metallurgy within castro settlements.

Together, these three settlements provide a picture into daily life prior to and at the moment of the Roman conquest of Las Médulas. In particular, the spatial organization of domestic units seems to indicate that each household was the primary locus for interaction. The absence of public space and presence of separate-facing doorways suggests that many interactions took place within the house among co-residents, who were probably family groups. On the other hand, the fact that all of the houses were organized within the castro walls is indicative of the fact that household units were bound together and interacted with their wider community for certain tasks including animal husbandry and agriculture, activities which provided the setting for constant interaction, and cemented social and economic relationships that bound each community together. Other tasks, including metallurgy, appear to have been the specialized domain of one household whose members were an integral part of the wider economic system at the castro level. Notably, no gold objects were found at any of these castros and—though metallurgy played a role in the daily lives of people at these settlements—gold mining, at least at a detectable scale, was entirely absent despite abundance of gold in nearby alluvial deposits (Fernández-Posse et al. 1993: 214).

Roman-period Settlements and Household Organization: the Emergence of a New Social Order

Based on a series of small-scale excavations and systematic surveys, the team of Spanish researchers working at Las Médulas since the 1980s has classified many of the known post-Roman conquest settlements by their primary functions (Sánchez-Palencia et al. 2002: 249) ranging from productive activities like agriculture, tool production, and mining to those involved in maintaining other features of the mining landscape, such as the channels, basins, and aqueducts that fed into the gold mining areas. Those settlements closest to the areas of intense gold exploitation are often categorized as housing the miners themselves because of the convenient access to the mines. Settlements that appear to have been dedicated to agriculture were located both north and south of the mines, either near the Sil River to the north or the Cabrera River to the south, which would have provided easy access to water and fertile land (Figure 4.18).⁶²

Most of these settlements maintain some characteristics of pre-Roman castros, including the traditional construction methods using local shale, limestone, and quartz with clay mortar and wood for houses. On the other hand, many fundamental elements of older castros disappeared—only some settlements were located on hilltops or near rivers but these geographic features no longer seem to have played a primary role in determining settlement location. While I argue that local people were still responsible for constructing their own settlements, which is directly visible in construction methods that

⁶² There are, of course, some limitations to this kind of functional interpretation of settlements. Because of the mixed populations living at each settlement, including women and children, and the basic needs of families there would inevitably have been various tasks performed by most communities. In categorizing by functional differentiation, the excavators are referring to the primary activity associated with each site based on a combination of elements including location and material uncovered in them. Further, this kind of functional differentiation and of rural Roman-period castro sites is also seen away from mineral zones (Sánchez-Palencia et al. 2002: 249).

are not observable in the Roman cities or settlements in the region, the Romans do appear to have enforced certain restrictions. Significantly, settlements were no longer built within surrounding walls (Sánchez-Palencia et al. 2002: 252). This might have been one logical restriction to put in place in order to discourage communities from fomenting uprisings in defensible settlements and undermining new Roman authority in the region. Further, a lack of site-surrounding walls would have eliminated the single most visible element of community cohesion from pre-Roman times. The absence of fortifications would have reminded the inhabitants of such settlements of the emerging imperial economic and social organization, in which they depended not on other households within a settlement but on other settlements for everything from subsistence, to material goods, to protection. Here, I examine three sites that are representative of different elements of the new economic and social order.

El Castro de Corporales, an indigenous settlement specializing in hydraulic technology

Located less than 1 kilometer from the hilltop settlement La Corona de Corporales, El Castro de Corporales was a new settlement with two phases dating to the very end of the 1st century BCE and the first decades of the 1st century CE (Sánchez-Palencia & Fernández-Posse 1985: 113–274). There are convincing signs that the inhabitants were relocated from La Corona or other nearby Iron Age settlements. The new settlement sprung up soon after the destruction of the old one. In addition, the continuity of various indigenous practices, such as basic architectural construction methods, domestic material culture including a high percentage of indigenous ceramics, and a similar diet to that observed at La Corona suggests a continuity in the composition of the population.

There are several notable differences in the organization of this settlement compared to La Corona de Corporales. In stark contrast to the apparent pre-Roman practice of having one or at least very few households that specialized in metallurgical production of iron and bronze, there were signs of metallurgy in a space that was shared between houses (Fernández-Posse et al. 1993: 215). In other words, common or public spaces not observed in pre-Roman sites now not only existed, but accommodated activities including metallurgy that were previously the domain of specialists working at the household level. Though less than half of the settlement was excavated, it does appear that there was a planned orthogonal layout along a northeast-southeast axis (Sánchez-Palencia & Fernández-Posse 1985: 233).

In addition, the placement of this settlement in the Eria River valley but still very close to the recently-destroyed La Corona may have had both a practical economic purpose but also a symbolic one. The new site was strategically located near the Eria River, where water was harnessed and funneled into excavated trenches, which led to water channels that ultimately served the gold mines at Las Médulas.⁶³ The excavators have hypothesized that the new castro specifically served the construction and maintenance of this part of the hydraulic system that fed into Las Médulas (Ruiz del Árbol et al. 2000: 235). Living in this location then, meant that the daily practices of the population were primarily directed towards one element of the overall mining system. This was not to the total exclusion of other activities, as is evident in the site-based

⁶³ The excavation of these trenches, which surround the site, has also been interpreted as a method of gold exploitation in and of itself were naturally occurring trenches were widened in search of gold (Sánchez-Palencia & Fernández-Posse 1985: 232) Significantly, the castro was built inside these trenches, which could have taken on some of the functions of the former constructed walls. These trenches are fairly typical of contemporary mining-related settlements (Matías & Rodríguez 2006: 217; Sáenz & Vélez 1974).

production of metal objects; certain other subsistence goods and products were likely also produced within the castro, but the *raison d'être* of the settlement was in its functional role in the wider mining landscape. Finally, living literally in the shadow of the destroyed and depopulated La Corona must have been a constant reminder to the inhabitants of the rupture to the former social order, the disappearance of their former independence, and their new role as one of many settlements dedicated to mining.

Orellán, an indigenous settlement specializing in iron metallurgy

For the sake of comparison with the pre-Roman metallurgical activity at the castro sites described above, it is useful to examine the iron-tool producing community of Orellán, which is located on a hilltop just east of the largest gold mines and which was inhabited in the 1st and 2nd centuries CE, for at least 150 years. While the hilltop location does replicate pre-Roman practices, it is unclear whether the choice for this settlement position was made based on the Iron Age tradition or on the close proximity of easily exploitable iron deposits. Regardless, the setting would have been familiar to the inhabitants of Orellán, who were likely also relocated from destroyed or abandoned pre-Roman castros. The construction methods used for the excavated houses in the settlement are of indisputably indigenous origin. They were made of predominantly local limestone with clay mortar, but also pragmatically took advantage of the locally produced slag to level walls and drainage systems. Each domestic unit consists of several rooms, with some interior dividing benches similar to those seen in Castrelín and other Iron Age castros. Additionally, houses do not share party walls, but the space between individual houses is minimal as was also observed in pre-Roman castros (Orejas & Sastre 2000: 265). Both the choice to live on a hilltop and to maintain the familiar household

organization structure, in which family units were conceptually and spatially delineated by the discrete houses they lived in, suggest that—despite drastic changes in settlement organization and function—some attempts were made to maintain indigenous ways of life at the household level.

On the other hand, there are several noticeable changes to pre-Roman castro structure that reflect changes in the organization of the community that came with the emerging social order. These include, again, an orthogonal layout of the town with doors opening onto a central, shared street—a stark contrast to earlier castros lacking shared space or central places (Figure 4.19). Like most new settlements, Orellán lacks fortification walls, the absence of which would have been constant reminder to Orellán's inhabitants that they were no longer independent, but part of the larger Roman socio-economic system in place around the gold mines. Further, it lacks even the trenches seen at El Castro de Corporales that would have served a hydraulic function, but could have replaced the walls in some symbolic aspects as well.

Aside from these structural changes to the settlement configuration, it is apparent that the organization of production changed dramatically from that observed at Castrelín and Corona de Corporales. Orellán appears to have been completely dedicated to the exploitation of iron deposits surrounding the settlement, and to the production of iron tools used in gold mining, which were standardized across the entire ZAM. Additionally, some lead and bronze items of personal adornment were produced at Orellán, but to a much more limited extent than utilitarian tools (Orejas & Sastre 2000: 264). There are frequent remains of furnaces and slag present throughout the site—not just confined to the metallurgical sector, and slag is also found in substantial heaps on the hillside

(Sánchez-Palencia, Fernández Posse, et al. 1999: 113).

If, indeed, the community was principally dedicated to metallurgy, they would have relied on local, regional, and long distance supply networks for other products, including food and ceramics. Indeed, there is no evidence of food storage in individual houses, which do not contain storerooms as was the custom for each domestic unit in pre-Roman castro settlements. Rather, in a distinct shift from pre-Roman times, one large communal storeroom was established that opened onto the main street, and was presumably used as the food supply for the settlement as a whole (Figure 4.20). In it remains of 70 kilograms of grain, including wheat, millet, and broad bean were uncovered (Orejas & Sastre 2000: 276). The prevalence of traces of metal production, coupled with this communal food supply, seem to indicate that the inhabitants of this settlement were primarily dedicated to production of metal tools for gold mining. In contrast to the pre-Roman pattern, the products of their labor were used outside of the settlement and food must have been brought in from another locale. The same is true of the ceramic assemblage: while indigenous handmade ceramic styles remained dominant at Orellán (they made up 59.6% of the overall assemblage), the community also had access to Roman wheel-made styles including thin-walled vessels and terra sigillata from elsewhere in the Iberian Peninsula (Sánchez-Palencia, Fernández Posse, et al. 1999: 113), a material indication of the connection to much wider economic networks than was previously the case.

Overall, Orellán provides a clear example of an indigenous settlement in which some lifeways dating to the Iron Age were preserved even in the face of drastic social and economic changes. This is especially clear in house construction and the apparent preference for indigenous ceramics and traditional agricultural products. On the other

hand, certain ruptures in traditional community formation are clear in the lack of a site surrounding wall, the increased access to goods produced outside of the castro, and finally in the predominance of one and not multiple occupations of the sites' inhabitants.

Las Pedreiras de Lago, a new Roman administrative settlement

In contrast to El Castro de Corporales and Orellán, in which construction techniques and material culture remained in many ways consistent with pre-Roman indigenous tradition, Las Pedreiras is an example of a Roman-period site that completely broke with indigenous patterns. The site is a Roman-style house that resembles other Roman villas of the region in basic plan, with a central peristyle courtyard surrounded by rooms (Figure 4.21). It was located close to the Augustan-period road (*via XVIII*) between Austurica Augusta and Bracara Augusta, which gave the site's inhabitants ready access to the transportation routes between these two *conventus* capitals as well as to the gold mines directly to the southeast.

The house itself was constructed using Roman methods and material preferences, including fired clay roof tiles and bricks; plaster mortar for the stone walls, plastered interiors, and plaster flooring in many of the rooms; glass window panes; and a drainage system using roof tiles as a cover. Additionally, some interior walls were painted to imitate marble, reminiscent of the first style of Pompeian wall painting. Similarly, the material assemblage from Las Pedreiras included Roman-style goods such as wheel- and mold-made ceramic, while indigenous ceramic was notably absent (Sánchez-Palencia, Fernández Posse, et al. 1999: 118–119; Sastre & Orejas 2000: 291–295).

Although Las Pedreiras looks essentially like a Roman villa, there is no evidence of any associated agricultural production. Its proximity to gold mines and to the major

Roman road that passed through the region suggest that the site housed people involved in upper-level administration of the mines. These could have been local aristocrats who had integrated themselves into the new Roman social order and adopted a residence and lifestyle fully Roman in appearance. More likely, however, is that Las Pedreiras housed dependents of the *officina metallorum*, who would have been imperial freedmen, or even the *procurator* himself. While there is no epigraphic evidence to suggest who precisely inhabited the residence, it is clear that they were engaged in none of the same productive activities—either mining or agriculture—as nearby settlements, and that the house and its contents lacked any connection to indigenous traditions or communities. The inhabitants of this house would have been responsible for interacting with those involved in wider trade and distribution networks that came with the provincial reorganization, and likely would have interacted with those who were more directly involved in mining or subsidiary activities. Although their lifestyle differed from nearby settlements with indigenous inhabitants, their daily interactions would have brought them into close contact with these indigenous communities and with the mining landscape, in a sense incorporating them into the wider constellation of settlements that formed the overall mining community.

Based solely on these data collected at the settlement and household level, it is clear that social and economic networks of communities at Las Médulas were greatly expanded in the centuries following Roman conquest, but with that came a loss of autonomy for local communities. I argue that this loss of social and economic independence and the incorporation of each community into the emerging social order fundamentally altered the perception of communities among the indigenous inhabitants of

the region. They would have come to rely on the work of those beyond their castro-group for survival, and—simply based on the fact that whole communities were engaged primarily in single tasks—individuals in community groups would have begun to base their identities on their role among the settlements in the wider mining landscape rather than on their role among the co-residents of their settlements. As the following sections show, the organization of settlements directly relates to both the organization of labor and the kinds of technologies that were used in gold mining.

Innovation and Persistence in Gold Mining Technology and Labor Organization

Although access to gold resources did not play any major role in settlement patterns in and around Las Médulas in pre-Roman times, gold working was a long established tradition, broadly, speaking, among castro populations in the Iron Age and indeed from at least the beginning of 3rd millennium in the region (García Vuelta 2007: 25). Studies of pre-Roman gold-working have typically been dominated by typological analysis of artifacts, but it is possible to deduce much about the methods of gold prospection and extraction practiced by castro communities, and the drastic shifts in both extraction technology and labor organization after Roman conquest. Whereas panning for gold among members of castro communities was enough to sustain artisanal levels of gold production in the Iron Age, the near industrial scale of production after Roman conquest required the introduction of new hydraulic technologies and an increased and diversified labor force to sustain these activities. This new system of organization, which developed alongside the new settlement patterns discussed above, had the effect of expanding networks of interaction and connecting people across social groups, which

would have contributed to the creation of communities centered on mining at Las Médulas.

Iron Age Gold-Working Technologies and Labor

In the Iron Age of northwest Iberia, gold was extracted not from mines but simply by panning for gold in the alluvial gold deposits found in sandy riverbeds and terraces throughout the region, a method that left no archaeological traces (Sánchez-Palencia, Pérez, et al. 1999: 14). Ethnographic observation and archaeological reconstructions have shown that, once placer gold deposits were located, pans (or *bateas*) made of metal or wood could be used to scoop up the material. Once shaken, the gold pieces sank to the bottom and lighter rocks and debris were manually removed from the top. Then, gold was collected and melted down to remove impurities, or to mix as an alloy, most commonly with silver and copper (García Vuelta 2007: 32–34). This process is also described by Strabo, quoting an older passage by Posidonius: “This soil, however, he adds, is brought by the streams; and the women scrape it up with shovels and wash it in sieves woven basket-like” (3.2.9; trans. H.L. Jones).

If Strabo’s words are to be trusted, then there is some indication that this was a women’s task among castro communities. Regardless of gender, however, no major technological feats had to be devised to collect gold because of the relatively simple method of extraction; only the patient labors of people over long durations of time were necessary (García Vuelta 2007: 32–34). According to Sánchez-Palencia and colleagues, it would take a season of work during the summer—when conditions were best for working in and around the rivers, and seasonal snowmelt had washed gold down from mountains—to obtain between 12 and 14 grams of gold. By these calculations, it might

take a single person working seasonally between two and three years to discover enough gold to make a pair of earrings (Sánchez-Palencia, Fernández Posse, et al. 1999: 55–56). This work was probably not a specialized or unique task of a single person or group of artisans, but rather undertaken on a small scale by castro communities alongside a many other daily and periodic projects that were more essential to survival; for instance, alongside washing and collecting water in nearby rivers.

The true technological feats were not in panning for gold but in crafting the elaborate pieces: torques, armbands, and other jewelry, which served as luxury objects either for corporeal decoration—probably of warriors⁶⁴—or stored as a form of collective wealth that reinforced hierarchical social differentiation among household and communities (Braz Martins 2010b: 67). The lost wax technique was employed for crafting many objects, which were then decorated with filigree and granulation, stamping, incision, and soldering (Braz Martins 2010b: 72–73). Significantly, gold was never made into coinage in this period in northwest Iberia.

Though many gold artifacts lack precise provenance, most come from domestic contexts rather than funerary contexts, as was the case in the Bronze Age (García Vuelta 2007: 30). It is important to note that, while such pieces did play a role in Iron Age social formation, gold objects were uncommon in northwest Iberia in general. Further, they were practically unknown in the region of Asturias (Sánchez-Palencia, Fernández Posse, et al. 1999: 56) and were increasingly rare leading up to the Roman conquest, even in regions such as Trás-os-Montes where they had been produced with relative frequency in the Second Iron Age (Braz Martins 2010b: 75). It was not until Roman conquest, when

⁶⁴ Warrior statues carved in stone often are adorned with depictions of torques (see Figure 4.22).

gold needed to be obtained to produce the *aureus* that gold mining began in the region on a large scale for economic rather than social purposes.

New Technologies: From Panning for Gold to Collapsing Mountains

The new scale and aims of gold mining after Roman conquest necessitated a complete shift in the technological methods employed for gold extraction, as well as in the labor organization that enabled mining to quickly become an enormous industry. Hydraulic mining techniques were introduced to the region, unattested archaeologically for previous periods. Because of the absence of large-scale mining in later periods, the physical remains of the mines in and around Las Médulas are remarkably well preserved. Additionally, in his *Historia Naturalis*, Pliny describes the process of gold mining based on what is thought to be his first-hand observation of Las Médulas (33.21; Appendix II). He served as procurator of Hispania Tarraconensis from 72 to 74 CE and likely visited the mines while they were at the height of operations (Syme 1969: 215–227).⁶⁵ Together, these sources allow for an accurate reconstruction of the mining technologies employed in the 1st and 2nd centuries CE.

Las Médulas is located in an area of Asturias with abundant secondary deposits of gold that were targeted using various types of hydraulic mining. Secondary deposits are found as nuggets in alluvial deposits in and around auriferous conglomerate formed by

⁶⁵ Pliny's precise and accurate description of this process matches the archaeological remains at Las Médulas perhaps better than any other mine in the Iberian Peninsula (Bird 2004; Bordes & Domergue 2007). Pliny also indicates that he is referring to northwest Iberia, and names Asturia, Gallaecia, and Lusitania specifically (*HN* 33.78).

alluvial deposition in the geological past.⁶⁶ (Primary deposits, on the other hand, refer to gold that is embedded in rock—usually quartz—and mixed with other metals and impurities. They are also common in northwest Iberia.)⁶⁷ Gold prospecting was executed by cutting a series of trenches along parts of the mountain to access different levels of conglomerate and washing water over them to determine which produced the highest gold content (Pérez García & Sánchez-Palencia 2000: 173). Common mining techniques included the converging grooves method and trench channeling. In the first, a series of targeted grooves were carved into the surface down to the bedrock, all of which lead towards a single channel where all loose material was directed, manually sorted, and gold was decanted. These are visible today, especially through aerial photography, at La Frisca (Figure 4.24). In trench channeling, a more extensive method, water was led through a series of basins and channels located high in the mountains, and directed down over hilltops to erode large trenches of conglomerate away down to the bedrock. The dislodged conglomerate was washed towards the valley below, where rocks were discarded and gold was decanted. The vast trenches and channels of La Furnia and El Couso are visible from the Mirador of Orellán today (Figure 4.25; Sánchez-Palencia, Fernández Posse, et al. 1999; Pérez García & Sánchez-Palencia 2000).

⁶⁶ For a more complete description of the geology of the region, see: Pérez García & Sánchez-Palencia 2000: 144–157; Sánchez-Palencia, Pérez, et al. 1999: 10–12; Sánchez-Palencia, Fernández Posse, et al. 1999: 61–73; Pérez-García et al. 2000.

⁶⁷ Different systems of gold mining were required to extract primary gold deposits, variations of which are also found in various parts of the Iberian Peninsula, including the northwest. These include both open-cast mining where large pits are excavated to extract gold and shaft-and-gallery mining, where gold veins are followed underground and extracted for processing on the surface. The extracted material then had to be processed through crushing and burning in order to separate the gold ore from its mother rock and remove any impurities. The second method is also described by Pliny (*HN* 33.68-69). For an excellent description of the various types of primary and secondary gold mining employed in northwest Iberia, see: Matías & Rodríguez 2006: 213–241.

The third and most famous method, Pliny aptly termed *ruina montium*—the collapsing of mountains—or *arrugiae* (*HN* 33.70). This technique was achieved by maneuvering large quantities of water into tunnels excavated into the mountains to weaken their structure and finally collapse them in order to loosen and wash out the gold nuggets. In the first stage of this process, a series of deep underground and interconnected tunnels with no external outlet below were dug into the auriferous conglomerate of the mountains of Las Médulas. The remains of some galleries are still extant, including the standing galleries of Orellán, which were abandoned in an uncollapsed, standing state in the final phase of mining (Figure 4.26) as well as La Cueva, a large cave thought to be the hollowed remains of a series of collapsed galleries (Figure 4.27). Pliny describes the operation of digging tunnels as a laborious and dangerous task: “By means of galleries driven for long distances the mountains are mined by the light of lamps—the spells of work are also measured by lamps, and the miners do not see daylight for many months” (*HN* 33.70). He asserts that arches were enforced to support the weight of the mountain while the workers were still inside, and that they had to employ “iron wedges and hammer-machines” to break up the masses of flint found encountered in the tunnels (Appendix II; *HN* 33.70-72).

Simultaneously, an elaborate system of water channels (*corrugi*) and tanks were carved into the mountains to bring water from the rivers to areas just above the tunnels. The channels themselves were usually between 60 centimeters and 120 centimeters wide and reached distances of up to 100 kilometers, as was the case with those connecting to the Ería River; tanks could have up to an 18,000 cubic meter capacity (Figure 4.28; Sánchez-Palencia & Sastre 2002: 244). Many of these features are visible in the

landscape, and there is reason to believe that still others have gone undetected: recently LiDAR survey has confirmed that the hydraulic networks in the Ería River valley pertaining to nearby mines were much more extensive than previously known (Fernández-Lozano et al. 2014). LiDAR work around Las Médulas could produce similar results. Pliny describes the complexities of constructing the hydraulic system:

The workman hewing the rock hangs suspended with ropes, so that spectators viewing the operations from a distance seem to see not so much a swarm of strange animals as a flight of birds. In the majority of cases they hang suspended in this way while taking the levels and marking out the lines for the route, and rivers are led by man's agency to run where there is no place for a man to plant his footsteps (*HN* 33.74-75; trans. H. Rackham).

This process would have involved a great deal of manpower and engineering skills, as the water had to be redirected at just the right angle and speed to produce the desired effect (Sánchez-Palencia, Fernández Posse, et al. 1999: 84–90).

Once the groundwork was laid, gold was extracted in three steps. First, a rush of water—created by opening up the stopping barrier on the tanks—was directed into the galleries in order to collapse the mountains through hydraulic force, and break up the auriferous conglomerate. Next, the flow of water was directed towards channels (*agogae*) lined with wood and rosemary (according to Pliny) where the gold was allowed to settle. Finally, larger boulders and rocks were removed and fresh water was washed through the *agogae* to flush the gold particles into collection containers (Sánchez-Palencia, Fernández Posse, et al. 1999: 91–97; Pérez García & Sánchez-Palencia 2000: 182). It is likely that hydraulic gold washing ebbed and flowed according to seasonal water availability (Quiring 1935: 8). *Ruina montium* had an incredibly transformative effect on the landscape: sheer mountain faces of red, auriferous conglomerate left behind from collapse episodes poke up from the valleys (Figure 4.29). Further, an entire lake was

formed, Lago de Carucedo, when the accumulation of refuse from mining eventually blocked the flow of water out of a nearby valley (Figure 4.30; Sánchez-Palencia, Fernández Posse, et al. 1999: 98; Sánchez-Palencia & Sastre 2002: 249). This tremendous technological feat made possible the extraction of, according to Pliny, 20,000 pounds of gold a year in northwest Hispania, with Asturia supplying the largest amount (of Asturia, Gallaecia, and Lusitania) (*HN* 33.78).

On the Mixed Labor Force

Although the technology of *ruina montium* was a Roman-period innovation at Las Médulas, its success can only be seen as the result of the combined knowledge and labors of indigenous populations alongside the Roman army and other Roman officials. That such an operation was possible is a clear indication of the interaction and cooperation of these various groups with each other and the wider landscape—interactions that brought people together across lines of status and origin for the common purpose of gold mining. These labors and daily interactions would have contributed to the formation of a community centered in the mining landscape and perpetuated by the activities of mining.

There is little doubt that the gold mines were directly controlled by the state, which involved the participation of procurators (*procuratores metallorum*) and/or imperial freedmen as administrators as well as the army. There are several arguments in favor of this situation. For one, complete supervision and direction of the supply of gold was essential to the organization of the Augustan coinage system and economy of the time (Sánchez-Palencia & Sastre 2002: 249; Orejas 2002b: 10). The proximity of Asturica Augusta to Las Médulas as well as the prolonged presence of troops in the region demonstrate the state's interest in control of gold mining in the area. Las Pedreiras

appears to have been built in close proximity to Las Médulas for the purposes of direct administration by the *procurator* or a subordinate; both the architecture of the villa and archaeobotanical and faunal remains indicate that the inhabitants had non-indigenous preferences and, thus, were likely foreigners (see page 137).

The Roman troops, in particular, had multiple supervisory and participatory roles to play in mining and transportation. The technical knowledge of hydraulic engineering held by the Roman military was necessary for carrying out the task of redirecting water flow for use in the mines (Pitillas Salañer 2010: 63). The probable use of topographic tools such as the chrobate for calculating the angle of water channels and a system of using ropes for marking out new paths, which is described by Pliny (*HN* 33.74-75), indicate that a high degree of specialization was required. The troops are the obvious candidates for this work because of their training in other kinds of engineering including road and aqueduct construction (Pérez García & Sánchez-Palencia 2000: 199). Aside from their technical skills, the army was likely involved in the organization of the indigenous labor force and in facilitating communication between different castro populations and administrators.⁶⁸ In the wider landscape, soldiers were probably responsible for accompanying gold as it was transported to Rome via overland convoys (Santos Yanguas 1993). The army's involvement in road construction in the region as well as the position of cities facilitated this arrangement. Land transportation was apparently considered safer than shipment by sea; Domergue (2010: 114) points to the

⁶⁸ While some have argued that the army was also in direct control of slaves and condemned laborers who worked in the mines (e.g., Santos Yanguas 1997; Santos Yanguas 1977: 5), it is unlikely that workers of either status made up a large portion of the overall pool of workers at Las Médulas. The settlement and household evidence much more strongly supports local populations as the primary source of labor.

absence of any known shipwrecks carrying Iberian gold ore to corroborate the overland transport hypothesis.

Despite the major shifts in technology and the key roles that the Roman administration and the army played in gold mining, indigenous populations were a major part of the labor force for mining and subsidiary activities, which has become increasingly clear in recent decades. The archaeological evidence for the construction of houses and the kinds of material culture used offers a compelling argument that the inhabitants of most settlements at Las Médulas were indigenous to the region. Similarly, there is no evidence—epigraphic, archaeological, or otherwise—that slaves or condemned prisoners were used in any significant numbers or that there was a system in place for attracting free laborers as entrepreneurs, as was the case in many of the mines that will be discussed in later chapters. Nor is there any archaeological evidence at the settlement or household level to suggest the forcible enslavement of local populations—people were still living in domestic units and carrying out many aspects of their daily lives as they had previous to conquest. Instead, it is likely that local laborers engaged in these activities as part of the newly imposed Roman tax system, where communities in each *conventus* were responsible for providing tribute in the form of labor or goods (Orejas & Sánchez-Palencia 2010: 32–33). The Bierzo Edict supports this hypothesis; essentially in granting *immunitas* to a certain tribe (*Paemeiobrigenses ex gente Susarrorum*), we understand that other tribes did owe tribute under the new fiscal system that could have been paid through labor.

It is tempting to see the introduction of *ruina montium* and other hydraulic mining as a top-down imposition of new technologies and systems of labor organization, a

complete shift from indigenous practices. However, the archaeological and literary records do indicate that indigenous populations had a high degree of autonomy in how production was organized at the settlement level. The material evidence shows that many aspects of gold mining and subsidiary activities remained in the hands of indigenous workers and local traditions. At settlements such as Orellán, for instance, indigenous workers were the ones producing iron tools for mining—so one might expect to see persistent elements of indigenous production practices were the archaeological record detailed enough to study this. Continuity is certainly evident in production of other material goods, especially of pottery, so there is reason to believe that such communities were free to organize production according to their own traditions and preferences.

Further, some scholars have argued based on linguistic analysis of Pliny's passage that local laborers contributed to the technological development of even the most complex hydraulic mining at Las Médulas. At least 11 of 16⁶⁹ technological words in Pliny's passage on gold mining do not appear in other instances in Latin texts; some have suggested that this is because they were derived from vocabulary specific to the native inhabitants of northwest Iberia who were working in the mines (Adams 2007: 235–238). In most cases, the origin of the words is extremely difficult to pinpoint owing both to the linguistic diversity of the pre-Roman Iberian Peninsula and Pliny's use of impersonal terminology such as *vocant* to introduce foreign or technical terms (de Hoz 2011: 521). It is unclear whether Pliny is referring to mining engineers or army personnel who imported terms from their own disparate places of origin or indeed to indigenous miners, or some

⁶⁹ *Scoria* and *agoga* are derived from Greek whereas *sudor*, *canaliciu*, and *canaliense* come from Latin. All other terms appear to have other origins, though the direct etymology of these words is in most cases still up for debate (Adams 2007: 235–238).

combination of both to form a distinctive mining vocabulary of diverse origin (de Hoz 2003: 78). While this matter is still far from resolved (Oroz 1996), the evidence suggests that it is likely that at least some of this vocabulary originated in the Iberian Peninsula because of Pliny's first-hand experiences, because it is not attested in other sources of origin outside of Hispania, and because archaeological sources already attest to the active involvement of local workers in gold mining. If this is true, then Pliny's passage testifies to a mixed labor force—dependent on both on the work of local people and their knowledge of their own landscape, as well as the technological skill set of the army.

By way of conclusion, the collaboration necessary for the success of large-scale hydraulic mining and the system of labor organization required to sustain high levels of production brought various groups into direct, daily social interaction, in turn contributing to the formation of the mining community at Las Médulas. I do not mean to suggest that the formation of such a community negated the maintenance of other concentric or competing communities at settlement and household levels, or that the formation of the mining community eliminated unequal divisions of power among the different social groups involved—it did not. Rather, the interactions that brought people together in one productive landscape fostered the development of a mining community despite these things. Turning finally to the economy, the following section examines how the formation of this mining community impacted economic interactions at various scales.

Between Local and Imperial Economies

A Note on Iron Age Economies of the Northwest

Prior to Roman conquest, castro settlements in the region of Las Médulas were largely economically autonomous. In this rural area, settlements were constructed in places where inhabitants had access to a variety of resources necessary for subsistence, including agricultural and pastoral land, and water, as well as raw materials for producing metal and stone tools and items of personal adornment, among other goods. As discussed in the context of El Castrelín de San Juan de Paluezas and La Corona de Corporales above, the household was the basic economic unit; families stored their food within a storeroom in each house and produced many necessities at the domestic level.

Faunal materials recovered from El Castrelín indicate that whole adult animals—including ovicaprids, cows, and pigs⁷⁰—were raised and butchered on site rather than brought in from elsewhere (Orejas & Sastre 2000: 275). While archaeobotanical studies are extremely rare,⁷¹ sampling from El Castrelín has attested to the presence of emmer wheat, barley, millet, broad beans, and peas (López-Marino et al. 2010: 916), all of which were likely produced in the surrounding landscape. This diversity of cereals, including emmer wheat and barley that grow in the winter, and millet, which is harvested in the summer, indicates that the communities made an effort to diversify crops and ensure food availability throughout the year (López-Marino et al. 2010: 917).

The presence of metallurgical zones (or even houses directed towards metallurgy as a primary activity) in each settlement does, however, indicate that metallurgy was a more specialized activity than farming or animal husbandry. Even so, metallurgical

⁷⁰ Horses and wild animals including deer and rabbits are also attested, but in extremely low quantities.

⁷¹ This is both because samples are not always collected from excavations and because the acidic soil in many parts of Northwest Iberia does not preserve botanical samples well. It is rare for any organic remains to be uncovered in Iron Age contexts except those that have been burned (Parcero Oubiña & Cobas Fernández 2004: 3).

production was distinctly local: mixed composition of both bronze and iron objects found at each of these sites indicates that objects were made from metals available locally and that they were melted down and recycled repeatedly (Fernández-Posse et al. 1993: 209–213). This system of metallurgical production reduced the need for large-scale mining to obtain ores for producing bronze or iron objects; the absence of gold objects indicates that gold mining at any scale did not play an economic role at either castro prior to Roman conquest. Coinage was not introduced into the region until after Roman conquest (Centeno 2013).⁷²

It is important to note that, while this economic system was predominant in the rural, non-hierarchical castro settlements of the interior, it was not necessarily the norm for coastal settlements. Particularly after the 5th century BCE, those close to the Atlantic saw marked increase with foreign traders who would have sailed up the coast, bringing Punic and some Greek material, especially pottery to castro settlements. González-Ruibal has suggested that small communities of Punic traders can be detected in some castros in Galicia including A Lanzada (Ría de Arousa) and Punto do Muiño de Vento (Ría de Vito) based on the presence of shrines, Punic architecture, and materials including cooking pots (González-Ruibal 2006: 121-150). Later, Roman influence was again felt more strongly in coastal areas, where large castros such as Briteiros took on more characteristics of Roman style settlements including the addition of major internal roads. González-Ruibal reminds us that settlements situated more than 30 kilometers from the

⁷² Centeno explains that coinage was introduced on a large scale after Augustus' conquest of the region, and utilized on a more frequent basis in the most militarized areas, in new urban centers, and in places well connected to the new road networks. Other means of exchanged were used prior to conquest, including precious metals or other objects cut into weighted pieces for "pre-monetary use" (Centeno 2013: 212–214).

coast would have had little interaction with foreign traders or goods.⁷³ Few imported goods aside from glass beads and some ceramics made it very far into the interior during the second Iron Age (González-Ruibal 2008: 911). Little by little, Roman materials did make their way into the interior, and both Italian and Hispanic terra sigillata are attested at inland castros both before and after Roman conquest, albeit in much lower quantities during the second Iron Age than indigenous, locally-produced ceramics (Zarzalejos Prieto 2005).

Despite regional variation, especially in coastal settlements, it is clear from the material record that the economic independence of castro settlements in the region of Las Médulas during the Iron Age reduced the need for regular interactions beyond the castro level. Interactions in the context of economic production and subsistence activities within family units and between households within the castro reinforced the formation of communities at the local level. Regional or long distance trade interactions remained relatively rare, and the absence of both foreign traders and foreign goods would have further increased a sense community and interdependence within castros.

Roman Economies

The modes of economic organization at every scale changed in many ways after the Roman conquest, as connectivity throughout the landscapes of northwest Iberia increased with the addition of new roads and the emergence of more interdependent social networks. While this brought about a reorganization of traditional economic

⁷³ The possibility does exist that some goods of exotic origin have been overlooked at many inland sites, primarily because archaeologists specializing in the castro culture receive little training in the material culture of Punic or Roman tradition.

patterns and the availability of goods from places further afield, other aspects of subsistence and economic organization—especially habits of consumption—persisted.

Change and Continuity in Local Economies

Turning first to the local, the transformation of economies at Las Médulas can be best observed in the material record of the settlements, described above (see page 131). While in the Iron Age, settlements were self sufficient, producing a variety of crafts—lithics, ceramics, metal objects—as well as participating in agricultural activities and animal husbandry, the Roman period settlements at Las Médulas became much more directed towards their specific role in the mining industry. At El Castro de Corporales, for instance, many of the daily activities of residents likely revolved around the maintenance of the hydraulic system. Similarly, at Orellán, the primary purpose of the settlement appears to have been the exploitation of local iron deposits for the production of mining tools, while Las Pedreiras was primarily an administrative center. The archaeological team at ZAM has proposed a division of resource exploitation in Las Médulas where still other settlements that were located farther from the active mining areas in fertile agricultural zones may have been directed primarily towards agricultural production. These products, then, would have been distributed to other settlements in the region that could no longer meet their subsistence needs and—in a significant break from past practices—food was stored communally rather than in individual households. This is evident in the large deposit of seeds and other plant remains in a room open to the street in the settlement at Orellán described above (Ruiz del Árbol et al. 2000: 272–278). While I would caution against interpreting each of these settlements as uni-functional, and certainly a multitude of productive/economic activities likely happened in each of these

small communities, these patterns among the constellation of settlements in ZAM certainly represent a break from the more isolated economic systems of the past.

Other aspects of consumption, however, remained in alignment with local preferences. This can be seen in both the ceramic assemblages and food consumption patterns at these settlements. For instance, at Orellán, 59.6% of the ceramics recovered were handmade, indigenous forms, while the remainder included thin-walled vessels and terra sigillata from production centers in the Iberian Peninsula (Sánchez-Palencia, Fernández Posse, et al. 1999: 113). While the community evidently had access to foreign goods at an unprecedented level, a strong preference remained for local wares. Similarly, inhabitants continued to take advantage of preferred local food sources. While studies of botanical remains in northwest Iberia are few and far between, a comparison of the evidence of the Iron Age site of El Castrelin and Orellán shows that the basic array of plant species documented remained the same. These include emmer wheat, barley, broomcorn millet, and broad beans. López-Marino and colleagues have suggested that there were some difference in the intensity and scale of cultivation at Las Médulas, both of which rose in the Roman period, perhaps to produce a surplus for the growing needs of the community at large. In particular, there may have been greater attention to decreasing vulnerability by varying crops by season. Millet, which is a summer crop with a short growing season, was supplemented with winter crops such as wheat and barley to ensure food availability throughout the year. Further, the naturally-occurring chestnut tree in the region appears to have been domesticated beginning in the 1st century to increase and regulate the supply of this food (López-Marino et al. 2010: 915–919).

The basic availability of animal products also remained the same across the Iron Age-Roman divide. At El Castrelín, faunal analysis indicates the presence of ovicaprids, bovids, and suids (in descending quantitative order). At Orellán, all of these animal types were also present, but with an increase in bovids over ovicaprids. Significantly, however, in the Iron Age case, the faunal assemblage indicates that adult animals were probably butchered on site and all parts of the animal were available. This implies, too, that animals were raised locally. By contrast, the assemblage at Orellán contains a high frequency of butchered parts of animals, suggesting that— as with grain—much of the meat supply was coming from other settlements. The presence of non-local populations at the administrative site of Las Pedreiras indicated by the elevated number of wild species of rabbits, boar, deer, and fowl in comparison to both El Castrelín and Orellán. Orejas and other have attributed the presence of these wild species to a taste for hunting among Romans and/or Romanized elites in the region (Orejas & Sastre 2000: 275; López-Marino et al. 2010: 919–920).

Connectivity and Isolation in Regional Economies

Turning next to regional economies, there was undoubtedly increased economic connectivity both within the region of northwest Iberia and between this region and other parts of Hispania. The new road networks facilitated trade between cities, as northwest Iberia became linked in new ways with the province of Lusitania through roads leading from Bracara Augusta, to Conimbriga, to Olisipo in the south, as well as to other centers including Emerita and Hispalis. Additionally, other roads led west and north to major cities including the capital of Hispania Tarraconensis, Tarraco. These connections can be observed, for instance, in the supply of some Roman ceramic from regional production

centers as well as from Gaul and Italy to the Roman-era settlements in Las Médulas and elsewhere beginning in with Augustus and at increased levels in the Julio-Claudian era (Zarzalejos Prieto 2005: 180). Another important attestation of these trade networks can be directly observed in the supply of foodstuffs via amphorae throughout settlements in northwest Iberia. The establishment of Roman urban centers and the influx of army personnel, Roman administrators, and an emerging local elite within this Roman system had the effect of expanding access—at least among these elite, urban groups—to wine, olive oil, and salted fish products from Baetica. This can be observed in the presence of Dressel 20 and Haltern 70 type amphorae. Greco-Italian and African forms as well as wine amphorae from Tarraconensis are also present, albeit in vastly smaller numbers than the Baetican types (Carreras Monfort 1996: 205–207).

Nevertheless, these supply networks also betray certain continuities with the past. For instance, an analysis of amphorae from urban centers including coastal Campa Torres and interior Asturica Augusta and Legio (León) shows that coastal centers continued to have elevated access to imported goods as they had in pre-Roman times. Further, northwest Iberia maintained certain Atlantic connections, and the amphorae assemblages from this region show more similarities to the provinces of Britannia, Aquitania, Lugdunensis, Belgica, and Germania Inferior than to the Mediterranean and southern coast of Hispania (Carreras Monfort 1996: 205–207). It is important to remember that amphorae were primarily distributed via maritime trade networks, so these patterns are not necessarily surprising. They do, however, show that the geographic isolation continued to contribute to economic patterns region wide, despite the Roman political domination.

Imperial Economies

I turn finally to a note on the imperial economy. There can be no doubt that Roman interest in this region was directly connected to a desire to access gold. This was a system of direct exploitation rather than an indirect, or privatized, system as was probably the case for Republican and early imperial exploitation in the southern Iberian Peninsula. As a result of Roman interest in gold, local and regional economies were transformed in the many notable ways described above. From an imperial perspective, while these local communities underwent significant changes (and, of course, retained certain practices), they also contributed to the Mediterranean economy in a way that had an empire-wide impact. Without access to this gold, Augustus would not have been able to readily employ gold as a standard in his reorganized monetary system. The success of the stability of the growing imperial economy, was contingent on Augustus' ability to grow the empire geographically in ways that allowed him to harness new resources. In effect, imperial success depended on the capabilities of the imperial government to fill its coffers. Though artisanal production of gold jewelry and other objects certainly occurred throughout northwest Iberia, most of the gold extracted at Las Médulas was exported directly to Rome to be minted as coins. In this way, the transformation of castro communities into gold mining communities at Las Médulas enabled these groups to contribute to the growth and stability of the Roman economy seen on an imperial scale.

Conclusions

To conclude, it is clear that the transformation of the landscape of Las Médulas into an industrial gold mining landscape in the 1st and 2nd centuries CE of this part of the Iberian Peninsula had a profound effect on the rural communities living in the local

landscape. I have argued here that political, social, and economic changes in the first two centuries following Roman conquest altered Iron Age ways of interacting and contributed to the formation of a mining community in and around the gold mines at Las Médulas. Turning first to landscape, alterations in political geography and the addition of cities and roads altered and expanded modes of movement, trade, and communication. Drastic physical changes to the landscape itself caused by the use of *ruina montium* and other hydraulic technologies must have impacted not only how indigenous populations interacted with each other but with the landscape itself as well. Second, the transition from predominantly autonomous castro settlements of the Second Iron Age to an interdependent constellation of settlements in the mining landscape after Roman conquest expanded networks of daily interactions necessary to acquire goods and carry out daily tasks. Third, the introduction of radically different hydraulic technologies that allowed the scale of mining to expand were only possible with the participation and interaction of various groups that made up the community: indigenous laborers, the army and engineering personnel, and administrators including the *procurator metallorum*. Finally, the expansion of the mines had the effect of expanding the economic spheres of interaction of the mining community in Las Médulas through the import of certain goods, while the products of their labors (the *aureus*) became essential to the Roman economy at an empire-wide level.

This detailed analysis of Las Médulas is only possible because of the fortuitous survival of many aspects of the archaeological landscape alongside historical and epigraphic evidence that directly relates to gold mining and local communities, as well as the decades of work carried out by primarily Spanish research teams. It is for this reason

that Las Médulas serves as an ideal model for what is possible in an analysis of mining communities, rather than as a typical scenario for how mining communities were formed in Hispania (indeed, Las Médulas is an exceptional site, even when compared to other gold mines of the northwest). This chapter, then, demonstrates the utility of using the multi-scalar, thematic approach laid out in Chapter 3, analyzing interactions in the contexts of landscape, settlements and households, technology and labor, and finally economies. It also shows the importance of utilizing a diachronic, multi-scalar approach to understand community formation; it is only possible to detect subtle changes and continuities in modes of interaction from a long-term perspective and at multiple scales. No study of mining communities, then, can dismiss the previous history of mining in each local landscape.

The following section of this dissertation, “Mining Communities and Industrial Landscapes in Southern Iberia,” turns now to a more complex set of case studies from southern Iberia, a place with a complicated history of colonial interaction beginning long before the arrival of the Romans and an even longer history of metallurgy. In the following chapters, I use case studies from the regions of Cartagena/Mazarrón, the Sierra Morena, and the Iberian Pyrite Belt in comparative perspective, analyzing how the creation of imperial mining landscapes impacted local communities in and around mines in these locales.



Figure 4.1 The archaeological zone of Las Médulas in geographical context (Figure 1 in Fernández-Posse & Sánchez-Palencia 1998: 128).

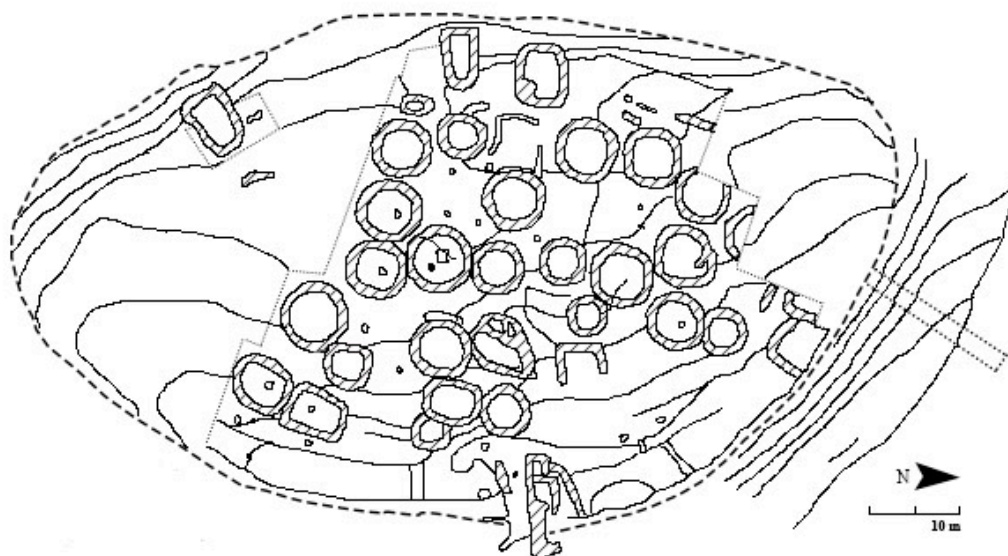


Figure 4.2 Generalized plan of a hilltop castro settlement with round houses based on the excavated plan of Borneiro (Cabana, Galicia) (after Romero Masiá 1992 in Parcero Oubiña & Cobas Fernández 2004: 30)



Figure 4.3 View of the landscape surrounding Castro da Torre (Galicia, Spain) demonstrating an example of the visually dominant situation of many castro sites, where much of the surrounding landscape is easily visible (author photo).



Figure 4.4 Photograph of the expansive settlement of Citania de Briteiros (Portugal) with remains of round houses and hypothetical reconstructions of two houses executed by Francisco Martins Sarmiento in the 19th century (author photo).

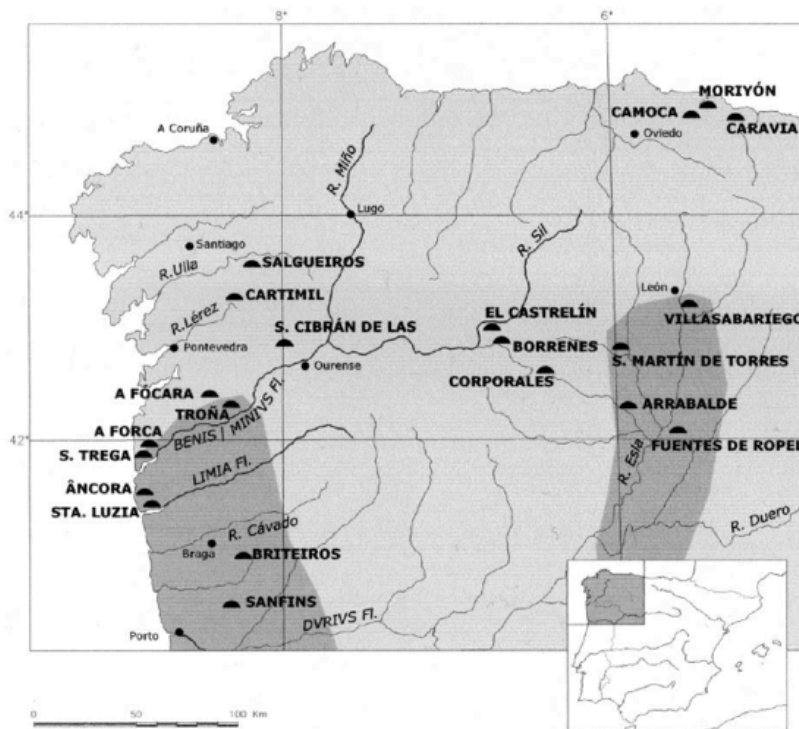


Figure 4.5 Major castro settlements of the second Iron Age (Figure 1 in Sastre 2004).

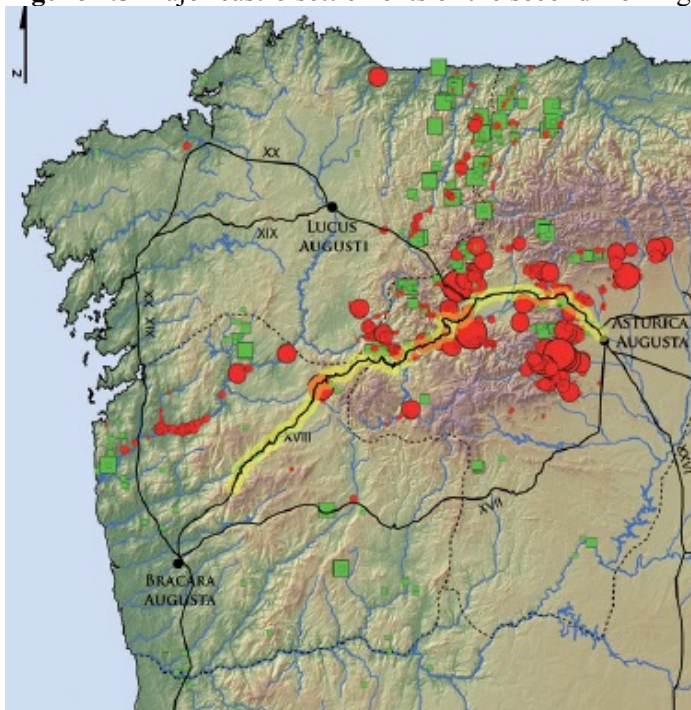


Figure 4.6 Relationship of Roman conventus capitals and road networks with mining districts. Mining in red represents secondary deposits of gold, while mining of primary deposits in hard rock is colored in green (Figure 2 in Orejas et al. 2012).



Figure 4.7 Photo of the house of the Mosaic of the Bear and Birds in Asturica Augusta, a 3rd century peristyle house with *opus signinum* pavements, which shows the presence of Roman-style houses in this conventus capital, as well as an example the limits of urban archaeology within the modern city of Astorga (author photo).



Figure 4.8 Photo of the current excavations of the theater and adjoining baths, Termas Romanas do Alto da Cividade, in Bracara Augusta (Braga), which were discovered after the relatively recent removal of modern buildings in the city (author photo).



Figure 4.9 Bierzo Edict, now located in the Museo de León (see Appendix I) (author photo).



Figure 4.10 The surviving remains of the Fonte do Ídolo in Bracara Augusta (Braga, Portugal) with the possible togate figure of indigenous deity Nabia on the left and the bust of indigenous Tongonabiagus on the right (author photo).

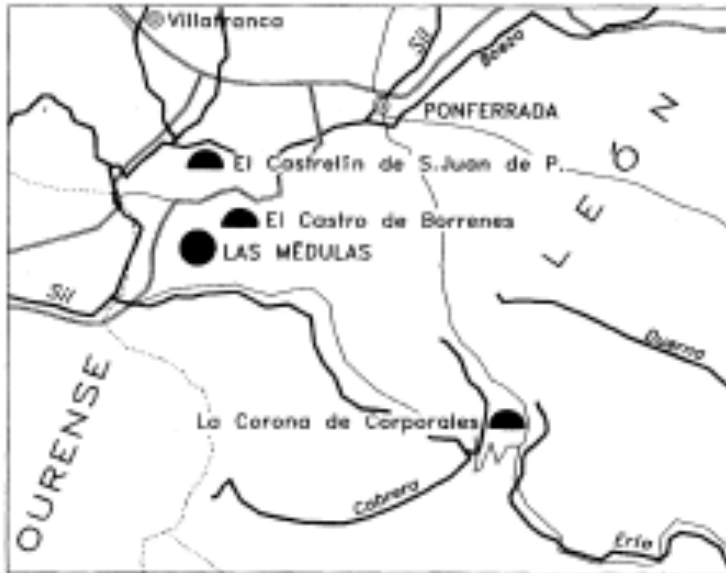


Figure 4.11 Locations of the Iron Age castros of Borrenes, El Castrelin de San Juan de Paluezas, and La Corona de Corporales in the wider landscape of the ZAM (Figure 1 in Fernández-Posse & Sánchez-Palencia 1998: 128).



Figure 4.12 Hypothetical reconstruction of a castro house at Santa Tecra (Galicia, Spain) (author photo).



Figure 4.13 Image of the fortification wall of Borrenes (photo courtesy Fundacion Las Médulas).



Figure 4.14 Aerial Image of Excavated Sectors of El Castreón de San Juan de Paluezas (Fernández-Posse 2001: 4)

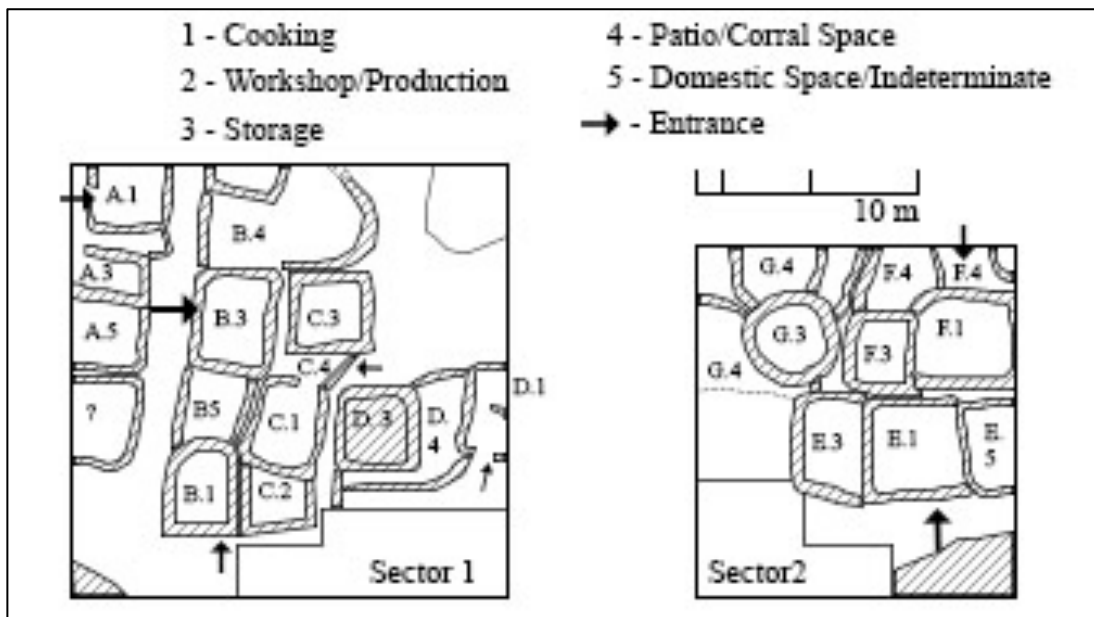


Figure 4.15 Excavated houses at El Castreón from the latest phase of occupation. Portions of seven separate houses were excavated in Sector 1 and Sector 2 shown above; each house is labeled with a letter A-G. The excavators assigned labels to their primary functions based on interior assemblages and style of construction, which are labeled by number in this figure. It is important to note, however, that much of this space likely served as multipurpose space (after Fernández-Posse 2000: 65; Fernández-Posse 2001)

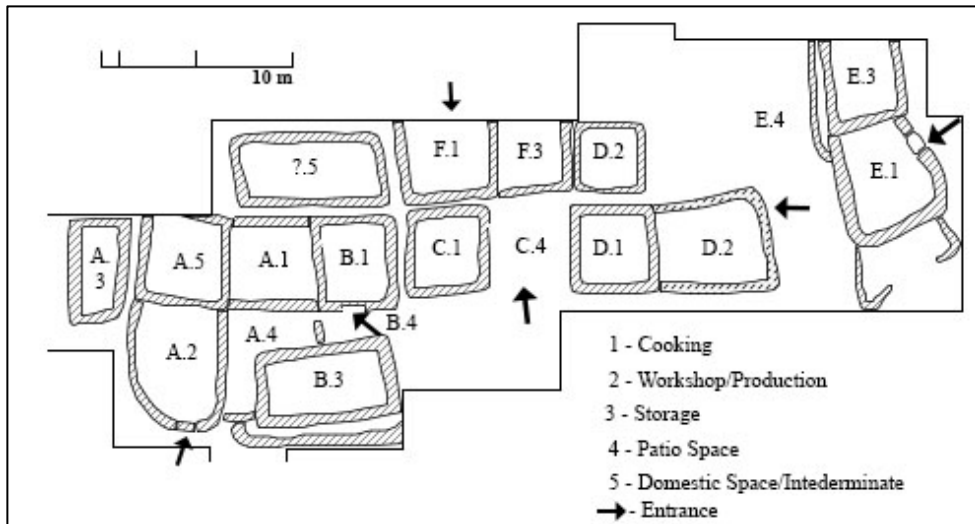


Figure 4.16 Excavated portions of the La Corona de Corporales. Portions of six separate houses were excavated, which are labeled A-F in this figure. The excavators assigned labels to their primary functions based on interior assemblages and style of construction, which are labeled by number in this figure. It is important to note, however, that much of this space likely served as multipurpose space (after Figure 52 in Fernández-Posse 2000: 66).

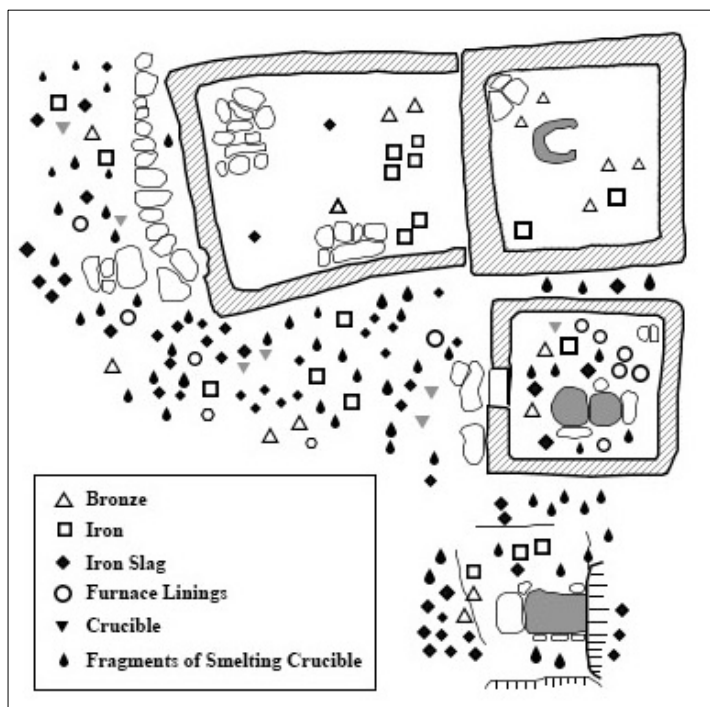


Figure 4.17 Metallurgical House at La Corona de Corporales showing the distribution of bronze, iron, iron slag, furnace linings, crucible, and smelting crucible fragments around the dwellings. The northernmost two rooms are built domestic space while the lower room is a stone base for an organic superstructure where smelting took place. The lower informal space also contains a smelting pit (after Figure 79 in Fernández-Posse 2000: 81).

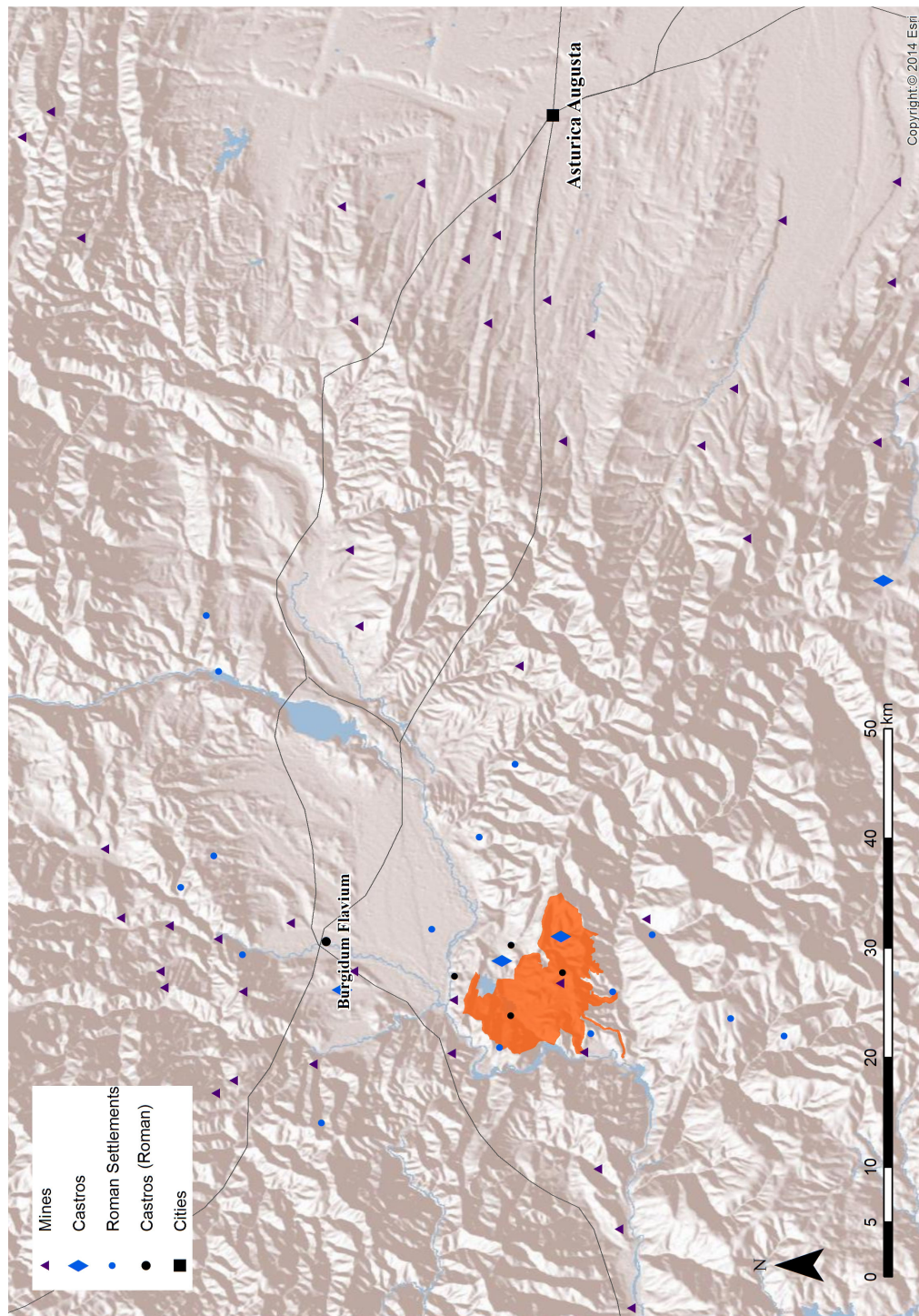


Figure 4.18 Map of Roman-period settlements in and around at Las Médulas (outlined in orange) with Iron Age castros depicted by blue diamonds.

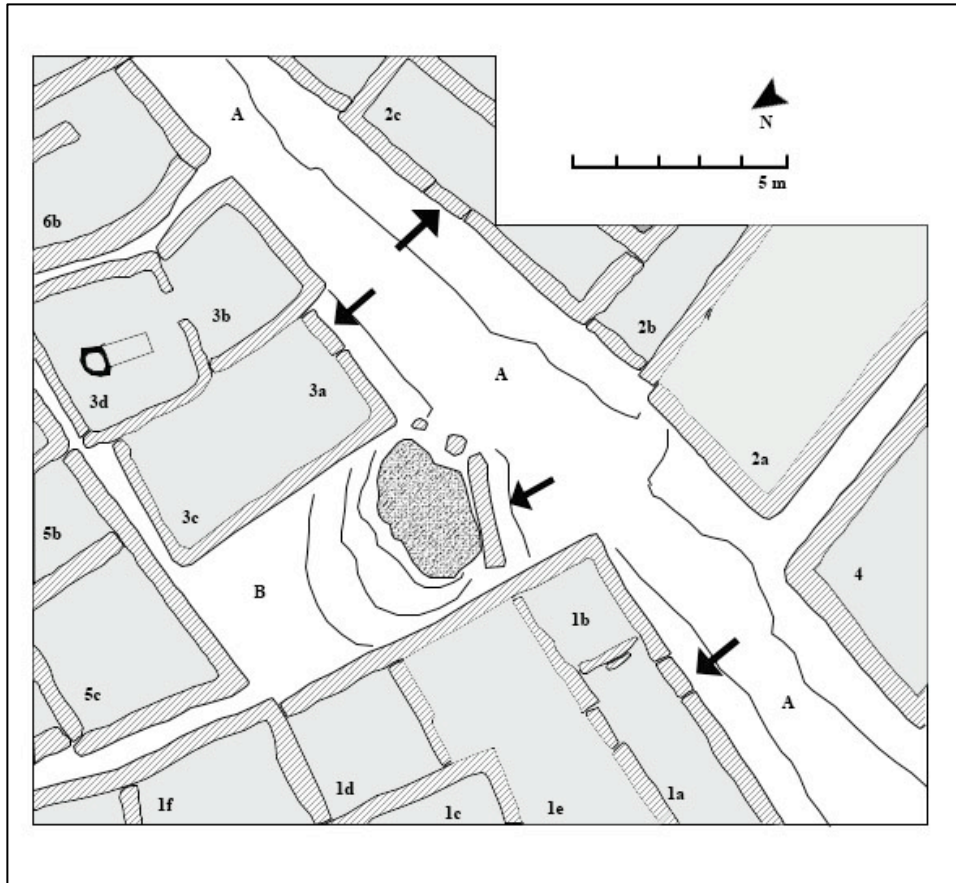


Figure 4.19 Orellán settlement with parts of 6 excavated houses highlighted in grey and numbered sequentially with lettered spaces. A indicates the central, shared street area and B indicates the communal storage area. Arrows indicate entrances to domestic units that face onto the central street (after Figure 309 in Ruiz del Árbol et al. 2000: 264).



Figure 4.20 Photograph of the excavated communal storage area indicated by the B in Figure 21. Facing North (author photo).

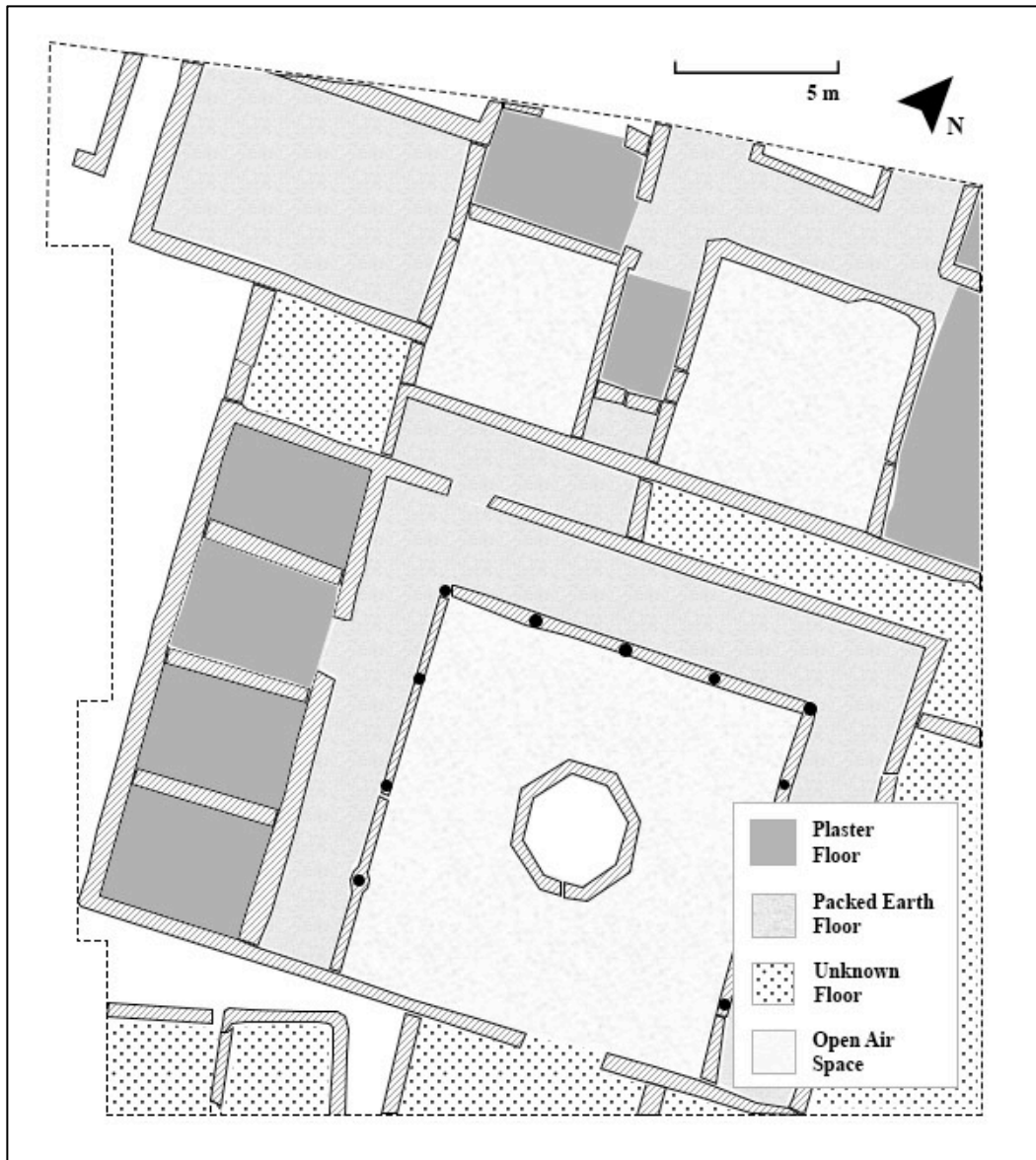


Figure 4.21 Simplified plan of Las Pedreiras del Lago (after Figure 322 in Sastre & Orejas 2000: 292)



Figure 4.22 Iron Age stone statue depicting a warrior wearing a torque around his neck now stored in the Museu Nacional de Arqueologia in Lisbon, Portugal (author photo).



Figure 4.23 Torques from Castro de Lanhoso, Museu Diogo di Sousa (Braga), Portugal (photo by Dan Diffendale).



Figure 4.24 La Frisga, showing in the highlighted box the archaeological remains of the converging grooves method of gold mining (image courtesy La Fundación Las Médulas).



Figure 4.25 La Furnia (A) and El Couso (B) showing the archaeological footprint of trench channeling at las Médulas opposite the Mirador of Orellán (author photo).



Figure 4.26 The galleries of Orellán from the Mirador of Orellán, with different strata of conglomerate clearly visible and water tunnels that escaped collapse carved into the mountain (author photo).



Figure 4.27 The expansive interior of La Cueva, believed to be the standing remains of a series of collapsed galleries inside a mountain at Las Médulas (author photo).



Figure 4.28 *Corrugi* or channels for directing water towards the tunnels excavated in the mountains (author photo).



Figure 4.29 View of Las Valiñas from the Mirador of Orellán depicting the complete transformation of the landscape as a result of *ruina montium* gold mining. The exposed mountain faces are the result of different collapse episodes from hydraulic mining (author photo).



Figure 4.30 Lago de Carucedo, a lake that formed in a valley below Las Médulas as drainage became blocked by mining refuse (author photo).

**PART II:
MINING COMMUNITIES AND INDUSTRIAL
LANDSCAPES IN SOUTHERN IBERIA**



Figure 4.31 The mining landscape of Riotinto, Huelva, Spain (author photo).

In the following four chapters of this dissertation, I examine the four thematic settings outlined in Chapter 3 through the lens of three regional case studies of mining in southern Iberia, including southeast Iberia (Cartagena-La Union, Mazarrón), south-central Iberia (the Sierra Morena with a focus on the Linares-La Carolina district), and southwest Iberia (the Iberian Pyrite Belt including Riotino, Aljustrel, and São Domingos, among others). Each chapter is organized around one setting: Landscape (Chapter 5), Settlement and Household (Chapter 6), Labor and Technology (Chapter 7), and finally Economies (Chapter 8). I present data from these case studies in the context of each setting, comparing and contrasting archaeological, epigraphic, and literary evidence from the region in order to form a more nuanced picture of regional similarities and differences in the formation of mining communities over time. These locales have long been considered focal points of mining in the Iberian Peninsula during the period of Roman domination, though they are rarely examined in concert because they are separated by modern national and regional divides, as well as ancient provincial divides within Hispania that have traditionally provided the basic—and limiting—framework for scholarly research.

Here, I have chosen to look at these case studies comparatively for several heuristic reasons. Together they provide evidence for mining from the earliest moment of

Roman conquest in the late 3rd century BCE through the end of the 2nd century CE.

Although, in several instances, mining continued long after this date, the end of the 2nd century serves as the endpoint of this study.⁷⁴ My intention is to avoid discussions of the 3rd century crisis, which is a fraught topic in itself, and instead focus on the period of most intense and successful exploitation of mineral wealth in Iberia. Examining these three cases alongside one another allows for diachronic, regional comparison.

Secondly, the minerals extracted under the Romans in southern Iberia primarily—though not exclusively—included copper, silver, and lead in various proportions.⁷⁵ As we have already seen (Chapter 4), the administration of gold mining sites such as Las Médulas was largely a direct imperial operation, and extraction techniques and organization of labor were often site-specific and particular to the needs of hydraulic gold mining. The different treatment of non-gold metal resources under the Romans—administratively, technologically, and economically—makes it reasonable to group key sites of copper, silver, and lead extraction together for analysis. This is especially true in the geological landscapes of southern Iberia, where these minerals often appear together.

The final, and key reason I have grouped these cases together is to highlight the long-term history and impacts of colonization and culture contact in the Iberian Peninsula. Although these case studies are situated in drastically different landscapes with their own pre-Roman cultural histories, the region of southern Iberia is bound

⁷⁴ For general texts on Late Roman, Islamic, and Medieval mining and further reference, see: Canto García & Cressier 2008; Miller et al. 2013; Edmondson 1989; Pérez Macías & Carriazo Rubio 2010.

⁷⁵ Gold was also present in southern Iberia, particularly in the southwest and further north in the “gold-bearing” Tagus. Although less archaeological work has been done on the Roman exploitation of gold in these regions, scholars (including Jonathan Edmondson and Carlos Fabião) believe that gold from the Tagus could have been a major source of ore for the Romans alongside that mined in northwest Iberia (Edmondson 2015, pers. Comm., 22 March). The Iberian Peninsula is also rich in tin, though the major areas of tin mining do not usually overlap with the copper, silver, and lead mines outlined here (see Merideth 1998).

together by a shared history of colonial encounters. Beginning in the 9th century, southern Iberia successively came under Phoenician, Punic, and then Roman influence. Thus, if we are to understand the long-term impacts of Roman colonization on mining communities, it is imperative to take into account the pre-Roman legacy of other trading and colonization episodes and their impact on the local practice of mining and metallurgy. When it comes to cultural interaction and influence, Roman imperialism should not be viewed as a fundamentally different or unique process from other ancient—or modern—colonialisms and imperialisms. Without entering into a debate on “Romanization,” suffice it to say that I have found it both useful and necessary to situate the Roman conquest and colonization of Iberia as one of various impactful ancient cultural encounters. Further, drawing inspiration from scholarship on other entangled relationships between colonialism and mining has served to broaden this study (Chapter 2). Ultimately, my contention is that pre-Roman economic and cultural encounters spurred the elaboration of a mining industry prior to Roman arrival; they conditioned the kinds of interactions that were already taking place in and around mining landscapes in southern Iberia, ultimately impacting the formation and transformation of mining communities into the period of Roman domination.

Before beginning the setting-by-setting analysis of mining communities in southern Iberia, then, it is useful to briefly outline scholarly assumptions about Roman administrative practices regarding mining in the Republic and Imperial periods.

A Note on Roman Mining Administration

Roman administration of the provinces has long been a topic of scholarly pursuit, and one might assume that mining administration in the provinces is relatively well

understood. On the contrary: much of our information on mining administration has been deduced from critical readings of classical sources, many of which are not contemporary with mining itself or which only discuss specific locations or examples. Additionally, archaeological and written evidence from each province has not been equally weighted—we know a great deal more about the Danubian provinces and Egypt because of the higher concentration (or preservation) of epigraphic materials referring to mining and/or quarrying administration in these places, and this information has been used to try to understand practices in the west that may or may not have been similar. Hirt has emphasized that the fragmented nature of existing evidence, “hinders any attempt at a full description of the imperial extractive industry in the kind of detail a study of modern organization would permit” (Hirt 2010: 8). On the other hand, evidence from the Iberian Peninsula alone is abundant enough to reconstruct some basic historical trends in mining administration from the Republic through the early imperial eras in the province of Hispania. Although there are many exceptions and regional variations that will become clear in the following chapters, it is helpful to present here some overall trends in administrative practices in Hispania that serve to ground locally specific practices presented in the case studies. From the initial stages of conquest, the state owned the mines, which became *ager publicus*, but the day-to-day operations and administration shifted depending on the time, place, material, and possibilities for maintaining security and increasing productivity.

Republican-Era Mining (late 3rd century BCE - late 1st century BCE)

After the Roman conquest of the Iberian Peninsula, Roman magistrates and/or the army likely maintained the administration and operating systems already in place in the

active mines in southeast Spain inherited from the Barcids in 209 BCE (Mangas & Orejas 1999: 221). Soon after, however, mines were passed from the public domain to be rented out to societies (groups similar to guilds called *societates of publicani*⁷⁶), families, or individuals, who might have paid by the Roman state according to their output (Blázquez Martínez 1996: 119) or who turned over a portion of their profits to the state in the form of a tax called a *vectigal* (Mangas & Orejas 1999: 222; Richardson 1976: 141). Although the precise system is little understood, we know, for instance, that the mines of Carthago Nova reportedly produced the equivalent 25,000 drachmas per day for the Roman state (Strabo 3.2.10).

It is not until the second half of the 2nd century BCE that stamped ingots with the names of lessees, societies, or families became commonplace (Domergue 1985: 93). Although this leaves a lacuna in our understanding of the earliest years of mining administration and organization, it does mean there is abundant epigraphic data indicating names of individuals involved in the mining industry at the administrative level by c. 150 BCE (from which we can hypothesize origin and status, see Chapter 7). The question of the role of an indigenous workforce and the use of slaves is still unsettled. What is clear is that there were comparatively fewer state directives about mining administration during this period than in later centuries, and that the solutions for how to extract minerals and how to organize labor appear to have been left up to enterprising individuals

⁷⁶ *Publicani* were essentially public contractors who performed various duties on behalf of the Roman state including building or maintaining public architecture, collecting taxes, and also organizing and performing various kinds of labor—including mining and metallurgy. *Publicanii* often formed groups (*societates*) to organize these tasks. While *publicani* were free, usually of equestrian order, they could also hold slaves to assist them in their work, which is known to have happened in mining, metallurgy, and other crafts (Hirt 2010: 163; Richardson 1976; Malmendier 2002).

and societies, provided that these groups paid their taxes and production levels remained high.

Imperial-Era Mining (late 1st century BCE - late 2nd century CE)

From the time of Augustus, there is strong evidence for a reform of the mining administration characterized by a marked increase in imperial control over mining centers. These changes came with the reorganization of the monetary system under Augustus, and the need for a steady supply of gold, silver, and bronze for the creation of new coinage for payments to the army, the administration, and large commercial payments, among other things (Howgego 1992). The responsibility for running operations fell either on the imperial *fiscus* or the senate depending on the administration of the province as a whole. In Hispania, Baetica remained a senatorial province, while Tarraconensis and Lusitania came under imperial administration. In certain instances, however, officials of the *fiscus* seem to have been in control of operations even in “senatorial” provinces, presumably because the *fiscus* was in control of all imperial *metalla*.

These transformations in operation practices were not immediate or black and white: scattered evidence suggests that some mines remained in the hands of individuals, groups, or colonies—especially in the early years of the empire. For instance, emperor Tiberius famously confiscated the gold mines of Sextus Marius in the Sierra Morena. Marius was accused of incest with his daughter and was thrown to his death from the Tarpeian rock, and his holdings then passed into imperial hands (Tacitus *Ann.* 6.19, Suetonius *Tib.* 49). In another instance, ingots from Augusta Firma Astigi (Baetica), which read ‘COLON AUG. FIRM.,’ indicate that the colony itself was in control of the

argentiferous lead mines there; these were published but are now lost (Blázquez Martínez 1996: 121). Similarly, the stamp ‘CARTHAGO NOVA’ appears on some lead ingots, though these may date from the late Republic rather than the early empire. In any case, the rise of certain urban centers near mining districts—even those that were not in direct control of their mining territory—is unmistakable in the late Republic and early empire (e.g., Munigua, Pax Iulia, Italica, Sisapo, etc.) (Orejas et al. 2012: 32).

Aside from these less-common variations, after the Julio-Claudian Dynasty, mines of a certain size appear to have been controlled by the imperial *fiscus* in two possible ways. The first, as was the case with Las Médulas, is direct exploitation by the Roman state (Sastre 2012). Here, Rome controlled the administration and many aspects of the organization of production through administrators (*procuratores metallorum*, *beneficarii*, etc.) and the army, and was responsible for either supplying or obtaining the labor necessary for mining. In the second case (indirect exploitation), Rome remained in ownership and supervisory control of the mineral wealth but mining was organized through a system of renting exploitation rights to individuals or groups, who were monitored by the *procurator metallorum* (usually an imperial freedman or a man of equestrian rank), other imperial officials, and/or members of the army. Mining operations of this variety were in full force by the Flavian period, when Vespasian reorganized the tributary system (Suetonius *Vesp.* 16) in order to maximize the extraction of resources and increase the monetary intake of the empire. This involved the establishment of clear territorial boundaries for taxation, and presumably more careful administration of mining land concessions and mining districts called *metalla* (Orejas et al. 2012: 37). Mining concessions were rented by lessees called *conductores*, who were responsible for

organizing their own workforce, which could include free and slave laborers; the societies of *publicani*, so common in the Republic, operated on a much more limited basis. During the 2nd century CE, operations continued with intensified levels of production and a high degree of state control, even in systems of indirect exploitation seen at imperial mines such as Vipasca (Orejas et al. 2012: 42).

These systems account for some of the diversity of exploitation and labor composition observed in imperial mines, both in the Iberian Peninsula and in other large mines of the Roman Empire. Scholars now agree that there was never an overarching organizational system for mining administration in the Roman Empire, but rather that systems had to be modified according to local landscapes and historical specificities (Hirt 2010: 368). The primary goal was to keep production constant and high for the benefit of the Roman state, and local solutions to accomplish this were tolerated and even encouraged, especially outside of large state ventures like the Roman gold mines in northwest Iberia. In the chapters that follow, instances of local variation in administration and organization are highlighted.

In the following four chapters, I will examine these local landscapes and historical specificities in the context of the three case studies from southern Iberia: Cartagena/Mazarrón, the Sierra Morena, and the Iberian Pyrite Belt. Rather than treat these three case studies separately as I did with gold mining (Chapter 4), the next four chapters treat the regions together, addressing issues and settings thematically in order to draw out regional similarities and differences and to highlight the development of the mining industry over time. It will become clear that the available evidence is highly

variable as a result of the inconsistent preservation of ancient workings and the extent and quality of published documentation of Roman and pre-Roman mines and mining settlements (Matías Rodríguez 1999: 161). The massive scale and destructive nature of early modern and contemporary opencast mining operations throughout southern Iberia is, of course, responsible for the fragmentary nature of the ancient data. But on the other hand, diligent mining engineers deserve credit for the discovery and recording of ancient evidence for mining and habitation in these mining districts. In the following chapters, I utilize these early reports alongside more recent investigations by trained archaeologists and other lines of literary, epigraphic, and scientific evidence. Although even taken together this evidence at times seems woefully incomplete, employing this thematic organization, drawing comparison with mining communities of other times and places, and focusing on daily practices helps to illuminate the multiple factors that contributed to the formation and transformation of mining communities in the Iberian Peninsula. The following chapter addresses the setting of landscape and serves as a broad introduction to the three mining centers that serve as case studies before I turn later to themes of settlement and household, labor and technology, and economies.

CHAPTER 5

PLACING COMMUNITIES IN THE MINING LANDSCAPES OF SOUTHERN IBERIA

Introduction

This chapter considers the three case studies under discussion in Part II of the dissertation, Cartagena/Mazarrón (southeast Iberia), the Sierra Morena (south-central Iberia), and the Iberian Pyrite Belt (southwest Iberia), through the thematic lens of landscape. It serves first to introduce each of these areas through a general examination of their histories of conquest and occupation, and the local histories of mining and metallurgy in each place. Beyond this introduction to each case study, this chapter examines the landscapes of southern Iberia from both top-down and bottom-up perspectives, with an emphasis on how Roman conquest and the expansion of the mining industry in each locale impacted the formation of mining communities.

Landscape studies can be seen as the broadest scale of spatial analysis on a continuum with settlements and households, which are discussed together in detail in the following chapter. Here, I discuss mining landscapes from two different but complementary perspectives: landscapes as settings for the display of imperial power, and landscapes as places where a rural and industrial character shaped the construction of communities. I first demonstrate that the locations of cities, towns, and roads relative to important natural features in the landscape, including water resources and metal deposits, can shed light on how the political organization of the landscape was impacted by the placement of natural resources. As discussed in Chapter 2, the metal-rich deposits of the

southern Iberian Peninsula were well known in antiquity and already had a long history of exploitation in prehistory, with periods of increased productivity in association with Phoenician, Punic, and Roman presence in the region. Rome's desire to access these metal-rich landscapes was a major factor—if not the driving force—of the early conquest of southern Iberia beginning in the late 3rd century BCE. In the context of each case study, then, I trace broad-scale connections between Roman imperial changes to the landscapes and mining in each region.

Beyond an examination of political landscapes and mines on this large scale, I also consider mining landscapes, with their rural and industrial character, as places that were both shaped by and that shaped the communities who lived and worked in them. Here, I examine the ways that the interactions of people with each other in the creation of mining landscapes—and indeed with the landscapes themselves—shaped their perceptions of these places and prompted the construction of dynamic, often interconnected communities at each locale.

Below, I begin by outlining these various approaches to landscapes, considering mines as imperial landscapes, rural landscapes, and industrial landscapes. I then turn to my case studies, examining the history of their broad geographic locations and the relationship of Roman conquest to mining and metallurgy in each place. In every case study, I also discuss how becoming a mining landscape impacted social and economic interactions in a way that led to the creation of communities centered around the mining industry. Finally, I conclude with a discussion that highlights the negotiation of community, place, and empire in each mining landscape. This reveals the many ways that Roman conquest altered landscapes and the interactions of people who inhabited them,

but other ways that local tradition and knowledge of the landscape persisted among mining communities.

Approaching Mining Landscapes

Landscape is a term with many meanings and a long history of study dating at least as early as the 17th century. It has been associated with various theoretical and methodological developments in fields ranging from art history, to geography, and—of course—to archaeology. The term “landscape” is often thought of in its simplest form as “territory that can be apprehended visually,” such as the natural palaces seen and painted in early Dutch landscape painting (Thomas 2012: 167). Beginning in the 1970s and 1980s, however, landscape archaeology grew into a diverse subfield of study, as archaeologists began to conduct survey work on a regular basis, study human-environment interactions through new scientific techniques, and eventually explore the social and experiential aspects of landscapes (David & Thomas 2008; Thomas 2012; Ashmore & Knapp 2000b). Generally speaking, modes of understanding landscape vary widely in archaeology, but particularly so in Roman and Mediterranean archaeology (e.g., Fleming & Hingley 2007; Walsh 2014; Alcock & Cherry 2004). In this present analysis of the multi-faceted aspects of mining landscapes, I draw from several specific understandings of the concept: political landscapes, rural landscapes, and industrial landscapes. It is useful to summarize these categories before turning to the three case studies of mining landscapes in southern Iberia.

Mining Landscapes as Political Landscapes

As I discussed in Chapter 2, a desire to access the metal-rich landscapes of far off places has been a driver of imperial and colonial expansion into new territory on many occasions throughout world history. As mining landscapes are incorporated into empires or new political regimes, they are often assigned new legal or territorial status and undergo a variety of physical transformations. These political changes in territorial organization are not just lines in the sand, but can have potent impacts on people's experiences, perceptions, and understandings of the landscape. In his work on political landscapes, Adam Smith defines landscapes as "social artifacts that are produced and reproduced through varying dimensions of spatial practice" (2003: 25). Through a discussion of the many ways that landscapes and politics are intertwined in early complex societies, he demonstrates how the physical ordering and reordering of space can be impacted or even dictated by political regimes, and the many real effects that this has on those who live in and experience such political landscapes. Specifically, landscapes can be seen as "the spatial constitution of political authority" (2003: 8) and, further:

The political landscape is constituted in the places that draw together the imagined civil community, a perceptual dimension of space in which built forms elicit affective responses that galvanize memories and emotions central to the experience of political belonging (2003: 10).

Political imprints on the landscape need not be only built forms, but can include places—such as mines—that are transformed for political motives, including economic gain. Here, it is key to recognize the recursive relationship between humans and their environments (Wernke 2013: 31). While mining landscapes are created through human activity and driven often by political and economic needs, the locations of metal-rich deposits in the landscapes also dictate where and on what scale mining is possible. In that

sense, the natural world can both shape and constrain the development of political landscapes (Smith 2003: 46; Crumley 1994).

In the Roman context, I use the terms “political landscape” and “imperial landscape” interchangeably, since Rome’s political power was inherently imperial in nature in Iberia and its other provinces (see Chapter 2). In Roman Iberia, political changes to mining landscapes came in many forms and are detectable at multiple scales from the largest, regional dimension to the specific context of the mines themselves. In northwest Iberia (Chapter 4), for instance, I discussed the ways that top-down political divisions of territory as well as the placement of Roman cities and roads impacted patterns of movement, exchange, and control throughout the region. Further, the constant, large-scale work of hydraulic gold mining left an imperial imprint on the landscape in the form of collapsed mountains and rerouted waterways.

In southern Iberia, the creation of an imperial landscape took on some similar patterns in all locales, but varied according to local histories and political needs. For instance, while mines became *ager publicus* from the time of conquest, it was not until the imperial period and a need for more direct supervision and control of local communities that mining landscapes were incorporated into the provincial territories as *metalla* and were overseen directly by the *fiscus* (page 184). Further, some transportation networks were maintained as those that the Romans inherited at the moment of conquest, but others were altered according to the new needs of empire with the construction of new road networks. Finally, the extent to which mining became a near industrial-scale, central activity in the landscape varied according to the quantities and types of metal ores present, the Roman imperial need to access them, and the technologies and labor

necessary to do so. All of these changes associated with the new political occupation of the territory had the effect of reinforcing Roman power on a monumental scale as well as altering the daily interactions of people who inhabited and interacted with these landscapes. Ultimately, these changes impacted many of the ways in which communities were formed, and placed mining squarely at the center of daily interactions.

Mining Landscapes as Rural and Industrial Landscapes

Many of the aspects of mining landscapes that set them apart from other imperial landscapes in the Roman Empire revolve around their rural, industrial character. The imposition of Roman cities and their urban elements such as temples and *fora*, markets, baths, and monuments can clearly be seen as powerful aspects of a Roman imperial landscape. On the other hand, most of the territory in Iberia and indeed elsewhere in the Roman Empire was not urban but rural. Despite this, such landscapes underwent transformations associated with Roman conquest that defined the interactions of people with and within them in ways that altered the social reproduction of communities. Rural landscapes, therefore, must be taken into account in the larger narrative of Roman imperial domination of provincial lands.

Scholars are increasingly recognizing the importance of rural landscapes and their various productive activities, especially agriculture, in the creation of economic stability in the Roman Empire and in pre-Roman times (Fentress & Docter 2003; Patterson 2006; Kehoe 2007; Bowman & Wilson 2013; Blouin 2014; Criado Boado & Ballesteros Arias 2002; Mataloto et al. 2014; van Dommelen & Gómez Bellard 2008; Carneiro 2014). Examining rural landscapes and the communities who inhabited them, then, illuminates the lives of the majority of people who were living in Iberia, generally speaking, both

before and after Roman conquest. Despite the distance of many mining landscapes (either conceptually or physically, or both) from urban centers, these industrial landscapes became connected to Roman imperial centers because of their economic importance and through the trade routes that linked landscapes of production with places of consumption. By considering mining alongside various other activities in non-urban areas, it becomes possible to diversify the picture of the types of communities that were living and working in rural areas and impacted by Roman provincial organization and economic modes of production.

In addition to this work on rural landscapes, there is a large body of scholarship on industrial landscapes, of which Roman mining landscapes should form a part. The concepts of rural landscapes and industrial landscapes are not mutually exclusive, but overlapping: mining landscapes are frequently places that are both rural and industrial in character. However, in some cases becoming a mining landscape can incite the formation of nearby urban centers, which can create an urban, industrial landscape in a place that had previously only been a rural one. This, for instance, was the case for the town of Potosí discussed in Chapter 2. In general, the term “industrial landscape,” derived from the subfield of industrial archaeology, has come to refer to places where industrial-level productive activities strongly shaped landscapes following the industrial revolution (Hume et al. 1965), but a diachronic understanding of “industrial landscapes” will facilitate more complete and meaningful interpretations of mining landscapes. Indeed, other scholars of prehistoric and Roman mines and quarries have begun to refer to them in these terms (Sekedat 2012; Knapp 2000; Kassianidou 2013). Beyond this, the physical remains of industrial, extractive activity in mining landscapes provide some of the best

evidence for interactions specific to mining that contributed to the creation of mining communities within industrial landscapes. Creating and witnessing the sounds, sights, and smells of active mining in the course of their daily lives must have shaped mining communities on a constant basis.

The conceptual separation of mining heritage from before and after the industrial revolution has had a toll on studies of the mining landscapes of southern Iberia that is not productive for understanding their long-term histories. For instance, in Spain, the National Plan for Industrial Patrimony (PNPI) was written in 2001 by a national committee delegated the Council for Historic Patrimony (Instituto del Patrimonio cultural de España 2011).⁷⁷ The catalyst for the creation of this law was a changing conception during the 1990s of the potential value of industrial heritage. Spain, taking inspiration from trends in Germany, the United Kingdom, Belgium, and elsewhere in western Europe, began to recognize industrial heritage as an economic resource that could be used in the development of tourism and to promote economic growth in towns where industrial centers had been abandoned (Benito del Pozo 2012: 446). Whereas previously many buildings were quick to be knocked down to make room for new ones or to repurpose

⁷⁷ Nowadays, additional restrictions are in place for the preservation of some ancient mining heritage, but these laws are separate from the PNPI guidelines. At the national level, sites can be classified as “bienes de interés cultural” (BIC) or protected cultural assets, a category that was developed in the government reorganization of 1978 following Generalissimo Franco’s death in 1975, and implemented as the 1985 “Law of Historical Patrimony.” The law expanded the definition of protected sites beyond monuments to include historical groups, gardens, cultural landscapes, and archaeological zones. This made it possible for ancient mining landscapes to be nominated for protection as “cultural landscapes” and many have. Beyond this national level of protection, some ancient mining sites are listed as UNESCO World Heritage including the gold mines of Las Médulas and the mercury mines of Almadén, Spain, which are grouped with those in Idrija, Slovenia as a UNESCO heritage site. In addition to these, “Spanish mining historical heritage” as a whole has been on the tentative list for UNESCO selection since 2007. If this group were to be selected this would add 17 mining sites from 9 autonomous regions to the register. It would also follow a strategy in Spain of grouping like-sites into itineraries to increase tourism to places that might be of less cultural interest on their own.

land for agriculture, both industrial buildings and their landscapes were increasingly seen as valuable cultural heritage resources.⁷⁸

The antiquity of industrial activity did not play a role, however, in the selection criteria for areas to be protected by the PNPI. In fact, nothing earlier than the mid-18th century is considered part of Spanish industrial heritage—the definition of which is inextricably linked to the Industrial Revolution and the mechanization of industrial technologies in Europe more broadly. Spain’s role in the Industrial Revolution is clearly a point of pride in the words of the law, which emphasize the “essentially European origin of industrialization” and “[Spain’s] contribution to modernity and the improvement of living conditions” (Instituto del Patrimonio Cultural de España 2011: 4). Proto- or pre-industrial remains are considered to have “more ethnographic than industrial value” (Instituto del Patrimonio Cultural de España 2011: 7). This division has created a conceptual, and indeed practical, separation between ancient and modern industry—often to the detriment of the preservation plans and the educational value of these multi-layered, diachronic mining landscapes. In practice, however, ancient mines (and especially those in southern Iberia), by virtue of the natural distribution of important metal deposits, are usually located in the same areas as contemporary or modern mines. In the case study sections below, I describe how contemporary industrial activity has contributed to our understanding of ancient landscapes.

⁷⁸ Although the PNPI developed at the national level, this plan has been administered differently in each of Spain’s 17 autonomous regions. Initially, committees from each region nominated industrial sites for protection and a total of 49 were selected, although under a third of these were extractive mining centers or related sites (Biel-Ibáñez 2009: 12). The responsibility of administration and heritage planning (including the expenses these incur) for the selected sites has fallen largely on autonomous districts and local communities. Certain districts, such as Asturias and Andalucía were quick to implement regional laws providing additional protections to industrial heritage, whereas others have either not had the money or the organization to elaborate successful plans for preserving sites.

In sum, conceptualizing Roman mining landscapes not only as political landscapes but also as rural and industrial landscapes expands the possibilities for interpreting the many ways that the increased scale of the mining industry transformed the interactions of people in the landscapes. By extension, it becomes possible to determine the ways that living in landscapes with both rural and industrial attributes transformed communities through everyday interactions associated with the making of these places in southern Iberia. Putting studies of mining landscapes into conversation with existing studies of rural and industrial landscapes can help us understand the diverse and complex histories of non-urban areas in the Roman Empire, and thus provide an avenue through which to interrogate and complicate the traditional narrative of Roman conquest. Turning now to the case studies, I look first at the mining landscapes of southeast Iberia.

Mining Landscapes of Southern Iberia: Three Case Studies

Southeast Iberia: Cartagena-La Unión and Mazarrón

Historical Trajectory of Conquest and Mining in the Region

The regions of Cartagena-La Unión and neighboring Mazarrón are located in southeastern Iberia on the Mediterranean coast. The area is rich in argentiiferous galena, which was heavily mined in the Roman Republican period for lead and silver, though other minerals including copper and iron were targeted to a lesser extent.⁷⁹ Indigenous groups developed mining and metallurgy from at least the Bronze Age, working deposits of copper, tin, silver, and iron (Lull et al. 2013). The most significant advances are attributed to the El Argar culture (Mangas & Orejas 1999: 219; Domergue 1990: 371;

⁷⁹ Iron and copper were likely used principally to supply local needs, while lead and silver were distributed to a Mediterranean-wide market (Antolinos Marín, Noguera Celdrán, et al. 2010: 168–170).

Ramallo Asensio & Berrocal 1994: 82–91). This culture developed a strong tradition of bronze, silver, and gold metallurgy and flourished in the area of Almería in the early Bronze Age (c. 2200–1550 BCE) (Aranda Jiménez et al. 2015). Many of these same mines were exploited during the Phoenician and Punic periods, with an intensification of activities from the 5th century BCE corresponding with the expansion of other productive sectors such as ceramics and fish salting (Ramallo Asensio & Berrocal 1994: 86–91). Based on a reading of Diodorus, Pliny, and Appian (Diodorus 5.38; Pliny *HN* 33.31, 96–97; Appian *Ib.* 12,19), scholars have suggested that the Barcids maintained direct supervision over silver and lead mining in order to procure raw materials for minting Hispano-Punic coins, which helped to finance the 2nd Punic War (Mangas & Orejas 1999: 220). Though the direct evidence for mining from Punic or Barcid periods is scarce, silver coins minted during these years bear Punic iconography and inscriptions, many of which name Punic cities such as Malaka (Málaga), Sexi (Almuñecar), Abdera (Adra), Iptuci (Prado del Rey, Cadíz), among others (Alfaro Asins 2006).⁸⁰

Rome came into possession of these operational Punic mines in 209 BCE, making this the earliest of the three case studies under consideration in which there is a clear connection between Roman territorial occupation and mining. In this early period, little is known about the organization of operations, though it is likely that there was some

⁸⁰ The Carthaginian silver currency was called a shekel (7.20 grams), while gold coins were struck on electrum and low-value coins were made in bronze (Ripollès 2012: 6). While these coins likely helped to pay troops in the 2nd Punic War, it is important to differentiate these from coins produced following Roman conquest but which still bore Punic writing, which persisted in the region on coinage through the mid-first century BCE (Jiménez 2014). Of the 69 known workshops operating in Hispania Ulterior during the Roman Republican period, 69.9% used Latin script, while 10.1% used Iberian lettering, 11.6% used Libyo-Phoenician, and 8.7% used Phoenician-Punic (Chaves Tristán 1998: 145).

continuity of the workforce,⁸¹ methods, and organization of production. It is not possible to determine from solely the extraction techniques employed whether mines date to the Punic or Roman period, as the same basic technology for mining continued to be used. During the years between 209 and 195 BCE, mining appears to have been directly state controlled, after which the system of leasing mining concessions likely started.⁸² It was during this period, in 197 BCE, that Hispania was reorganized into two provinces: Citerior and Ulterior. Significantly, Carthago Nova (Cartagena)—already an important port city and now connected with mining operations—became the most important city in southernmost Hispania Citerior, while Tarraco (Tarragona) also grew to be a major city farther north along the Mediterranean coast of the province.

During the course of the 2nd and 1st centuries BCE, mining operations in the region flourished, and with them came significant changes to both the scale of mining and the social fabric of the communities involved. Mines loomed large in and under the rural landscape, causing dramatic changes in the landscape itself and in the organization of the rural economy. Metals were extracted primarily by means of complex shaft and gallery systems that targeted subsurface veins, though opencast workings where open-air pits were excavated were also used—often in conjunction with underground techniques (Antolinos Marín & Noguera Celdrán 2013: 343). These shafts were up to 100 meters deep with galleries for exploitation and drainage at levels up to 300 meters below the surface, much larger than shaft and gallery mines dating to earlier periods (Mangas &

⁸¹ In 206 the Romans took 2,000 prisoners of war (Polybius 12.1, Livy 26.47), so it is possible that some of them were assigned to mining labor.

⁸² Cato during his time as consul apparently imposed a vectigal tax on iron and silver, which implies that by that time the system of leasing to societies, groups, or individuals was already in place (and necessitated a system of taxation) (Mangas & Orejas 1999: 222).

Orejas 1999: 234). Many new settlements sprang up to support the various necessary industrial activities, from extraction, to smelting, to as well as the commodification of the ingots produced. These happened alongside smaller-scale agricultural, salted fish, and other kinds of production. Immigration from Italy is attested epigraphically and textually, as well as population shifts of indigenous groups; many people of various backgrounds and statuses labored in the mines and related activities (see pages 284, 317). Finally, the products of these labors were shipped across the Mediterranean and, in turn, imports from Italy and elsewhere arrived via Carthago Nova to rural settlements in the industrial landscape.

By the end of the 1st century BCE operations waned, and though there is some evidence for continued production into the 1st century CE, all major mining operations had ceased in the region as mining shifted to sites in the Sierra Morena to access untapped resources. The extraction that did continue was of primarily local importance and the production of stamped ingots for supra-local circulation was greatly reduced. Some scholars have suggested that the mining landscape was not altogether abandoned, but repurposed for other kinds of productive activity. Agriculture and the production of salted fish, for instance, rose in importance during this later period (Mangas & Orejas 1999: 270; Noguera Celdrán 1995; Noguera Celdrán 2010).

Political Landscapes from a Regional Perspective

In the gold mining districts of northwest Iberia under discussion in Chapter 4, the creation of Roman imperial landscapes marked a distinct transition with the past as the modes of Iron Age territorial organization of the landscape shifted dramatically after Roman conquest. By contrast, in conquering the territory of Cartagena/Mazarrón, the

Romans inherited a landscape with a long-term history of colonial encounters and one that was already closely tied to the established mining industry in the region. The major political shifts, then, can be seen in the transformation and monumentalization of the port city of the region alongside the expansion and reorganization of transportation networks and settlements associated with mining. In other words, this was not a case where mining communities were created *ex novo*, but one where scale, infrastructure, and power dynamics in mining communities shifted following Roman conquest.

The primary Roman city of the region, Carthago Nova, had been first established in 229 BCE as *Qart Hadast* following the First Punic War as the Carthaginian base in the region and served as the capital city for the short-lived Barcid Empire. The city had therefore been functioning for years as a political, administrative, and economic center from which other colonial powers had controlled the territory and organized the extraction of metals alongside other resources such as stone, agricultural, and marine products (Murcia Muñoz et al. 2013: 124; López Castro 1995: 76). Carthago Nova was a new, but established city when the Romans entered the scene and took over in 209 BCE; it was already a place with strong associations with political and economic power.

The Romans did, however, reinforce this power by transforming the urban landscape of the city itself. Urban modifications can be noted especially around the end of the 2nd century and into the 1st century BCE, when the mining industry was flourishing. This included an elaboration of the port infrastructure, city walls, public buildings and spaces, and private houses. The city continued to grow in the Imperial period, however, and many urban elements of the city were renovated or added during that time (Mangas & Orejas 1999: 230–231). Recent excavations have revealed many of

these structures, including a large theatre from the Augustan period (Figure 5.1), public baths (Figure 5.3), and Roman roads (Figure 5.2) (Ramallo Asensio & Ruiz Valderas 2003; Ramallo Asensio et al. 2013). Much of the quarried stone for these construction projects and modifications to the city came from the rural areas surrounding Carthago Nova where mining was also happening (Murcia Muñoz et al. 2013: 124–125; Meroño Molina 2014).

Aspects of the older city including the basic perimeter were preserved and remnants of the large Punic surrounding wall are standing even today (Figure 5.4). From a cultural standpoint, elements of Punic culture and language were also retained by local populations for years after Roman conquest. The Romans appear to have recognized the “western Phoenicians” as a distinct ethnic and linguistic unit, and one that continued to be present alongside the native Iberians in southeast Iberia well after Roman conquest (López Castro 2007: 117). There is evidence that Phoenician religion, laws, language, and writing persisted in altered forms into late antiquity, and were integrated into the social and political system under the Romans (López Castro 2007: 121), especially in the former Punic cities. This was also the case in other areas of the western Mediterranean including Sardinia and western Sicily (Ferrer Albelda 2013; Martí-Aguilar & Ferrer Albelda 2009).

Outside of Carthago Nova, Roman domination impacted the landscapes of the coast and interior. The geography of southeast Iberia can be characterized by a marked divide between the coastal territory close to Cartagena and the inland area. The interior was inhabited by indigenous populations who lived in large hillforts called *oppida* prior to Roman conquest. These were generally located at some distance from one another, and

commanded control over rich agricultural landscapes (Murcia Muñoz et al. 2013:123). From *oppida*, indigenous populations controlled their surrounding territory and routes between the inland and the coastal centers, where they traded with Phoenician and later Punic merchants. Following Roman conquest, many *oppida* continued to be occupied, but functioned under the new Roman tax system, while others, such as Coimbra del Barranco Ancho (Jumilla), for instance, were destroyed. Eventually, however, many of the large centers fell out of use. By the Augustan period, many of the rural interior indigenous settlements were small farms rather than *oppida*, which may have facilitated easier compliance with the Roman tax system (Murcia Muñoz et al. 2013: 125–126).

In contrast to the situation in the rural interior, where much of the best agricultural land of the region was located, the coastal area contained rich metal deposits as well as easy access to marine resources. These resources were located in areas relatively close and well connected to the urban city of Carthago Nova. This facilitated transport of metal and other products from the nearby landscapes, often along rivers. These routes had likely been in use during the Iron Age, though local settlement patterns are not well understood during this earlier period (Murcia Muñoz 2010: 145–148).

Generally speaking, there was a closer relationship between the urban center and industrial landscape than is possible to detect in other parts of southern Iberia. For instance, many of the inscriptions on ingots produced from southeastern Iberian mines contain the names of families who also contributed to urban construction products, including the Atelii, Aquini, Turullii, Laetili, and Varii. Their acts of euergetism are recorded in urban and suburban epigraphy during the height of mining, though many of these families remained wealthy elites in Carthago Nova even into the imperial period.

One example of this phenomenon is a suburban sanctuary dedicated to Iuppiter Stator which was commissioned in the late 2nd century BCE or early 1st century CE by M. Aquinius, whose *gens* has been associated with mining through ingot stamps (Fig. 3.4; Mangas & Orejas 1999: 230; Orejas & Sánchez-Palencia 2002: 583). This is significant because the very changes that were being made to Carthago Nova to make it more ‘Roman’ in appearance were carried out at the hands of those whose wealth was rooted in the rural mining landscape, making the urbanization, imperial power, and mining fundamentally intertwined.

It is clear that Roman conquest of southeast Iberia resulted in the elaboration of the city and the strengthening of economic ties between Carthago Nova and the surrounding rural landscape, particularly through direct involvement of diverse groups of people in mining. The major architectural changes to the former capital city of the Barcid Empire were in some ways practical additions to the infrastructure of the city, but in other ways undoubtedly served to highlight new Roman power in the area. Next, I discuss specific changes to the rural landscapes that occurred in their transformation into industrial ones from the late 3rd century BCE through the late 1st century BCE.

Rural and Industrial Landscapes of the Southeast

The transformation of the rural landscapes outside of Carthago Nova into industrial mining landscapes had already begun by the 5th century BCE, and perhaps earlier at the hands of indigenous miners. Following Roman conquest, this transformation was expedited and intensified as the scale of mining increased and new settlements and other infrastructure were set up to support the industry. Polybius visited the Iberian Peninsula in the mid-2nd century BCE with Scipio Aemilianus and his observations are

preserved in his own text and quoted later in Strabo's *Geography* (Polybius 10.10.10-11; Strabo, *Geography* 3.2.10). During this visit, Polybius apparently observed, or was told, that the mines occupied a vast part of the landscape only about 20 stadia (3.7 kilometers) from the city, and that they took up a large area with a perimeter of around 400 stadia, or 75 kilometers (Antolinos Marín & Noguera Celdrán 2013: 341). That he wrote about the mines at all indicates that they were a significant feature of the overall landscape, even from the perspective of a foreign visitor to the city. Polybius also recounted that as many as 40,000 people were living and working in these mining landscapes and producing the equivalent of 25,000 drachmas per day (Strabo, *Geography* 3.2.10).⁸³ Though this population estimate may well have been exaggerated, it is clear that the number of settlements and metallurgical sites greatly increased from the time of conquest through the 1st century BCE.

There are two main mining zones in the rural landscapes outside of Carthago Nova. The closest is the district of Cartagena-La Unión in the Sierra de Cartagena (Murcia), with mineral deposits occupying a space roughly 25 kilometers long by 5 kilometers wide from just outside of the city to the eastern edge of land on the Mediterranean coast known today as Cabo de Palos. The mineral zone of Mazarrón occupies an area stretching approximately 28 to 35 kilometers west of Cartagena in the south of the modern province of Murcia. Both of these landscapes were transformed into industrial ones through opencast and subterranean mining, as well as the addition of foundries, washeries, and other processing areas alongside settlements of domestic,

⁸³ Strabo records a now-lost passage written by Polybius about the mines. In recounting this passage, Strabo mentions that the mines had passed into private ownership but were previously state owned, another testament to the changing administrative passages (Strabo, *Geography* 3.2.10). Antolinos Marín and colleagues discuss the text in more detail (2010: 167–168).

administrative, and/or religious character (Antolinos Marín & Noguera Celdrán 2013: 341–344; Antolinos Marín, Noguera Celdrán, et al. 2010). From the late 3rd century to the 1st century BCE, both zones exhibit an increase in the number of towns and villages. Many of these new settlements contained smelting furnaces—that is to say domestic activity and industrial production often took place side by side. Further, settlements were concentrated close to the mines and the watercourses leading to coastal urban centers and ports, especially Carthago Nova (Orejas & Sánchez-Palencia 2002: 583).

Thanks to many years of rescue excavations in the region catalyzed by the development of the tourist industry from the 1970s onwards, southeast Iberia is fairly well known archaeologically (though, admittedly, much of the archaeological work has taken place somewhat later, from the late 1980s). Also, as with the other case studies in southern Iberia, large-scale contemporary mining has prompted the discovery of many ancient workings and artifacts. While contemporary mining is inevitably destructive, it has also resulted in increased archaeological study of the region as a whole and the preservation of many organic artifacts, including esparto grass baskets and shoes, from the underground mines (see Chapter 7). The distribution of these settlements and mining areas has been continually mapped and updated over the past several decades, with results much more comprehensive than currently exist for either the Sierra Morena or the Iberian Pyrite Belt (Figure 5.5; Antolinos Marín, Noguera Celdrán, et al. 2010; Antolinos Marín & Noguera Celdrán 2013; Antolinos Marín & Rico 2012; Antolinos Marín et al. 2013; Antolinos Marín 2012; Noguera Celdrán 1995; Ruiz Valderas 1995).

These mining settlements outside of Carthago Nova yield high proportions of indigenous ceramics and other artifacts alongside Campanian pottery, Italian amphorae,

and eastern-made ceramics during the Republican period. The continuity of local material traditions is also evident in the use of local building materials and construction methods consistent with those used in earlier Iberian settlements in the region. In some cases, however, Roman influence can be seen in the introduction of *opus signinum* pavements, mosaics, and wall paintings of styles similar to those seen in the city of Carthago Nova in the 2nd and 1st centuries BCE (Orejas & Sánchez-Palencia 2002: 585). It is clear that, while these settlements were located in relatively rural areas and in close proximity to industrial mining activity, they were also well connected both with the urban center and with social and material networks that brought Italian products into the region as well as Italian immigrants who came to live in the region alongside indigenous people. I argue that this connectivity had the effect of linking communities living in the industrial landscape with the outside world more closely than did many rural agricultural areas, which could remain more isolated in the case of subsistence farming (though this observation does not apply to large scale oil or grain production for the *annona*). Also, it had the effect of forming diverse communities in southeast Iberia whose daily activities and experiences were closely tied to participation in mining. I explore these issues further through material remains of one such mining installation and settlement at the site of El Gorguel in the following chapter.

South-central Iberia: the Sierra Morena

Historical Trajectory of Conquest and Mining in the Region

The second major mining district in southern Iberia is located in and around the Sierra Morena mountain range, especially in the modern Spanish regions of Jaén, Ciudad Real, Córdoba, the southeast of Badajoz, and the north of Sevilla. During the Roman

Republic, this region lay in the province of Hispania Ulterior and later became a part of Baetica after the Augustan-era reorganization of the provinces. Although many of these places were subject to intense modern mining operations—especially during the 19th century—the areas best-explored archaeologically and which will be the object of focus for the following chapters are the mining districts of Linares-La Carolina (Jaén) and Córdoba (e.g., Arboledas Martínez 2010; García Romero 2002). The region is geologically and topographically diverse, with mesetas and river valleys running into the prominent Guadalquivir River. As with southeast Iberia, it contained large deposits of argentiferous galena, which were exploited in the Roman period for lead and silver, primarily in the 2nd century BCE through the 1st century CE. Lesser quantities of copper, gold, cinnabar, iron, and mercury were also exploited in the Sierra Morena region before, during, and after these years.

The chronology of extractive activity extends much earlier, with indigenous mining dating as early as the Chalcolithic, probably carried out as part of the domestic economy on a much smaller scale than is the case after later colonization episodes (Mangas & Orejas 1999: 243). As in the southeast, the Bronze Age saw more regularized and intense production of metal objects, primarily in copper (Lull et al. 2013: 599–600). Punic exploitation is recorded by ancient authors who wrote of Punic silver mining in ancient Turdetania (Strabo 3.2.14) and specifically of mines such as Babelo (probably in Jaén) that supplied Hannibal with silver (Pliny *HN* 33.96-97). The Romans came into possession of the city of Castulo (Linares, Jaén) in 206 BCE, and intensive Roman exploitation began in the 2nd century BCE and grew into a flourishing industry in the 1st century BCE (Mangas & Orejas 1999: 243).

During the Republican period, mines included superficial workings where veins were exploited in open cast trenches as well as underground workings using shaft-and-gallery systems with advanced technology for the evacuation of water from underground tunnels. Most of these operations appear to have been administered by societies of varying scales (see page 182), the names of which are attested on stamped ingots, buckets, and other tools. As in the southeast, the labor composition was varied, with Italian immigrants and aristocrats of local origin possibly running such societies, with a mixed labor force of local people, slaves, and perhaps even condemned criminals (Rico 2010; Arboledas Martínez 2010: 133–162). Mining settlements developed in and around many of the districts of highest exploitation. The mining economy brought foreign goods and monetization to mining communities from early on, and local/regional connections and trade networks can also be seen in the diversity of material goods.

In the early empire, much changed in the region. It is possible that the annexation of Britain under Claudius gave the Romans ready access to lead and other minerals, accounting for the decline in mining in this district from the 1st century CE (Jones & Mattingly 1990: 179–196; Pérez Macías 1998: 140). Local changes, including the rise of other industries, certainly played a role in this decline as well. Although some mines remained active until the 2nd century CE and later, silver and lead from other provinces became more important to the imperial economy. The mines that did continue were administered differently: either by the senate, which had come into control of Baetica through the provincial reorganization, the imperial *fiscus*, or by smaller entities including cities and individuals (Mangas & Orejas 1999: 249–253). Eventually, this part of Baetica came to play a much more significant role in the production and distribution of olive oil

than it did in the extraction of metals (Blázquez Martínez 1992). Beginning in the 1st century CE, the olive oil industry replaced mining as the dominant commercial activity; mines that remained active in later centuries were not subject to central control and were primarily of local consequence.

Political Landscapes of the Sierra Morena

As was the case with southeast Iberia, the Romans inherited a productive landscape that had already been producing copper, silver, and lead for many thousands of years before their arrival. While this set the stage for the creation of Roman mining landscapes in the region, changes to the political landscape—including the addition of new roads—impacted the organization of the mining industry and increased connectivity throughout the Sierra Morena. Further, politics involved in Roman domination of this area impacted the placement of settlements in the landscape and the stability of communities associated with mining.

The infrastructure for long-distance and regional trade of metals was already in place as a result of Phoenician and Punic trading with the indigenous Iberians along the southern Mediterranean coast from the 8th century BCE and earlier. At that time the *oppidum* of Cástulo emerged as a nexus between the mining landscapes (and agricultural landscapes) of the eastern Sierra Morena and the southern Mediterranean coast.⁸⁴ It functioned as a redistributive center between various smaller settlements associated with mining itself and the coastal trading posts. When Cástulo fell into the hands of the Romans in 206 BCE, they inherited a trade network that had already been operating in

⁸⁴ In the 4th century BCE, Cástulo received Attic pottery in such quantities through these trade networks that one type of Attic cup is known as the “Cástulo” cup (Sánchez 1992).

the landscape for centuries, and this city maintained its important redistributive function in the Roman Republican and imperial periods (Arboledas Martínez 2010: 112).

Interestingly, this part of southern Iberia did not undergo the process of Roman municipalization until the second half of the 1st century CE, but despite this lack of municipal status, existing Iberian centers maintained their key roles as economic centers in the emerging Roman economic sphere (Keay 1998; Fear 1996; León Alonso & Rodríguez Oliva 1993). Cástulo, however, was a *municipium iuris Latini* and is named in Pliny's lists (*HN* 3.25).

The implantation of Roman roads in the landscape, as in all of southern Iberia, was one of the most important aspects of the political transformation of the Sierra Morena. New roads had the effect of increasing connectivity between mining centers and Roman cities and ports, which facilitated the movement of people in and out of mining landscapes beyond what had been possible in earlier periods. Cástulo, for instance, was connected through new roads to mining centers at La Carolina, El Centenillo, Baños de la Encina, and others. Additionally, the site was located along the Guadalquivir River, yet another key navigable transportation route for Roman commerce (Arboledas Martínez 2010: 114).

Finally, despite the growth in connectivity in the region associated with Roman conquest and various political changes, political upheaval in the region continued after the 2nd Punic War with, for instance, the Lusitanian Wars (155-139 BCE) and the Sertorian War (80-72 BCE). These bellicose episodes did cause some discontinuity in mining activity and instability among local communities. Chavés Tristán, Arboledas Martínez, and others have noted that many hoards are found in this area dating from the

time of conquest to the end of the 2nd century BCE. These can be indicative of a desire of local communities living in and around mining districts to protect and conceal their accumulated wealth (Arboledas Martínez 2010: 112–113). Further, some settlements in the areas associated with mining activity became fortified, perhaps as a result of external political factors rather than a need to control and supervise local populations. Next, I discuss the placement of settlements in the landscape and how political instability may have impacted the rural and industrial mining landscapes.

Rural and Industrial Landscapes of the Sierra Morena

The Sierra Morena region is large and unevenly studied from the perspective of rural and industrial landscapes. The Linares-La Carolina region of Jaén located just north of Cástulo in the Guadalquivir River Valley is perhaps the most comprehensively studied area (Arboledas Martínez 2010; Arboledas Martínez 2008; Arboledas Martínez 2005), though other locales including the Cerro Muriano north of Córdoba as well as Sisapo have also been extensively studied (Zarzalejos Prieto et al. 2012; Penco Valenzuela 2010; García Romero 2002; Fernández Ochoa et al. 2002). It is generally the case, however, that investigations have focused on specific mining sites or settlements rather than taken the region as a whole, perhaps because of the large area it encompasses and the many modern territorial divisions that dissect it.

As with both southeast Iberia and the Iberian Pyrite Belt, industrial mining was active in this region in the 19th and 20th centuries, which resulted in the discovery and destruction of many more ancient mining landscapes and sites. This recent history of mining increased interest in industrial heritage in the region, and it is now home to various active groups of amateur industrial archaeologists. One such organization is the

Proyecto Arrayanes, a non-profit organization run by a collective of volunteers to record industrial heritage in the Linares-La Carolina region. The group initially formed in 1991 at the time that the last lead mines in the district ceased operations. While their catalog is primarily directed towards contemporary industrial heritage, some ancient workings are also recorded on their website and presented in their information center in Linares (Colectivo Proyecto Arrayanes 2016).

Although various cultures living in the Linares-La Carolina region practiced metallurgy from the Chalcolithic period onwards, it is not until much later that a direct connection with settlement in the landscape and mining activity can be correlated. During the Bronze Age, the strong hierarchization of settlements facilitated the distribution of metals. During this period, copper was formed into convex, circular ingots that were circulated regionally and inter-regionally from sites involved in the extraction of copper, such as Rumblar, Peñalosa, Verónica, and Cerro de las Obras, to other settlements in the wider Guadalquivir valley (Arboledas Martínez 2010: 111). While these trade networks waned at the end of the Bronze Age, mining again increased with the arrival of the Phoenicians and later the Carthaginians and their desire to acquire the silver ores of the Sierra Morena. While it was during this period that the *oppidum* of Cástulo emerged as a redistributive center and small settlements associated with the silver mines emerged, the mining landscape as it relates to indigenous Iberian settlement is not well known archaeologically.

Settlement patterns and landscape use are somewhat better understood during the Roman period, though few have been thoroughly investigated from a regional perspective. Most settlements that emerged were small villages or groups of houses

located close to the mines themselves or within nearby metal smelting and refining installations (Mangas & Orejas 1999: 255). In many instances of Roman mining, however, settlements have gone unrecognized or undiscovered. This is perhaps because of a failure of archaeologists to recognize domestic space that overlapped and coexisted with industrial installations. For instance, buildings nearby furnaces and slag heaps have sometimes gone unidentified, but could have served as domestic space, workshop space, or storage space (Arboledas Martínez 2010: 115). In the following chapter, I discuss the settlement of La Loba in greater detail. It provides a concrete example of some of the ways that domestic and productive space at mining settlements overlapped.

In addition to small village settlements, additional fortified sites are known that seem to be placed in association with known mineral exploitation during the Roman Republican period. These settlements called “castillets” by Spanish archaeologists are often located on hilltops with good visual control of the surrounding landscape, contain the remnants of defensive fortifications, and have remnants of washing, smelting, and other activities associated with mining. These sites can be found in many regions of the Sierra Morena, including Córdoba, Extremadura, and Granada. While their interpretation is debated and uncertain, the need to fortify some areas may have been a direct result of the political instability in this region following the 2nd Punic War and even into the 1st century, and a need to protect and control mineral resources (Arboledas Martínez 2010: 115–117).

From an experiential standpoint, contemporary industrial heritage strongly marks the mining landscapes of this region with smelting installations, slag, and abandoned mining equipment easily visible, while Roman and other remains are difficult to locate

without specific instructions and a keen eye (Figure 5.6, Figure 5.7). In the past however, the sights, sounds, and smells of ancient mining must have also marked the mining landscapes of the Sierra Morena. The close association of many of these settlements not just with extractive opencast and underground mining, but also with crushing, washing, and smelting ores would have made all aspects of mining a constant part of the lived experience of local communities in these rural landscapes.

Southwest Iberia: the Iberian Pyrite Belt

Historical Trajectory of Conquest and Mining in the Region

The final case study of southwest Iberia encompasses the geological zone known as the Iberian Pyrite Belt, which encompasses a roughly 200 km long by 30 km wide strip of land spanning the border between Spain and Portugal, from Sevilla in the east to the Atlantic coast of southern Portugal in the Alentejo and Algarve regions in the west (García Palomero 2004). The zone also spanned a major border in antiquity: the provincial border between Lusitania and Baetica established from the period of the Augustan reorganization of Hispania. These modern and ancient political divisions have hindered comprehensive study of the Iberian Pyrite Belt. Nevertheless, the region as a whole has been targeted for its rich deposits of silver and copper as well as smaller quantities of gold from antiquity until very recently, and provides a key example of Roman-period mining in Iberia.

The Iberian Pyrite Belt has a long history of ancient working, perhaps from the late Neolithic, with especially early evidence for mining and metallurgy from the province of Huelva (Spain). While traditional viewpoints once held that the Phoenicians brought the technology and orientalizing forms and techniques of working gold and other

metals, it is now recognized that indigenous groups were practicing mining and metallurgy from early dates. The Tartessian culture, which expanded beginning in the 8th century BCE, is famous for intricate gold pieces such as the Carambolo treasure. Likewise, the Turdetanian culture, a subset of Iberian culture, which arose after the fall of Tartessos was heavily involved with mining and metallurgy (Escacena & Belén 1998; Downs 1998; Pellicer Catalán 1980; Pérez Macías 1996a; Pérez Macías 1996b; Pérez Macías 2009). The arrival of the Phoenicians to the western shores of the Iberian Peninsula did, however, bring about economic changes and an expansion in the scale of the mining industry (Hunt Ortiz 2003; Rothenberg & Blanco-Freijeiro 1981; Pérez Macías 2007).

Contrary to the situation in southeast and south-central Iberia, there is very little evidence for large-scale mining during the Punic period or Roman Republican periods in the southwest. No ingots were produced in this region during those years and many fewer examples of coinage and epigraphy are known. Instead, the heyday of mining in southwest Iberia did not begin until the Roman Imperial period, with the highest years of exploitation from the second half of the 1st century to the end of the 2nd century CE. During these years, mining targeted the rich deposits of silver and copper often found deep underground in the contact zone between the more superficial gossan layer and the pyrite-rich layer beneath. Although superficial workings and prospections were common, the largest mines at sites such as Riotinto and São Domingos grew into enormous underground shaft-and-gallery operations with tunnels for prospecting, extraction, illumination, ventilation, and water drainage (and various mechanical technologies for assisting this process). Because of the tighter administrative control over mining districts

in the Imperial period, these large operations were overseen by imperial officials (*procuratores metallorum*) sometimes with help from the army, but usually were run through a system of leasing concessions to various agents who would organize the day-to-day logistics of operations (see page 184, 324).

Alongside these booming imperial operations came a major restructuring of the political landscape including new urban centers and infrastructure that enabled movement and trade throughout the region. Within this system, mining districts (now called *metalla*) held a large degree of autonomy and developed far beyond the small productive centers known in the earlier industrial landscapes in southeast and south-central Iberia. We know from a pair of tablets fortuitously discovered at Vipasca (Aljustrel, Portugal) in the late 19th century that mining towns had a variety of resources from baths to schools to barber shops, and housed individuals of multiple professions subsidiary to mining that supported the community.

Although the scale of operations greatly decreased after the 2nd century CE, modest production continued into the 3rd, 4th and 5th centuries CE. Operations began again on a large scale in the 16th century, with particularly heavy phases of opencast mining in the 19th century (Salkield 1987). Mining techniques from these later periods involved large opencast operations rather than shaft-and-gallery mining, which were responsible for the destruction of ancient galleries at important Roman-era sites such as Riotino, Tharsis, São Domingos, and Ajustrel, but also simultaneously allowed for recording of ancient remains by engineers (Pérez Macías 1996a).

Political Landscapes of the Iberian Pyrite Belt

As with the other case studies under consideration, southwest Iberia became an imperial landscape with Roman cities, roads, and other infrastructure that served the dual purpose of facilitating mining (alongside a plethora of other rural productive activities) and reinforcing the political authority of Rome in the region. The emergence of Roman cities at the port cities of Huelva (Onuba) and Mértola (Myrtilis), Tejada la Nueva (Iptuci), and Niebla (Ilipla)—all preexisting urban centers prior to Roman times—demonstrates a desire by Rome to take over existing trade networks. Indeed, most of the known roads in this region were not monumentalized in any major way, and many must have existed to connect these Tartessian and Turdetanian centers prior to Roman conquest. It is difficult to determine the age of many pathways in southwest Iberia or identify them specifically with Roman-era activity (Ruiz Acevedo 2009: 172).

However, Roman additions to road systems show that some distinctly different patterns of trade involving the mining industry emerged after Roman conquest. In earlier periods, most metal extracted in the Iberian Pyrite Belt for colonial trade was distributed regionally through fluvial transportation routes along the Odiel, Río Tinto, and Guadiana rivers. Huelva functioned as the major port city for trade with Phoenician merchants, who frequented the southern Iberian coasts (Gomez Toscano 2002; Jones 1980; Aubet 2001). Much of the metal was, of course, used for local artisanal or utilitarian purposes as well.

After Roman conquest, there was a rupture in this system, or at least an expansion that involved the creation of new trade networks within the Roman imperial system. While Huelva remained an important port city for Mediterranean-wide shipping (and indeed other port cities in the region, such as Cádiz (Gades), retained their significance), the new roads in the landscapes indicate that new systems were put in place in order to

bring metals to other Roman cities in Baetica and Lusitania aside from Huelva and to distribute in products from elsewhere in mining landscapes. These included, for instance, roads leading southeast to Hispalis and Italica (Sevilla) as well as north to the capital city of Lusitania, Augusta Emerita (modern Mérida). Such routes are recorded for instance, in the Antonine Itinerary, which lists a road linking the region from the mouth of the Guadiana River to Italica and Augusta Emerita, the capital of Lusitania. This road passed through the mining districts along the way, including the town of Urium, which has been tentatively identified as Riotinto, and Tharsis (possibly Rubrae), among other key sites in the Iberian Pyrite Belt (Jones 1980; Ruiz Acevedo 2009). That such places were listed on the Antonine Itinerary serves to indicate their relative importance on an empire-level conception of Roman provincial territory in Hispania. Here, it is clear that changes to the political landscape involving Roman roads and cities reinforced the political authority of Rome in the region, as well as the economic significance of these cities to the imperial economy.

Rural and Industrial Landscapes of the Iberian Pyrite Belt

The Iberian Pyrite Belt, even perhaps more so than southeast Iberia and the Sierra Morena, is a place where landscapes have been scarred and transformed by millennia of industrial activity within the rural landscapes.⁸⁵ Contemporary opencast mining at what were likely some of the largest copper mines in the Roman Empire, including Riotinto,

⁸⁵ It is important to remember that agriculture always played an important role in this region, and varied depending on the scale and scope of mining. In prehistory, it was an activity that happened alongside mining to supply local communities, whereas in the Roman period some areas dedicated to agriculture must have supplied the Roman mining communities. In the later Roman Imperial period when mining waned in the region, more of the landscape may have been given over to agriculture than in the early empire (Pérez Macías 2014). The modern landscape is still given over to many of these same activities: agriculture (especially wine and cork production), pastoralism, and mining (e.g., Maddox 1993).

Tharsis, São Domingos, and Aljustrel, has obliterated many of the existing Roman pre-Roman and Roman era settlements as well as areas of opencast and subterranean mining activity from antiquity (Checkland 1967; Fernández Posse & Sánchez-Palencia 2000; Ruiz Ballesteros 2002; Rodrigues Lobato 1983; Martins et al. 2003; Salkield 1987). These modern workings are visible in places like the benched, opencast mines of Corta Atalaya, Riotinto (Figure 5.9) and the landscape at Riotinto, deforested and barren from many different mining episodes (Figure 5.10). In addition to these visible industrial changes, the long-term history of mining in these landscapes has caused irreparable damage through pollution (e.g., Davis Jr. et al. 2000; Candeias et al. 2011). Despite these realities, many artifacts have been saved and ancient workings recorded at the hands of modern mining engineers. Today, the former hospital at Riotinto serves as the museum to display the pieces collected over the years and house the archives of the workings at the site.

Because of this history, the overall understanding of settlement patterns in the rural landscapes of the Iberian Pyrite belt is fragmentary in comparison to the data available from Cartagena-Unión and Mazarrón discussed above. The province of Huelva is relatively well-understood as a result of surveys conducted by the Huelva Archaeo-Metallurgical Project beginning in 1973 (Rothenberg & Blanco-Freijeiro 1981) and the subsequent regional study of prehistoric mining in southwest Iberia by Mark Hunt Ortiz (2003). The mines of Riotinto lie within the modern province of Huelva and have been the topic of many site-specific analyses.

At Riotinto there does not appear to have been one mining city, but a series of small communities living in the areas of active mining; these are attested by architecture

and cemeteries uncovered in the process of modern mining. It is likely that the site of Urium recorded in the Antonine Itinerary and elsewhere refers not to a single urban center but to the various towns that comprised the *metallum* under Roman rule (Pérez Macías 1986; Pérez Macías 2002; Pérez Macías, Delgado Domínguez, et al. 2012; Pérez Macías & Delgado Domínguez 2007; Pérez Macías & Delgado Domínguez 2012). In the following chapter, I discuss the settlements at the sites of El Cerro del Moro and Corta del Lago, which provide examples of the short-lived, utilitarian mining settlements that sprung up during the Roman period there.

Generally speaking, because mining settlements were incorporated into imperial *metalla* during this period rather than into the municipal framework of cities, mining districts functioned as self-contained administrative units. This certainly would have constrained the kinds of daily interactions that took place between people and the regular movement of miners in and out of mining districts; on the other hand, imperial oversight of these industrial landscapes ensured the presence of foreign officials and soldiers as well as access to products from far afield.

Discussion: Industrial Landscapes as Negotiated Places

Imperial Mining Landscapes, Local Perspectives

This introduction to the mining landscapes of southwest Iberia, the Sierra Morena, and the Iberian Pyrite Belt has highlighted many of the ways that the Roman conquest of southern Iberia as a whole impacted the formation of mining landscapes, and by extension of mining communities. From the top-down perspective of political landscapes, changes can be seen at the large scale that are indicative of the Roman desire to modify the rural landscapes of southern Iberia in ways that allowed easy access to the metal

deposits. In all three cases, the implantation of roads in the rural landscapes—and the ways that old routes were co-opted—allowed processed ores to be commoditized and transported out of industrial landscapes, which benefitted the emerging Roman economy. In each case, some of these routes had been well-established already because of Phoenician and Punic trading and occupation of the region from at least the 8th century BCE onwards, but infrastructure was expanded and incorporated into new Roman territorial divisions and administrative structures.

The expansion and consolidation of trade networks also had the effect of increasing connectivity in the region. This included an expanded access at the local level to products from other areas of the Roman Empire, such as Italy and North Africa, in the moments soon after conquest in southeast and south-central Iberia. Further, it increased the distribution of regional products from Iberia to mining districts in the Imperial period. Here, Bernard Knapp's description of mining landscapes in Cyprus is apt:

The relationship between mining, settlement, and landscape varies according to the scale and organizational level of production... Whenever copper production exceeded the local or regional scale, mining communities were perforce linked into interregional, national, or global networks of communication and exchange (Knapp 2000: 237–238).

These issues will be discussed at a smaller scale in the context of settlements in the following chapter as well as in the context of economies in Chapter 8.

There were, of course, locally and temporally-specific variations in the ways that the Roman imperial footprint manifested itself in mining landscapes. In the southeast, the proximity of the mining landscapes to the city of Carthago Nova and the city's importance as a trading center from the time of its Punic foundation meant there was always a direct connection between elite social structures, the mining landscape, and the creation of the urbanized, Roman landscape at Carthago Nova. By contrast, the *metalla* of

the imperial period in southwest Iberia were administered directly by the imperial *fiscus* in a manner that severed some of these connections and fiscal interdependence between mining landscapes and the cities of the region (though cities such as Huelva, of course, continued to function as essential shipping ports).

Next, I argue that, in each case under consideration, the rural and industrial character of mining landscapes helped condition the interactions of people in these places on a day-to-day basis. In Roman antiquity, as in many of the centuries that followed in these places with histories inextricably linked to mining, everyday life happened against the backdrop of (and indeed in interaction with) industrial activity, with its striking visual characteristics, such as enormous slag heaps and deforested hillsides, potent smells, and perpetual sounds. The sensory aspects of mining landscapes, and the interactions of people with the land and with others participating in the industry, incited the formation and reaffirmation of communities linked through their daily practice to mining activity. Beyond this, I argued for the importance of considering mining landscapes alongside agricultural ones in the wider body of literature on rural landscapes. After all, rural places were home to the majority of people in the Roman Empire and Iberia is no exception. If we are to understand the impact of Roman conquest on the Iberian Peninsula, it is essential to examine rural landscapes, especially those with long-term histories of industrial activity.

Ideational Considerations and Local Knowledge in Mining Landscapes

The creation of mining landscapes is often seen as a mainly economic endeavor for the extraction of raw material, and it is primarily in these terms that I have considered landscapes in this chapter. However, the interactions that took place in the context of

creating and living in the mining landscape had implications beyond the economic realm, and could deeply impact the way that people conceived of their landscapes. By extension, perceptions of a changing landscape could alter the ways that people conceived of their own communities. Scholars have long noted that places can be associated with memories, identities, and the construction of social order in ways that depend on maintaining, experiencing, and perpetuating the cultural ideas linked to them (e.g., Ashmore & Knapp 1999: 10–19; Van Dyke 2008; Basso 1996). The concept of the “ideational landscape” proposed by Ashmore and Knapp provides one way to begin to imagine the non-economic aspects of the mining landscape. Specifically, the ideational landscape is both “‘imaginative’ (in the sense of being a mental image of something) and emotional (in the sense of cultivating or eliciting some spiritual value or ideal)” (1999: 12).

Mining is an inherently destructive activity, and in the process of extracting ores, people transform landscapes in ways that can alter or erase places of deep-seated cultural meaning or cultural memories. In the context of northwest Iberia, I discussed the ways that alterations as a result of gold mining to mountains, rivers, and other watercourses could have had a destructive effect on places castro communities associated with traditional deities. Specifically, indigenous people monumentalized fountains after Roman conquest and began to place altars in the landscape (see page 120), perhaps in an effort to mediate some of these destructive effects.

Cultic or religious activity is known to play a role in the construction and maintenance of many contemporary mining communities. For instance, Santa Barbara dos Mineiros is often given a shrine in a central location in mining settlements such as Lousal, Portugal (Figure 5.11), and miners prayed to her for their continued safety

underground when the mines were active through the 20th century. Similarly, across the ocean from Iberia in contemporary Bolivia, shrines to the indigenous deity Supay are placed underground in mining shafts, and miners leave offerings such as tobacco and alcohol to appease the underworld deity as they disturb his domain (Nash 1979).

Turning to the Roman world, some have suggested that Dis Pater, represented in the form of a horse, was part of a cult for miners. There are representations of Dis Pater in at mining settlements such as Munigua (southwest Spain) and in Dacia, however none are attested in the specific case studies under consideration in this dissertation. In Riotinto, evidence for cult activity is limited to the mention of Jupiter in an inscription (CIL I, 28; Pérez Macías et al. 2012: 70–71). It is reasonable to assume, however, that cultic activity could have played a role in the formation of mining communities in Roman Iberia, just as cultic activity helped solidify communal bonds in other Roman social contexts, such as the worship of the cult of Mithras and other deities among military and diaspora communities throughout the Roman Empire (Collar 2013).

Communal religious practice may also have provided a forum for mining communities to come together, uniting across social or class boundaries. A look at community life in many more contemporary mining settlements reveals the importance of the Catholic faith in the maintenance of communal solidarity. Churches were often located in central locations in mining settlements of the 18th, 19th, and 20th centuries. To take a contemporary example from Portugal, the Catholic church in São Domingos is located at the point of intersection of all the main roads in the settlement and on a visually prominent hillside in the landscape (Custódio 2013: 8). The church was easily accessible via pedestrian and road pathways to both the British neighborhood for

engineers and their families and to the humbler rows of houses. Although funerary rites were administered in different locations, and these two communities were buried separately, attending Catholic mass or other church functions could have served as a mechanism for bringing the mining community together through religious practice. The significance of maintaining this church to the community is clear in the successive construction and reconstruction of different versions of the present building. According to an information panel onsite, a small chapel dedicated to Saint Domingo was constructed in the original mining settlement. Soon thereafter, a large church was constructed which opened in 1863. When the settlement was demolished and relocated in the process of opencast mining, a new church was constructed in 1938. When that church was damaged by fire, the current version was built on the same location in 1951 (Figure 5.12).

An examination of religious practice is one way to access the nebulous ideational landscape. Religion could have served several important functions at both the individual and community level within the mining landscape. Mining is and always has been a dangerous activity that involves the irreversible destruction of land. Religious practices could have provided some emotional security to miners during the course of their labors or to families whose fathers or sons were working underground. Further, it could have served as a means of negotiating the complex relationship of people with the surrounding landscapes that they were actively destroying. Finally, the practice of communal worship and cultic activity could have united members of mining communities across various social divides.

While some aspects of the ideational landscape may have involved activity to mediate the destructive character of mining that began after Roman conquest, landscapes

with long-term mining histories may have already had strong ideational connections to industry. Speaking of the mining landscape in prehistoric Cyprus, Bernard Knapp has noted that the ideational landscape was “intimately linked to industrial (specifically, mining) activities, and to the Bronze Age elites who exploited their perceived ‘supernatural’ knowledge in exchange for control over the appropriation, distribution, and consumption of labor, land and raw materials—especially copper” (Knapp 2000: 230). Local knowledge of resources and topography, alongside cultural links to mining, could have helped some indigenous people to negotiate their own place and power within the emerging Roman imperial economic sphere.

The perceptions and opinions of people living in the landscape mattered, not just for ideational reasons, but also in very practical ways. Although the mineral wealth of Iberia was well known in a general sense, the precise locations of ores within the landscape could not always have been apparent. It is for this reason that local understandings of the landscape could become important to those involved in Roman conquest of the landscape itself and in their search for the famed ores. Except in the cases where mining was an active, obvious, and observable activity at the moment of conquest, local landscape knowledge must have been a key resource for people already in southern Iberia at the moment of conquest of each region and in the years following it as the industry developed. Rockman has suggested that it takes at least a generation after the colonization of a new landscape for newcomers to gain a full understanding of natural resources and a familiarity with the range of environmental fluctuations on a seasonal and yearly basis (2003: 5). If this is true, then, local populations, with their indigenous traditions of finding and retrieving metal ore in the wider landscape, could have derived

some power from this knowledge within the new Roman political sphere. I discuss this topic in detail in Chapter 7.

Conclusion

This chapter on the landscapes of southern Iberia served, first of all, to introduce the three geographic regions that are case studies in the following chapters, including Cartagena/Mazarrón (southeast Iberia), the Sierra Morena (south-central Iberia), and the Iberian Pyrite Belt (southwest Iberia). I argued that these mining landscapes are best understood as political, rural, and industrial landscapes. Roman conquest, and indeed previous colonial encounters in these regions, shaped the political landscapes in ways that made it easier to access and control mineral resources. Roman strategies varied from augmenting road networks and building new pathways to metal rich zones to expanding the infrastructure of ports and cities in order to accommodate expanding economic activity. These changes, alongside the creation of the mines themselves, served not just as conveniences but also as markers of imperial power.

Top-down political changes also had localized effects on mining landscapes that can be seen when they are considered as rural and industrial landscapes. Specifically, local communities participated in the creation and transformation of mining landscapes, and in doing so they participated in the imperial economy and became a part of growing economic networks in southern Iberia. These changes at the level of landscape, I argue, could have incited the creation and maintenance of communities whose daily practices and identities were in many ways linked to the practice of large-scale mining in often rural locations. In areas with preexisting strong traditions of mining, local landscape knowledge could have given local communities power within the new political economy.

In order to examine the impacts of these landscape changes on local communities, it is imperative to turn to evidence at a smaller scale. Specifically, in Chapter 6, I will look at select settlements and households from each region in order to understand the organization of daily life in specific communities on the ground. I will then turn in Chapter 7 to the organization of labor and technology in these mining landscapes, examining the technological practices and organization of labor necessary to create the large-scale landscape changes I discussed here.



Figure 5.1 Roman theater of Carthago Nova (author photo).



Figure 5.2 Remnants of Roman road, Carthago Nova (author photo).



Figure 5.3 Remnants of the *frigidarium* of the public baths of Carthago Nova, excavated in 1982 (author photo).



Figure 5.4 Remnants of the Punic wall of Carthago Nova with intrusive burials (author photo).

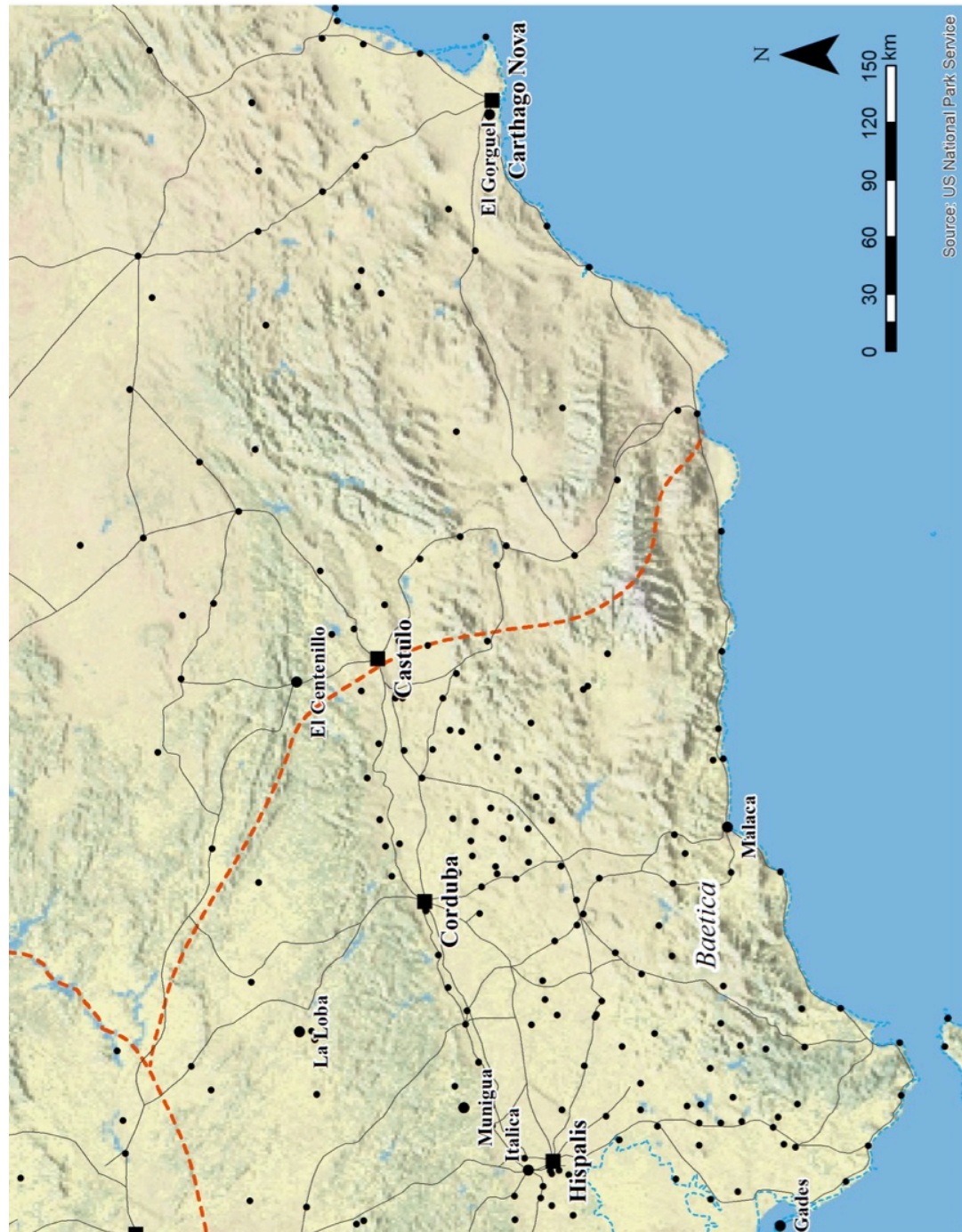


Figure 5.5 Map of the mining settlements and activity in Cartagena-La Unión and the Sierra Morena and Mazarrón featuring sites mentioned in the text. Roman roads are represented in grey and provincial divisions (after Augustus) are represented in red. Other settlements are represented by black circles. Ancient coastline, where it differs from the modern coastline is represented by the blue dotted line (author map).



Figure 5.6 Contemporary mining installations at the well-known Roman mine of El Centenillo in Linares (Jaén, Spain) (author photo).



Figure 5.7 View of the Sierra Morena mountains from the contemporary mining installations at El Centenillo (Jaén, Spain) (author photo).

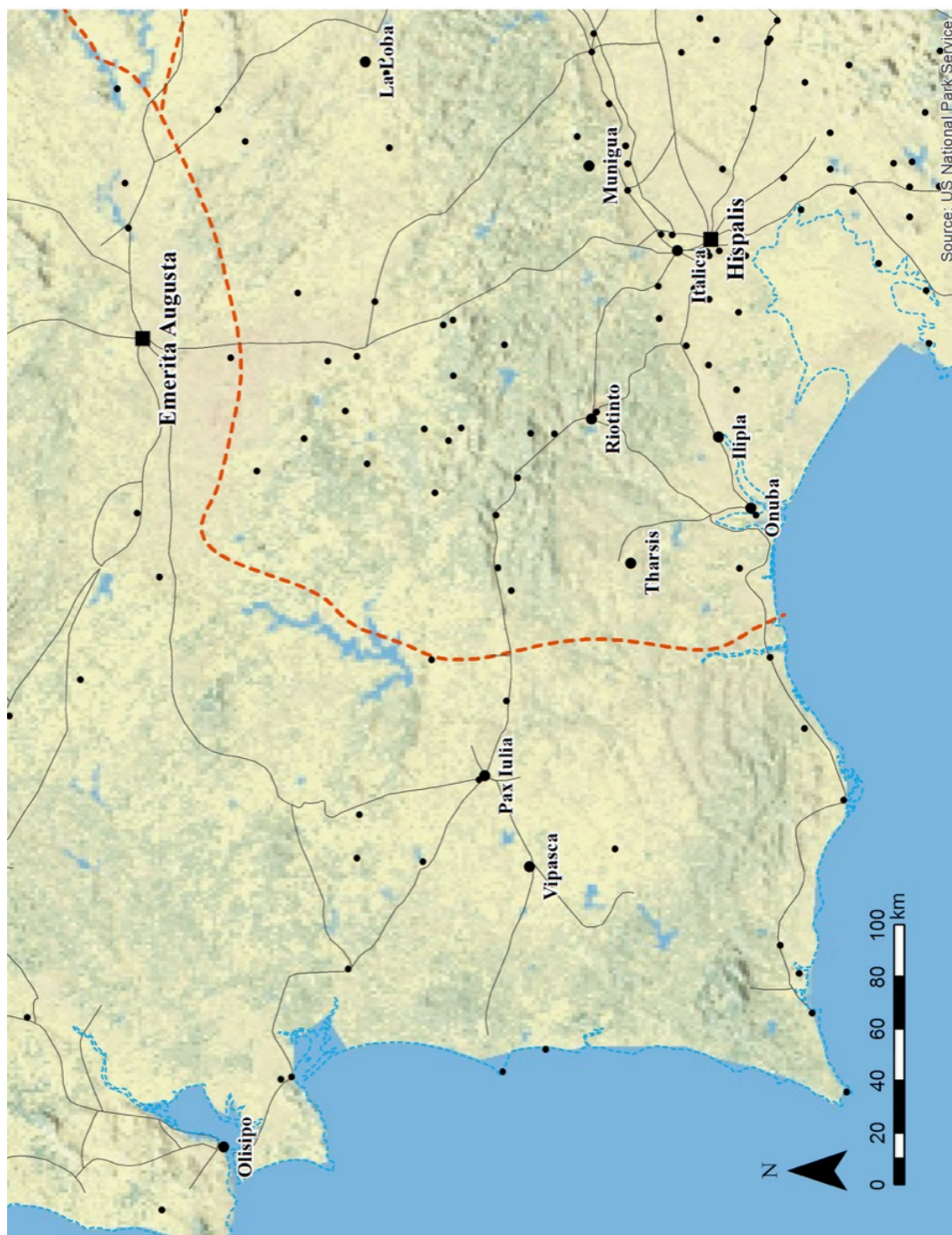


Figure 5.8 Major mining sites and Roman cities in southwest Iberia. Roman roads are represented in grey and provincial divisions (after Augustus) are represented in red. Other settlements are represented by black circles. Ancient coastline, where it differs from the modern coastline is represented by the blue dotted line (author map).



Figure 5.9 The modern opencast mining trench of Corta Atalaya, Riotinto (author photo).



Figure 5.10 View of the barren industrial landscape of Riotinto in 2011 (author photo).



Figure 5.11 Shrine to Santa Barbara dos Mineiros (Lousal, Portugal) (author photo).



Figure 5.12 Catholic Church of São Domingos, Portugal (author photo).

CHAPTER 6

SETTLEMENTS AND HOUSEHOLDS: EVERYDAY LIFE IN MINING COMMUNITIES

Somewhere between household and empire lies the community.
-Joyce Marcus (2000: 231)

Introduction

The significance of human interactions with landscapes through the extraction of metal ores should, by now, be abundantly clear. The opening of mines in Iberia under the Romans gave rural landscapes new political and economic importance as they were repurposed for industrial activity. Further, it refashioned the modes of interaction between local communities and their homelands. Ultimately, landscapes served as one setting in which mining communities were formed and transformed over time. If landscapes represent a macro-scale level of analysis of such interactions, settlements and households represent medium- and small-scale units of analysis for looking at interactions and daily practices. The study of mining settlements and their households provides an essential component to understanding the interplay between wider political and economic processes related to the expansion of the Roman Empire into Iberia and the formation of mining communities within industrial landscapes. Specifically, surviving examples of mining settlements and their households provide a key way to access those face-to-face, intimate interactions between people that led to the formation and transformation of distinctive communities in industrial mining landscapes. As Cynthia Robin has noted: “What people do in their households is deeply implicated in what is

going on in the broader world around them” (2013: 52). As study of evidence at this scale of analysis then, provides an important window into the impact of empire on people’s daily lives and the contribution of mining communities to the empire itself.

In this chapter, I first outline the potential of settlement and household studies for highlighting interactions and daily practices in the everyday lives of miners, interactions that contributed to the formation of mining communities who produced enormous quantities of ore in Hispania. I then select the best-recorded case studies from each of the three regions under consideration in order to highlight the changing dynamics of everyday life among members of mining communities in the places in which they interacted the most: in the settlements where they lived and worked, and the houses where the most intimate parts of their daily lives took place. In southeast Iberia, I discuss the case of El Gorguel, a rural site outside of Carthago Nova where people lived and practiced smelting activities related to silver and lead extraction and processing. In south-central Iberia, I draw from evidence at the settlement of La Loba, also linked to the mining and processing of argentiferous galena as well as copper ore. Finally, in southwest Iberia where the evidence is most abundant in this category, I discuss several examples of settlements, their houses, and their cemeteries from different time periods ranging from the 1st century BCE to the 2nd century CE in Riotinto (Spain) and Aljustrel (Portugal).

Although each of these sites provides a distinct window into mining communities at different times and in disparate places, I conclude the chapter with a discussion of several trends that become clear through the presentation of case studies. First, in mining communities and households, the ties between domestic and community life and

everyday labor to support mining were often very close, both physically and conceptually. In short, mining communities were set up to facilitate production. This reality likely led to the formation of group identities based on associations with the mining industry. Second, the communities living in mining settlements were comprised of diverse groups of people of disparate ethnic and geographic origins, statuses, genders, and ages. The diversity of mining communities likely contributed to 1) the maintenance of external social and economic connections, and 2) the development of a communal solidarity formed around the only common ground shared by members of the community: the extraction of metals. Finally, the close relationship between extraction and empire strongly marked relations of power within these communities, and the relationships of these communities with regional and empire-wide social and economic networks.

Framing Settlements and Households: Everyday Life and Community Practices in Mining Landscapes

In Chapter 3, I argued that a full understanding of mining communities is only possible through a multi-scalar analysis of existing data to highlight the interactions and practices of everyday life in various settings including landscapes, settlements and households, technology and labor, and economies. I view settlement and household studies together with landscape studies on a broad continuum of scales of spatial analysis: household-level data serves to illuminate interactions at the micro-scale, settlement-level data reveals the organization of communities at a medium scale, and the largest level of landscape-level data goes a step further to look at human-landscape interaction broadly conceptualized. While the archaeology of settlements and households both have long traditions as relatively separate sub-disciplines, I consider them together here as two

settings of analysis at different scales of resolution that can contribute to our overall understanding of the interactions and practices of everyday life in mining communities.

The term household archaeology was first coined in the early 1980s by Wilk and Rathje (1982), who even then proposed a definition of the household based on activities, or practices. For them the household was the “smallest and most abundant activity group” (Wilk & Rathje 1982: 618). Since that time, various topics of comparative interest have emerged in the literature on households such as avenues of social reproduction in houses and house societies (e.g., Joyce & Gillespie 2000), feminist and gender studies as they relate to the house, domestic production and consumption, household religion (e.g., Bodel & Olyan 2008), and household activities broadly defined (e.g., Allison 1999b). Household studies have emerged as an important focus of research in Mesoamerica and especially the Maya world (e.g., Robin 2003; Wilk & Ashmore 1988; Carballo 2011), among historical archaeologists (e.g., King 2006; Mrozowski 2006; Voss 2008; Groover 2001), in Egyptian archaeology (e.g., Müller 2015), and in the archaeology of the ancient Near East (e.g., Parker & Foster 2012).⁸⁶

Scholarship on houses from the classical world has not always engaged with debates in the wider field of household archaeology; traditional archaeological and art historical studies often take house structures out of their wider contexts and discuss elements such as architectural layout, paintings, mosaics, architecture, and artifact assemblages separately. More recent studies, however, have taken a corrective turn, conceptualizing houses in holistic and socially-meaningful ways, especially at well-

⁸⁶ This bibliography is not intended to be exhaustive, but rather to reference recent work and especially edited volumes that present both the history of scholarship in these fields and new work. An increasing number of volumes discuss ancient houses, as well as theories and methods for studying them in cross-cultural perspective, especially the recent Müller 2015 and Parker & Foster 2012.

preserved sites such as Olynthus (Greece) and Pompeii, among others (e.g., Nevett 2010; Nevett 2003; Allison 2004; Allison 2001; Allison 1999a; Bergmann 2008; Bowes 2012; Cahill 2002; Ault & Nevett 2005).

Despite this, a general focus on the dwellings of urban and elite houses remains, and the only rural houses that receive constant attention are lavish villas and countryside estates (e.g., Smith 1997; Marzano 2007). Houses of lower status people, especially those in rural and industrial landscapes have not often been given much attention in the classical Mediterranean world, at least when it comes to studies where domestic evidence is theorized as part of the “household” (but see: Ghisleni et al. 2011). On the other hand, the household has been used to study issues including relations of power, gender, social organization, and consumption practices at mining settlements in other times and places with great success (e.g., Sweitz 2012; Bury 2004), and it is on this vein of research that I model this chapter.

As with household archaeology, settlement studies have developed along a relatively independent trajectory, on the one hand as part of wider archaeological surveys that examine settlement patterns in the landscape (Fletcher 1986; Trigger 1967; Parsons 1972; Kowalewski 2008) and on the other as site-specific examinations of cities, settlements, urban places, and the built environment (e.g., Smith 2003). The previous chapter touched on how the size and distribution of settlements in the landscape can impact patterns of interaction and communication between and within towns, cities, and other kinds of agglomerations. Turning to a smaller level of analysis for examining settlement, however, has the potential to reveal a great deal about the social organization of the space in which many of the interactions of everyday life in communities took

place. Through archaeological and textual sources it is possible to examine the layout of settlements including the organization of houses alongside public places. Specifically, we can examine the kinds of houses present and their organization into distinct neighborhoods; the placement of domestic spaces in relation to public areas or communal places such as stores, workshops, places of worship, hospitals, schools, cemeteries, and open or communal space; and finally the infrastructure present, including sanitation, roads, and points of access. After all, the built environment both conditioned and was conditioned by the interactions that took place among those living in settlements.

Studies of Roman urbanism and cities are common in the provinces of Hispania and throughout the Roman Empire (e.g., Hernández Guerra & Sagredo San Eustaquio 1998; Osland 2006; Goffaux 2001; Kulikowski 2004; Sewell 2010; Keay 2008; Laurence et al. 2011; Goodman 2007; Alborch Bataller 1993), but investigations of rural settlements specialized in industrial activity have been much less frequent. The major exception to this is Egypt, where mining and quarrying settlements in the Eastern Desert dating to the Roman and Late Roman period have been extensively investigated. These include the Roman quarrying settlements of Mons Claudianus and Mons Porphyrites (Maxfield & Peacock 2001; Peacock & Maxfield 2007; Maxfield 2001; Peacock & Maxfield 1997; Peacock & Maxfield 2001) as well as the Byzantine gold mining settlement of Bir umm Fawakhir (Meyer et al. 2000; Meyer et al. 2011; Meyer et al. 2014; Meyer 1998). Because of the specific environmental conditions of this region and the absence of modern mining or settlement, a wealth of evidence for settlement organization from these sites was readily brought to light and well contextualized with diachronic patterns of extraction, seasonal and temporary habitation, and permanent

settlement in the region (Shaw 1994; Barnard & Duistermaat 2012; Sidebotham et al. 2008).

In contrast to the abundant evidence from Roman Egypt—and indeed in stark contrast to the detailed descriptions of castros and mining settlements at Las Médulas in northwest Iberia (Chapter 4)—known settlements in mining landscapes are few and far between in southern Iberia—both those excavated or surveyed archaeologically and those recorded in epigraphic or historical documents. In some cases, it is only possible to discuss the general distribution of settlements in landscapes because they have only been surveyed in wider landscape survey projects or reported by amateur industrial archaeologists. In a few fortunate cases, the internal layout of settlements and domestic structures can be distinguished.

Despite the limitations of this evidence, select case studies of settlements and households from southeast Spain (El Gorguel), south-central Spain (La Loba), and southwest Iberia (Riotinto and Aljustrel) provide compelling evidence ranging from the 2nd century BCE to the 2nd century CE for everyday life in mining settlements. Specifically, this evidence provides the basis for discussion about the ways that communities accessed, distributed, and consumed goods; organized domestic and communal activities including subsidiary production; and built and rebuilt their domestic and public spaces. These topics shed light on the many ways that people constructed and maintained social bonds with each other on an everyday basis and with those in the outside world after the Roman domination of Iberia, ultimately revealing the ways that living together in mining landscapes contributed to the creation of communities.

Households and Settlement in the Mining Landscapes of Southern Iberia

El Gorguel: Living and Working in the Rural Landscape of Southeast Spain

As discussed in Chapter 5, many settlements arose in the rural landscapes of southeast Iberia from the late 3rd century to the 1st century BCE Iberia that were clearly connected to the mining industry there. These settlements contained smelting furnaces, were located near the mines, and well connected to watercourses and roads leading to coastal urban centers. Here, I explore one such settlement located outside of Carthago Nova: El Gorguel. This site is located between 5 and 8 kilometers west of the city of Carthago Nova. The settlement occupies a valley between the hills of Las Colmenas to the north and the Sierra de la Fausilla to the south, a dispersed area of roughly 210 hectares with separate but interconnected areas of occupation. Five distinct archaeological sites have been located within the eastern sector of the site, the Fundación El Gorguel, Instalaciones del Gorguel, Toctarba, Los Simones, and the Canteras de Las Colmenas (Figure 6.1). The first three were explored through a series of rescue excavations and the final two were only investigated through pedestrian survey. Many small shaft-and-gallery mines dot the hills surrounding the valley, which were exploited from the 2nd century BCE to the beginning of the 1st century CE. Together, this evidence sheds light on the organization of domestic space alongside metallurgical production at this site, and gives us clues as to the inhabitants and their external connections.

The so-called “foundry” of El Gorguel, excavated in 2008 as part of a rescue excavation, is a large structure where metallurgy and domestic life took place side-by-side. The first phase of occupation of the site began around 200-180 BCE and lasted until 110-80 BCE, but the known architecture belongs to a second phase that lasted roughly

from the end of the 2nd century to the first quarter of the 1st century CE according to the ceramic chronologies. It is in this second phase that it is possible to discuss the organization of space. There is a large rectangular building measuring 53 x 26 meters, with a number of walled interior divisions (Figure 6.2). Two small rooms on the exterior of the building have been interpreted as a possible tower base for guarding the building, though the fact that each contains a drain as well as their location alongside rooms dedicated to smelting indicates that they were more likely used in the production process. The southwestern rooms were dedicated to the initial treatment of the ores, including grinding and washing. In the northeastern sector, there were two large spaces dedicated to the metallurgical processing of argentiferous galena including a series of furnaces for smelting lead and silver, and a storage area for finished products. By contrast, the southeast has multiple rooms likely dedicated to domestic and/or administrative activities (Antolinos Marín 2012: 65).

In the southeast quadrant, a new, likely domestic, building was constructed during reforms that took place at the end of the 2nd century BCE. This building, 19.9 x 10.8 meters in plan, had four internal room divisions, which were all accessed from the exterior and which did not communicate with one another. This new construction also created two new rooms (5 and 6) with the surrounding perimeter wall. Most of the floors in this construction were made of *opus signinum* (with the exception of Rooms 2 and 6, made of packed dirt). Room 4 was the most lavish, with marble inlays in geometric patterns typical of the late Republican floors of domestic spaces in nearby Carthago Nova as well as in Italy (Antolinos Marín 2012: 67–68). This construction is significant because it appears to be a domestic space in a largely industrial building, one that

followed the styles and trends of Roman-construction, in the industrial landscape outside of Carthago Nova. This suggests at the very least a movement of ideas about the decorative elements of urban dwellings in Rome, Carthago Nova, and other urban centers into rural and industrial spaces. Further, it suggests the movement of people from the Italian peninsula to Iberia to seek their fortune in mining. Diodorus wrote: “But later on, when the Romans took control of Iberia, a crowd of Italians filled the mines and bore off great wealth through their lust for profit” (History 5.36; Appendix IV). Alongside this literary evidence, Italian names on stamped ingots from the region (see page 348) and the presence of Italian-style buildings points to a migration of Italians into southeast Iberia. Thus, this domestic complex might have housed Italians involved in overseeing and administering the smelting process at El Gorguel, or at least local elites who had adopted certain building practices drawn from Italian traditions. This, of course, fits well with the chronology of conquest: Carthago Nova had been conquered by the Romans in 209 BCE.

The southwestern building was a space for production contemporary with the domestic space described above. It contained three rooms (7, 8, and 9) measuring roughly 12 x 8.6 meters that were devoted to the washing and crushing of ores. Though Room 9 was badly preserved, Room 8 conserved pieces of dolomitic limestone for crushing ores, while Room 7, divided into two spaces paved in *opus signinum*, likely served as an ore washery as indicated by the drainage pipe leading out of the room to the northeast (Antolinos Marín 2012: 69–70). While ore processing is described in detail in the following chapter, it is significant to emphasize here that ore processing was taking place alongside domestic life in the industrial landscape where ores were being extracted. This gives us insight into the organization of production and everyday life in this particular

mining landscape: people were living in close proximity to the locations of ore crushing, washing, and smelting and not far from the underground deposits of metal. Though this may have served as an important way for overseers to control this end of the production process and perhaps the distribution of ingots out of El Gorguel, it certainly would have had physical and social ramifications. Living close to smelting areas with their fumes and smells—even part time—likely had negative health impacts on members of the mining community. Silicosis is a common ailment of many miners and smelters, and those involved in—or living in proximity to—silver and lead smelting exhibit a number of problems related to heavy metal poisoning (e.g., Zare Naghadehi et al. 2014; Holzman 2011; Robins & Hagan 2012; Brown 2001; Fraser 2009). On a more conceptual level, this close link between everyday life and metal production could have served to reinforce individual identities linked to being a part of the mining community. From morning to night, the daily life of residents took place in constant interaction with the smells, sounds, and sights of the mining landscape. Many of the daily activities must have been related to metallurgical production. Through these interactions, the basis for community identity was constantly reinforced.

The northeastern quadrant of the foundry of El Gorguel appears to have been a large open or partially covered area, 12.5 x 9.4 meters, devoted to the next phase of metallurgy. The northern border of Room 10 was divided into six small spaces that served as furnaces, where charcoal, ash, and lead slag were found alongside crucibles and ceramic tuyeres, tubes that allowed oxygen into the furnace during smelting. Three additional furnaces were installed in the center of Room 10, while three other small furnaces were constructed in Room 11 in this area. Similarly, the northwestern sector of

the foundry contained two large rooms: Room 12 contained at least three furnaces, though all were badly preserved. Room 13, also badly preserved, was likely for the storage of metal products, fuel, and tools (Antolinos Marín 2012: 70–73).

Most of the material uncovered from the Foundry of El Gorguel was slag, charcoal, and other debris associated with smelting, but a number of ceramics were also in the assemblage. These included Campanian ware (type C) for domestic tableware and amphora from different production centers and traditions including Haltern 79 amphorae from Hispania, late Punic amphorae (Mañá C2b), as well as various kinds of amphorae from Italy (Grecoitalian and type Lamb. 2) (Antolinos Marín 2012: 65–66). This use of some Italian pottery forms also corroborates the hypothesis that some of the inhabitants of this industrial landscape were of Italian origin, and suggests that the site, though rural, was strongly connected to Roman trade routes and supply networks through the nearby city of Carthago Nova.

The foundry of El Gorguel was just one of various metallurgical sites in the valley (Figure 6.1). Another, the so-called Instalaciones del Gorguel, 90 meters to the west of the complex described above, also appears to have been a part of a similar metallurgical complex that was largely destroyed in the construction of the modern foundry called Santa Isabel in 1845. The presence of a large slagheap, roughly 110 x 70 meters in area, attests to the productivity of this particular production center. Similarly, the site of Tocatarba, 250 meters south and partially excavated in 2002, revealed the badly damaged remains of a mineral washery dating from the 2nd to the 1st century CE. While it remains unexcavated, Los Simones, 1 km southwest of the foundry, likely represents another metallurgical settlement, as remains of smelting alongside amphorae, tableware, and

commonware pottery were found in surface prospection there. Aside from mining activity in the surrounding landscape, limestone was quarried in the hills just 400 meters to the north of the foundry of El Gorguel. These rocks were used for the construction of various local architecture installations, and were probably also transported to Carthago Nova and other urban centers for use in urban architecture.

Overall, it is clear from this brief survey of the area that El Gorguel was but one small element of a large, productive landscape outside of Carthago Nova. These workshops and residential complexes had clear ties to the mines and quarries, from which they derived their material; the close proximity of settlements and productive installations must have also brought workers, traders, and laborers in contact to one another on a constant basis as well as with the wider social and material networks that linked to Carthago Nova by land and sea. These ties between settlement and landscape brought people into constant interaction during the processes of metal extraction and production, as well in the process of organizing food supply and other necessary activities. These realities of everyday life in this mining landscape must have contributed to the formation of mining communities of people of diverse origin with emerging identities linked very much to their participation in the mining industry, with deep connections to the local landscape as well as economic and social ties to Carthago Nova, by extension, to the Roman Empire.

La Loba: Household Interactions and Household Activities in the Sierra Morena

I turn next to the site of La Loba, which provides some of the best-recorded archaeological evidence of a mining settlement in the region of the Sierra Morena mountain range in south-central Iberia, rich in argentiferous galena and copper ore

extracted during the Roman Republican period. There, it is possible to trace the spatial distribution of artifacts within the excavated areas. The site is located about 90 kilometers northwest of Córdoba. Exploration between 1978 and 1981 was conducted there by a joint team of the Universidad Complutense de Madrid, the Université de Toulouse-Le Mirail, and the Escuela Universitaria de Ingeniería Técnica Minera de Bêlmez.⁸⁷ The project involved the exploration of the large alongside the exploration of two periods of settlement, one from the Bronze Age⁸⁸ and the other from the Roman Republic (Blázquez Martínez et al. 2002: 12–15).

At La Loba, the full layout of the landscape and productive activities are not fully reconstructable because of contemporary exploitation during the 19th and 20th centuries, but a general plan of the excavated settlement area in relation to roads and exploitation areas exists (Figure 6.4). In particular, the Sociedad Minero-Metalúrgica de Peñarroya reworked Roman slag to extract lead for use during World War I and therefore much of it was melted down and displaced (Blázquez Martínez 1983: 3). The remains of a Bronze Age settlement have been found on a hill close to the known mining area (Domergue 2002b), while the Roman-era village was about 1 kilometer away from the area mineral extraction. Three exploitation areas of metal veins are known, two of which were solely opencast extractive areas, which had the advantage of providing a safer working environment for those involved in mining. The third exploitation area developed was a

⁸⁷ The initial publications of this work, which present dubious conclusions about the composition of the community at this settlement, are a prime example of assumptions based on ancient sources coloring archaeological interpretation. Blázquez Martínez's first article on the topic called La Loba "a town of mining slaves." He wrote "the slaves lived in the conditions of a concentration camp," quoting Strabo's passage on the long hours of mining work that slaves endured (Blázquez Martínez 1981: 11–12).

⁸⁸ The Chalcolithic site of Cerro de los Castillejos, located less than a kilometer from La Loba, also attests to the long-term occupation of the central Sierra Morena. The hilltop location of this site was probably chosen because of its proximity to the Guadalquivir and Guadiana river basins, its visual dominance over the area, and its proximity to the rich copper deposits, which were exploited even then (Kayser 2002).

large underground mine, which was only partially explored in the present day because it is now filled with water—a problem that inhibited its full exploration by archaeologists and almost certainly slowed the process of mining in its primary use phase in antiquity (Domergue & Tollon 2002: 53–64).

The Roman-era settlement was occupied only for a short time, an estimated 30 years in total, beginning around 120 BCE. The numismatic evidence, including Roman *denarii* and bronze Iberian coins, ranges in date from 119 to 105 BCE, while the diagnostic pottery—including Dressel 1 amphorae, Campanian pottery, and oil lamps, date primarily to the first decade of the 1st century BCE just before the period of abandonment (Blázquez Martínez et al. 2002: 399–400). In the excavations of the settlement, four distinct areas were located, which the excavators refer to as blocks with letter names, each with their own set of houses (Figure 6.4). The overall construction technique for architecture at La Loba involved building a foundation made of local stone directly on the bedrock, which was then covered with walls made of mud. Because of the poor preservation of the organic upper levels of the houses, some aspects of the construction are not well understood, including where doorways were located. Only three partial pieces of *tegulae* were discovered in the whole of La Loba, which means that organic material rather than roof tiles was probably the option of choice for roofing materials.⁸⁹ Floors, on the other hand, were well preserved at the site and consisted of gravel and small rocks used for leveling with packed-earth on top. One common feature of all the houses in La Loba was the presence of a hearth or oven, usually embedded in a

⁸⁹ Alternatively, most of the tiles could have been taken away for repurposing when the site was abandoned or relocated elsewhere, though one might expect to see more examples of broken and discarded tiles if this were the case.

wall or delimited by small stone walls. The frequent presence of litharge as well as domestic ceramics near these hearths suggests that they were used both for cooking and for artisanal production of metal products, which I discuss below. Many houses also contain drainage systems constructed of ceramic—oftentimes reused Dressel 1 amphorae—buried beneath the floors to carry water out of houses into roads or open outdoor spaces. These construction practices are consistent with Iron Age architecture in the region, which also used stone foundations with walls of rammed earth (Sillières 2002: 149–158).

Because of the short-occupation period of La Loba, which involved a single construction phase for most areas, it is possible to discuss house plans in concrete terms. Three distinct types of houses were present in the settlement. In Block B, houses were rectangular in shape with six to eight rooms arranged along a central axis. There, three houses were partially excavated with B-II being the best-preserved example (Figure 6.5, right), measuring roughly 19 x 8 meters in size. The houses of Block A and at least one in Block D, of which house A-II represents the best example, were similar in rectangular form and in size to those of Block B. However, the interior layout was more symmetrical, and rooms surround a central space or corridor (Figure 6.5, left), which lead out onto the street in front of the house. Finally, the C-I, or the “great house” according to the excavators, was the largest domestic space, taking up some 600 square meters (as opposed to the c. 150 square meters of the other residences). This house, though only partially excavated is a large, semi-rectangular building (19 meters on the northern side, 21.5 meters on the southern side, and 29 meters long) with a central court of 12 x 8 meters. This court was likely open to the sky, but surrounded by a portico on all sides

held up by four pillars—reminiscent in plan of a Roman-style atrium. The northern end of the atrium house has been interpreted as a space for domestic life, while the southern rooms may have been given over to some kinds of domestic production, cooking, and/or served as a stable. This is indicated by the presence of horse bones and wooden and metal fragments of chariot wheels, amphorae, and cooking ware (Sillières 2002: 145–149; Domergue & Sillières 2002a: 118–127). Overall, it is clear from the disparity in house sizes between A-II, B-II, and C-I that there must have been a degree of social stratification at the site.

It is also tempting to suggest that house C-I, with its plan reminiscent of a Roman-style atrium house, may have been designed to accommodate Italian immigrants who, like those at El Gorguel, may have come to take part in the booming mining industry in Iberia. In contrast to El Gorguel, however, house C-I is completely lacking in internal decorative elements such as *opus signinum* or fresco walls, but instead was constructed entirely using local-architectural practices (Sillières 2002: 158–161). Local laborers were likely involved in the construction of this settlement and did so using their own techniques, which appears to have been laid out on a clear plan with orthogonal buildings and central streets. This may have been done in consultation with Italian immigrants, who brought certain preferences in the layout of space to La Loba and especially to house C-I.

Within the settlement, the presence of tools related to mining as well as metallurgical refuse demonstrates the close connection between domestic life within the settlement and metal extraction and processing, but also variation in the spatial distribution of these activities. Iron tools associated with mining were a common find at La Loba. These include seven picks, 12 points, 23 wedges, 15 thin chisels, eight flat

chisels, and one pair of pliers. Other metal objects possibly associated with metal carrying and final processing included bronze basket handles and lead weights (Domergue 2002a: 333–369). Significantly, the proportional number of mining tools is highest in Block A, which was located the closest walking distance to the mines. There, 27 of 41 total tools were discovered within the houses (Figure 6.7). House C-I, with its distinctive architecture, did not contain a single tool, which may speak to the division of labor of residents of the settlement. Specifically, those living in C-I were not participating actively in mining itself, but perhaps in overseeing, which is the expectation for Italian immigrants to mining districts if Diodorus' description is to be trusted. The fact that miners carried tools back from the mines to their houses also speaks to the organization of life at the settlement: miners were responsible for maintenance and repair for at least some of their personal tools, which they stored in their homes when they were not working in the mines.

While much of the initial processing of ore took place outside of the location of the mines, the processing of metal ores from these exploitation areas appears to have taken place in certain areas within the settlement, if the distribution of waste from smelting is any indication. For instance, copper matte was found in multiple distinct rooms in blocks A, B, and C of the excavations (Figure 6.8; Domergue & Tollon 2002: 65–65). The smelting process that produces this residue is “for treating the low-grade primary sulphidic ores which make up the bulk of any deposit” (Craddock 1995: 149).⁹⁰ Although the furnaces for smelting argentiferous galena were never found at La Loba, litharge from the process has also be uncovered within rooms and outdoor spaces within

⁹⁰ This process involves the roasting, slagging, and smelting of copper ores, and is well attested in antiquity. For a full description of the process see Craddock 1995: 149–153.

the settlement.⁹¹ In particular, rolls or *tubuli* formed from *spuma argenti*—a lead oxide that forms in the process of cupellation separating lead and silver—were recovered from multiple areas (Figure 6.9). These rolls or tubes were a way to facilitate use and transportation of this material, which was known to have multiple medical functions in antiquity such as use in eye ointment (see especially Pliny *HN* 33.106-108; Domergue & Tollon 2002: 70–73). It is unclear whether these *tubuli* were being prepared for shipment out of the site or used within households there, but it is likely that a combination of both occurred. Or, as the excavators propose, that this was a case of artisanal production using subsidiary products from mining for profit and personal use at the household level (Domergue & Sillières 2002b: 388–389).

Turning finally to other aspects of the material assemblage at the site, the rich array of ceramic artifacts and coins attest to significant interregional and cross-Mediterranean connections at La Loba. For instance, the excavations revealed 93 coins from secure contexts throughout the settlement. The most significant were a deposit of Roman *denarii* used as a foundation deposit (i.e.: placed there before the house was constructed) below a wall in house C-I⁹² and another deposit of Iberian bronze coins (*Arekorata* type) in the entrance of house A-II reveal connections with the production center to the north in Hispania Citerior. While these were the only deliberate deposits of coins, others from throughout the settlement reveal the widespread use of money in all areas. This may indicate that the inhabitants of La Loba were compensated for their work as miners, rather than forced to work as condemned criminals or slaves. Mints

⁹¹ Domergue and Sillières do note that the low-temperatures required to shape these *tubuli* means that they could have been created in domestic ovens within the houses (Domergue & Sillières 2002b: 391).

⁹² This is the only deposit of Roman *denarii* from a secure context in a mining settlement in all of Iberia (Chaves Tristán & Otero Morán 2002: 172).

represented aside from Rome and *Arekorata* include various other Iberian mints in Hispania Citerior (*Belikio, Bolskan, Kelse, Sekaisa, Sekia, Tabaniu, Tikiakos, Titum*) and in Hispania Ulterior (*Castulo, Obulco*), and Latin mints (*Ilipa* and *Ulia*) also in Hispania Ulterior. The residents of La Loba, therefore, had access primarily to money from within the Iberian Peninsula and primarily to those minting Iberian bronze coins. The distribution of mints in Citerior and Ulterior shows significant economic connections with the north and south, if not migration of certain segments of the population. Also significant is the presence of *denarii* from Rome in this rural area—*denarii* that were deposited in house C-I soon after their production as a foundation deposit. This corroborates the hypothesis that at least some of the residents of La Loba, and particularly those living in house C-I, came from Italy and perhaps brought coins with them (though the coins certainly could have arrived there through other trade networks as well) (Chaves Tristán & Otero Morán 2002).

If the coins reveal significant connections within Iberia, the ceramic show consistent external connections with Italian production centers for tableware and foodstuffs, especially wine, alongside occasional goods from other provinces and from inside the Iberian Peninsula. Campanian ware was often imported from Italy (primarily Campanian A) as well as thin walled vessels and lamps. These were used alongside commonware, mortars, and other ceramic of Iberian production, which was present in lesser quantities (Passelac 2002). Amphorae, primarily Dressel I and Lamboglia 2 forms, reveal that wine was imported from Campania, Etruria, and the Adriatic. Oil imports appear to have come from Tripolitana in North Africa (form Tripolitana I) (Benquet & Olmer 2002: 296–331).

While much of the ceramic assemblage was imported, it was used over relatively long periods of time at La Loba, as demonstrated by the multiple visible repairs and instances of reuse. Aside from the use of Dressel I amphorae in drainage systems in houses, this also includes repairs to Campanian tableware by binding broken pieces together with lead clasps (Domergue 2002a: 356). Further, despite the Italian origin of many of the products, inscriptions on multiple vessels indicate that they were used by people of Iberian origin living in La Loba. Fourteen graffiti in Iberian were inscribed on vessels after their firing, and two more were inscribed on locally made vessels before their firing (a lamp and a commonware handmade base sherd). Of the 17 total inscriptions, only one was inscribed in Latin, this one on the base of an amphora before it was fired (Moret 2002: 377–379).

La Loba was abandoned before the 2nd half of the first century BCE and perhaps as early as 80 BCE, as indicated by the absence of terra sigillata and the chronology of the coins (Domergue & Sillières 2002b: 385–386). While the reason for this is not entirely clear, it is possible that other production centers became more important or metal resources were depleted in the immediate vicinity of the site. The short occupation period of the settlement provides a window into community life at a key moment in Roman conquest and exploitation of the region, when the Sierra Morena had begun to match Carthago Nova/Mazarrón in production capacity and output. At La Loba, Italian immigrants appear to have moved to this rural, mountainous area in order to gain access to the profits of this industry. With this movement of people came a constant flow of material goods from far off places into the mining settlement, it is clear that many of the inhabitants were of indigenous origin based on the construction techniques, graffiti on

ceramic, and presence of some Iberian ceramic and many Iberian coins. This community must have been brought together for no other purpose than mining, and the daily activities both within and outside the houses were directed towards this industry. Miners worked in the nearby landscape and people produced subsidiary goods from mining inside their houses and repaired their tools in domestic contexts. This close connection between mining and domestic life must have guided daily activities, brought Italians and Iberians into constant interaction, and encouraged the forging of communities based on these interactions.

Riotinto: the Practicalities of Everyday Life and Death in the Iberian Pyrite Belt

Although the classical sources do indicate that southwest Iberia was a huge producer of metals under the Romans, they are silent about the towns located in the mining districts of the Iberian Pyrite Belt. The only exception to this is the mention of Urium by Ptolemy (2.4.11), which has been associated with the Roman settlements in the mining district or *metallum* at Riotinto. While some have linked Urium specifically with the largest known settlement in Riotinto at Llano de los Tesoros/Corta del Lago in Riotinto (Luzón Nogue & Ruiz Mata 1970: 127), it is more likely that it referred to the constellation of interconnected settlements in the region associated with different extraction and production areas (Figure 6.10). While Corta del Lago is the best known of these, others include El Cerro del Morro (Nerva), Marismilla (Planes), El Valle (now the football field of Riotinto), Tres Cruces, and a possible settlement in the vicinity of the English cemetery of Riotinto (Pérez Macías, Delgado Domínguez, et al. 2012: 50–51). In contrast to literary evidence, archaeological evidence for many of these sites exists, much of it haphazardly recorded in the process of modern mining or during rescue excavations

of areas partially destroyed. It has provided key evidence for occupation in the mining district as early as the 8th century BCE, and again in the Julio-Claudian era and 3rd and 4th centuries CE. In the following pages, I present evidence of the settlements El Cerro del Moro and Corta del Lago, including evidence of houses and cemeteries, which reveals who some of the residents of mining communities at Riotinto were and which illuminates the interactions of their everyday lives.

El Cerro del Moro (Nerva, Huelva, Andalucía)

The mining settlement of Cerro del Moro (also known as Cerro de Arenillas) is located in the municipality of Nerva just outside of the modern urban center of the town, which is close to the town of Minas de Riotinto. It is about 3 kilometers away from the main slag heaps at Corta del Lago (Craddock et al. 1987: 8) and was even briefly described early on by Oliver Davies (1935: 128).⁹³ In 1984, following superficial prospections in the area conducted by the Proyecto Río Tinto, a series of sondages were opened, which provided the opportunity to map architecture and recover archaeological materials from domestic contexts. The coins and pottery recovered from the settlement places its occupation neatly within the short period between 27 BCE to 14 CE, providing evidence that predates other Roman-era mining settlements in the region including Corta del Lago (Pérez Macías 1984). The archaeological remains at Cerro del Moro suggest that it housed a mixed population of military personnel who carried out administrative and supervisory duties, alongside civilians, probably of local origin, who practiced metallurgy, subsidiary production, and domestic tasks including cooking at the site.

⁹³ In earlier notes, the settlement was thought to have been fortified with a surrounding wall. However, recent interpretation contend that the walls visible on the surface were associated with contemporary boundary walls and terracing (Pérez Macías & Delgado Domínguez 2007: 113).

Cerro del Moro covers an area of about 2.3 hectares. Its hilltop location on the east margin of Riotinto gave easy access to the road leading to Italica (Sevilla) and Ilipa Magna (Pérez Macías & Delgado Domínguez 2007: 112–113). The settlement itself was composed of rectilinear structures made of local volcanic and slate stone with clay mortar. Tiles found on the surface, *tegulae* and *imbrices*, indicate that many buildings were roofed in this Roman architectural tradition. The poor preservation of the architecture means that in some areas only superficial mapping of partial walls was possible. However, the basic plan of Cerro del Moro is more complete than any other mining settlement in the Iberian Pyrite Belt (Figure 6.11). Based on the architectural forms and overall distribution of goods, it is possible to hypothesize the basic organization of space at the settlement with areas for military and administrative housing, storage, and administration; civilian housing; and metallurgical production. Of course, many of these spaces were likely multifunctional. There also appears to have been a close relationship between domestic space and metallurgical production, a scenario similar to that observed at El Gorguel and La Loba.

Of particular note are the large, rectilinear structures found in sectors A and F, which have an appearance similar to structures found in Roman military encampments, leading Pérez Macías and others to hypothesize that they housed the administrative/military wing of the settlement. Buildings A-1 and A-2 were rectilinear buildings (c. 11.5 x 5 meters) with tripartite internal divisions, possibly for military housing in the eastern extension side of the settlement. Similarly, the buildings of Sector 5 (F-1 and F-2) have nearly identical forms and are located on the far west of the

settlement. These are slightly larger at 11.2 x 9 meters (Pérez Macías & Delgado Domínguez 2007: 115, 120)

A-3 is a large structure 32.2 x 36.4 meters in size termed “Casa Grande” by the excavators—though it probably served as a storehouse rather than a domestic space (Figure 6.12). The structure is nearly square, with multiple internal divisions. It had a central patio and rows of nearly-square walled divisions along the left and right ends of the structure, possibly for the support of a floor constructed of wood. Inside the building, coins from Cástulo, iron ingots and glands, cameos, intaglios, and amphorae were found (Pérez Macías & Delgado Domínguez 2007: 116–117). The discovery of a few inscribed pieces of slate recording inventory inside the building corroborate the interpretation that it may have served as a storage space (Gimeno Pascual & Stylow 2007: 191). This building, with its tripartite divisions and thick walls (up to 97 centimeters for external walls), is reminiscent in form of *principia* buildings in Roman forts across the Roman Empire. In general, *principia* were large and centrally-located buildings in Roman forts averaging 30 x 25 meters in size (Johnson 1983: 104), a footprint similar to the building under discussion. They consisted of a tripartite plan with a central courtyard, an aisled cross-hall, and a range of smaller interior rooms, though the interior plan could vary considerably. These structures likely held administrative offices, the armory (*armamentaria*), and had spaces for storage of foodstuffs and other items (Johnson 1983: 104–132). The best studied examples come from Roman Britain and the German provinces (Johnson 1983; Biwell 2007).

Sectors C, D, E, G, and H were poorly preserved, but—in comparison to sectors A and F—walls were not as regular in construction, and were modified to follow the

slope of the irregular landscape. In sectors G and H, especially, the large quantity of domestic pottery and goods including dolia, loom weights, and oil lamps reinforces the idea that this central area of the settlement was primarily devoted to housing civilian, possibly local populations. Loom weights—which were trapezoidal in form with one perforation—were only uncovered from the test trenches in Sectors E and H, indicating that weaving was probably confined to this domestic area of the settlement and not an activity practiced in those areas of more military or administrative in design (Pérez Macías & Delgado Domínguez 2007: 82). In Sector D, the partial remains of a metallurgical workshop for smelting silver were uncovered. It was a u-shaped building with a central patio and small rooms, which had been badly damaged but which were covered with metallurgical refuse (Pérez Macías & Delgado Domínguez 2007: 119–120). Again, this speaks to the close connection between domestic life, metallurgical production, and subsidiary industries even at a settlement where some of the inhabitants were focused on administrative activities.

Overall, the material assemblage from the site revealed important trade connections that brought materials into the mining settlement, alongside the persistence of local products for domestic use. Tableware imported from Italy included Pompeiian redware plates as well as Italic terra sigillata. Stamps such as ANTIOCI, UMBRI, SERT, PHL, TRIGRANI indicate that many of these wares came from known production centers in Arezzo (Pérez Macías 1984: 30). At the same time, commonware and cooking ware from local production centers in southwest Iberia continued to be used, including cooking pots with ovoid bodies and bowls of Late Iberian ceramic forms found also at sites including Munigua and Italica through the first half of the 1st century CE. Aside from

cookware, larger storage vessels, including dolia, were also locally produced. Other forms of unspecified origin included oil lamps and mortaria (Pérez Macías 1984: 6–32). The most common form of amphora was Haltern 70, which has been associated with Baetican production centers of olive products and wine along the Guadalquivir including Hispalis, Orippe, and Puente Melchor, among others. Other forms included Dressel 7-11 from production centers in the Bay of Cádiz and Dressel 20 amphorae for olive oil. In general, amphorae indicate that olive and grape products were imported from relatively nearby centers in Iberia rather than from more distant provinces (Pérez Macías & Delgado Domínguez 2007: 63–72).

Here, in contrast to the material assemblage at La Loba, the rise of other industries—salted fish, oil, and wine—alongside mining in Iberia and the emergence of strong trade networks within Iberia played a major role in the food products available to local inhabitants of Cerro del Moro. At the same time, the inhabitants continued to use localized ceramic forms on the one hand and, on the other, received tableware from far off places such as Arezzo. It is possible that the diversity of this assemblage speaks to a mixed population of indigenous people alongside Roman military personnel, who had different tastes and consumption practices. At the very least, the material patterning shows the maintenance of local supply networks alongside the strengthening of regional and cross-Mediterranean connections contemporaneously with the growth of the mining industry.

The range of coins collected at Cerro del Moro also indicates regional economic connections with Gades (Cádiz), Augusta Emerita (Mérida), Italica (Sevilla), and Colonia Patricia (Córdoba), as well as other locales in the Iberian Peninsula. One coin was even

minted in Lucus Augusti (Lugo), one of the *conventus* capitals in the gold mining region in the northwest (Pérez Macías 1984: 33–37). Together the ceramic and numismatic evidence suggests the movement of people and goods in and out of this small mining settlement on a regular basis during its relatively short lived period of occupation, likely fueled by the site's connection to silver and copper production or the administration of mining. Significantly, many of these materials were from within the Iberian Peninsula, which attests to the elevated occurrence of internal migration and trade across cities and towns in the peninsula as well as between Roman centers in Iberia rather than from far-off provinces during this time.

It is possible that this settlement was abandoned as productive activities as well as the administrative center at Riotinto shifted towards the settlement at Corta del Lago in the early imperial period (the latest dated evidence is from 14 CE) (Pérez Macías 1984: 45). The settlement, however, provides an important window into metallurgical and administrative organization in the early years of intensive mining activity at Riotinto. Here, it is possible to see for the first time at Riotinto, the possibility of a Roman military and administrative occupation of a site associated with mining, alongside the presence of likely-local populations who were practicing metallurgy near their houses and alongside other domestic tasks, including cooking. The placement of the site near key roads also indicates a desire to connect with networks of exchange, while the presence of military buildings on the far east- and west-ends of the settlement do indicate a top-down Roman interest in controlling both the site of Cerro del Morro and the wider landscape of Riotinto in which it was located.

Corta del Lago (Riotinto, Huelva, Andalucía)

The settlement area of Corta del Lago is located on the northeast side of Cerro Salomón in Riotinto, and was first discovered in the course of modern opencast mining when a large section (8 m tall and 500 meters long) was opened with bulldozers in the early 1970s. It is an important testament to the long-term occupation of the site of a community who was directly involved in mining, metallurgy, and many subsidiary industries. The whole area was covered with two or more meters of ancient slag overlying the bedrock, in which the remains of buildings, tile, and ceramics were found during archaeological investigations. Though most finds were not recorded stratigraphically, they indicate that occupation dates from at least the Late Bronze Age (12th c. BCE-9th century BCE) with other episodes of occupation in the Iron Age, Roman Republic and early Empire, as well as in the 4th and 5th centuries CE (Rothenberg & Blanco-Freijeiro 1981: 101–106). Silver was the main metal extracted until the Roman period, when silver and copper were both extracted from the secondary enrichment zone located deep under the gossan layer in the Iberian Pyrite Belt. It is also possible that iron was produced from the gossan during this later phase, as the first identifiable iron slag from Riotinto came from Corta del Lago (Rothenberg & Blanco-Freijeiro 1981: 106).⁹⁴

At Corta del Lago, the partial remains of houses and other buildings were recorded in rescue excavations in the late 1970s and have been published, including a detailed study of a section of a mining bench, the side of the modern opencast mine that revealed successive layers of occupation (Jones 1980; Pérez Macías 1998: 108–141;

⁹⁴ Despite this local evidence of production, it is likely that iron smelting was never practiced at a large scale at Riotinto, but rather iron and/or iron tools were likely imported from other places such as Munigua (see page 350), though the small-scale production at Corta del Lago “may have been sufficient for the local production of mining tools and implements of daily use” (Rothenberg & Blanco-Freijeiro 1981: 106).

Pérez Macías & Delgado Domínguez 2007: 37–45; Pérez Macías 1986: 137–138). The earliest layer included three furnaces in association with 7th and 6th century BCE pottery, contemporary with the known settlement of Cerro Salomón nearby (Blanco Freijeiro et al. 1970).⁹⁵ Upper levels contained some evidence from the late 2nd century or 1st half of the 1st century BCE, including a Campanian ware base. While mining in the Imperial period was probably done at a higher productive scale, it is clear that Republican era activity was already bringing imported products to the settlement from early on during the Roman domination of southwest Iberia. Buildings of the 1st and 2nd centuries included multi-room structures and a cistern, as well as large quantities of slag, clay, and ash (Jones 1980: 157–158). The ceramic assemblage from this period is not published in enough detail to provide statistics on functional types or imports. However, it included terra sigillata (from Italy, Gaul, as well as from the region of Andujar, Jaén) and locally-produced common ware types including cooking pots, lamps, and mortaria (Pérez Macías 1998: 108–141)—revealing that local production as well as regional and long-distance trade provided materials for everyday activities such as cooking and eating.

The successive buildings at Corta del Lago were often constructed of sheets of slag, which proved to be a practical building material in areas where miners were living and working. Rather than maintain buildings for long periods of time, the inhabitants of the settlement often filled rooms with the rapidly accumulating slag from smelting, leveled the ground, and built new structures at a higher level using the same refuse

⁹⁵ This settlement is the earliest excavated mining settlement at Rio Tinto, which has been connected with the increase in mining under the Phoenicians in southwest Iberia. It likely supplied silver to the Phoenicians via the trade route connected to Huelva and many Phoenician and Phoenician-style ceramics have been found in association with the buildings, including lamps and tripod bowls (Blanco Freijero et al. 1970; Aubet 2001).

material.⁹⁶ It was perhaps more efficient to leave slag in the settlement and rebuild than it would have been to transport the heavy waste a greater distance away. In fact, none of this slag was cleared until the construction of the railroad built to transport metals from Minas de Riotinto to the Spanish coast. When construction began in 1873, engineers moved large quantities of ancient slag to use as ballast for laying the railway tracks (Delgado Domínguez 2012: 117). This phenomenon is not isolated to Corta del Lago. The use of slag as a building material is well attested at other sites in Riotinto and also at Tharsis at the site of Pueblo Nuevo near the south lode of the mine (Pérez Macías 1998: 141–149). Late 3rd century and 4th century CE domestic structures uncovered at the nearby Llano de los Tesoros in a rescue excavation campaign present some of the latest evidence of settlement at Riotinto. These were made of gossan walls constructed directly on top of slag from the 1st century CE, which in turn covered older slag-built structures of the Julio-Claudian era (Luzón Nogue & Ruiz Mata 1970: 134–136). It is possible that this settlement was originally connected to the one at Corta del Lago, but the land between them was obliterated by modern mining (Pérez Macías 1998: 108).

This building practice at Corta del Lago indicates that the immediate mining landscape and the settlement within it changed rapidly during the period of near industrial scale mining in Roman antiquity, and that communities had to readily adapt to these changes through modifications to their built environment. Cross-culturally, scholars have argued that settlements, and particularly houses, serve as locales for social reproduction across generations. However, in mining communities such as Corta del Lago, people could not count on this kind of stability or permanence in their built environment as the

⁹⁶ These buildings could, however, be modified with new elements, such as window glass which was recovered from the site in the 1990s (Regalado Ortega et al. 2010).

settlement was often in need of repair, reconstruction, and even relocation. I argue below (p. 284) that this impermanence must have prompted communities to look to spheres of interaction outside the settlement and household to fulfill these kinds of social needs. They may, then, have formed family and community identities based on more their activities related to mining and the wider, ever-changing mining landscape than to their connection to a specific dwelling.⁹⁷

A second key point to make about this evidence concerns the activities of daily life at the mining settlement. The fact that slag accumulated so rapidly, coupled with ash and other evidence of smelting and other productive activities in the immediate vicinity of the settlement, provides a window into the organization of production at Corta del Lago. It suggests that the work and domestic lives of laborers and craftsmen were closely intertwined: the interactions of their daily lives and labors took place in close proximity to (or even in) their homes. This includes not just producing metals, but crafting other materials necessary for mining technologies such as esparto grass baskets, rope, or ceramics for equipment such as lamps or tuyeres (for smelting bellows). At Corta del Lago, loom weights of slightly larger sizes than are traditional in domestic weaving were common finds in the material assemblage—though most were not discovered *in situ*. It is likely that these were employed in the production of large ropes that were used in underground mining works by members of the community at Riotionto (Jones 1980: 159). While need for diverse craftspeople to produce products subsidiary to mining is discussed in the following chapter (see page 353), suffice it to say here that the mining

⁹⁷ While these contexts are certainly domestic—mining settlements are dwelling places—they clearly have particular characteristics because of their association with work. It may be useful then, to consider them alongside other work-related settlements from antiquity such as the pyramid and tomb-building towns and neighborhoods in Egypt such as Lahun, Deir el-Medina, and Amarna (Koltsida 2007).

settlement at Corta del Lago was occupied by not only those primarily engaged in mining, but also engaged in other productive activities necessary to sustain the mining industry and feed the population living at Riotinto. Participation in these activities in and around the settlement brought people into interaction in ways that must have reinforced their roles in the wider mining industry, their interdependence on one another for continued production, and finally, their identities based on these interactions.

In Death as in Life: the Cemetery of La Dehesa and Funerary Evidence from Riotinto

The cemetery of La Dehesa is the best published of at least six cemeteries discovered in the vicinity of Riotinto in the course of modern mining operations. Others include those at Nerva, Planes, Bellavista, San Dionisio, and the North Lode. Many of these were located in areas of the greatest Roman-era slag heaps and likely were associated with now-lost mining settlements at Riotinto. Such cemeteries are a reflection of the people who lived and died in these settlements (or, at least those who could afford to commemorate their deaths with tombstones), and therefore can serve as a proxy for the kinds of people who lived in the very mining communities under discussion. La Dehesa, while incomplete, provides a small window into the members of one such mining settlement,⁹⁸ who were buried along the road that led north from Riotinto to Mérida, north of the North Lode of the modern mines of Riotinto. The cemetery, named after the modern town it lies near called la Aldea de La Dehesa, is located on two small hills, one of which lies within a zone of modern installations at Riotinto. Its full extent is not

⁹⁸ Pérez Macías (1985) has suggested that this cemetery was related to the settlement known from El Llano de los Tesoros. Aguilera Collado suggests instead that it was related to Corta del Lago (Instituto Andaluz de Patrimonio Histórico 2015). These two settlements may have in fact been linked in antiquity, and only appear separate because of the incompleteness of the archaeological record in the area.

known because it was completely buried in slag produced in later mining episodes and then damaged by modern operations; it was excavated beginning in 1975 after it had already been damaged and looted. At that time, excavations revealed 290 graves, and over 100 were fully recorded (Jones 1980: 154–156). La Dehesa is now protected from further damage as a “Bien de Interés Cultural,” a heritage designation for sites of cultural significance in Spain (Instituto Andaluz de Patrimonio Histórico 2015).

The interments at La Dehesa consisted primarily of cremation burials with grave goods placed into half-meter square cuts into the bedrock, some of which had an extra niche to hold the urn and other grave goods (Figure 6.14). They were capped with large carved semi-cylindrical stones, into which funerary inscriptions on smaller plaques of marble or another material were placed (Figure 6.15). Common grave goods included amphorae, commonware ceramics, terra sigillata, and glass unguentaria (Martínez Rodríguez 1990: 22-30). Two larger tomb monuments were also uncovered in the cemetery, which are “tower” or “pedestal tombs”—though they had already been partially dismantled prior to excavation, the remains allow for a partial reconstruction of each. The first (Jones’ Tomb 1) was a quadrangular tower monument, consisting of a foundation of slate and slag cemented together, which was topped with large, cut gossan blocks, found *in situ*. The upper area, though badly damaged, conserved the base of a central pillar and a bench running along two sides. This design is similar to funeral towers and pedestal tombs found in Roman North Africa (Stone 2007; Stone & Sterling 2007; Moore 2007), a fact potentially significant to issues of migration between mining districts.⁹⁹ The other monumental tomb, located in the southeast side of the cemetery, was

⁹⁹ The presence of tombs with parallels in North Africa is potentially significant to issues of migration

also quadrangular in plan with a similar gossan block construction. This monument cut earlier rock-cut graves, indicating that the cemetery was used and modified over a long period of time (Jones 1980: 154–156).¹⁰⁰

The grave goods present in La Dehesa cemetery indicate that it was used from the Flavian to Antonine periods in the 1st and 2nd centuries CE,¹⁰¹ corresponding with the height of mining in the area. While Jones suggests that many of the interments were “humbler cremation burials of the mining community that must have contained a very large slave element in the 1st and 2nd centuries CE” (1980: 154), it is difficult to determine the juridical status of these deceased members of the mining community. On the other hand, the presence of large, rock cut tombs and grave goods for many of the deceased indicates that they were carefully buried, regardless of their status. This suggests that, even if these graves are relatively “humble” they were probably not those

between mining or quarrying districts within the larger administrative structure of *metalla* in the Roman Empire. Jones (1980: 1954) notes that nearby Carmona contains graves with Punic influence (as do many other cemeteries in this region that had successively been under Phoenician and Punic control) while the capital city of Lusitania (Merida) to the north had a funerary culture more closely linked with that of Italy, so patterns of regional migration might be tracked partially through funerary traditions.

¹⁰⁰ Unfortunately, the state of preservation of La Dehesa and the publications of it, which are not exhaustive, leaves much to be desired. For instance, stable isotope and DNA studies of the bones could reveal information about the origin of residents of the cemetery and about aspects such as diet and health that would provide another window into the conditions of their daily lives in mining settlements. Cemeteries at other mining settlements have not fared much better. Checkland reports, for instance, that the finds from the cemetery at La Zarza (Tharsis), not far from Riotinto, were lost in a fire of the mining office there in 1927 and were never published (Checkland 1967: 54). Similarly, at Marismilla (Planes), graves dating from the 1st to the 4th centuries CE have been uncovered over the years in the vicinity of the soccer field at Nerva, but few were recorded by archaeologists (Pérez Macías, Delgado Domínguez, et al. 2012: 63–69). The excavations of nearly 500 inhumation and cremation burials at La Valdoca cemetery at Aljustrel were conducted in the 1950s before osteological and scientific studies of human bones were common, though the grave goods—which included many locally produced ceramics prompting the excavators to call it a “Romano-Celtic” cemetery—have been published (Freire de Andrade 1958; Freire de Andrade et al. 1957; Martins 1996).

¹⁰¹ Aside from those found in the official excavations undertaken by Jones, unofficial excavations took place in the area for many years. Pérez Macías and Delgado Domínguez note that children were awarded money for collecting artifacts and handing them over to a small museum in the British mining neighborhood of Bellavista (Pérez Macías & Delgado Domínguez 2007; Harvey 1981).

of condemned criminals or chattel slaves¹⁰² sent to the mines to labor until their deaths, who must have been unlikely to receive epitaphs at all. Rather, these were the graves of valued members the mining community—including free men, women, and children, as well as domestic slaves and slaves who worked in the mines. Further, the presence of at least two tombs of a different, more elaborate type likely indicates a degree of social stratification within the mining settlement: those who could afford large, architectural tombs were buried alongside those who were buried in a less elaborate fashion.

Presumably, despite differences in social status, these were all members of the local mining community and were therefore buried close to where they lived and worked.

This Roman-era example is in stark contrast to contemporary cemeteries of mining communities who worked at Riotinto in the 19th and 20th centuries and indeed other contemporary mines in southwest Iberia including São Domingos (Custódio 1996; Custódio 2013: 167–177). In these areas, neighborhoods of the foreign, usually British upper class mining engineers and their families were separated from the areas where laborers—by and large Spanish or Portuguese—and their families lived. Upper class neighborhoods often had parks, tennis courts, and other amenities. São Domingos (Figure 6.17) and Riotinto (Figure 6.18) are still largely intact. Workers' housing, by contrast, was smaller and individual houses often lacked dedicated kitchens and other amenities available to the engineers and their families (Figure 6.19). Typically, each neighborhood was equipped with a distinct, walled cemetery, separating the classes in death as they were separated in life (Figure 6.20). It is potentially meaningful that at Riotinto

¹⁰² This is not to imply that slaves were not present in this community. As the epigraphic evidence discussed below indicates—they certainly were. However, evidence for large scale, *chattel* slavery is much stronger for earlier periods than it is for the 1st and 2nd CE (see Chapter 7).

cemeteries appear to be concentrated around slag heaps representing different areas of production accompanied by settlement areas—and cemeteries—containing people of mixed social status. This perhaps indicates a greater communal solidarity and community integration in these small, Roman-era production oriented-places, where people of various genders, classes, and juridical statuses interacted more closely than in their contemporary counterparts.

Epigraphic evidence from other Roman-era burials at Riotinto supports the assertion that communities were composed of diverse members, many of whom were commemorated with inscriptions upon their death. Inscriptions naming slaves from Riotinto include the epitaph of Germanus¹⁰³ (Figure 6.21; *AE* 1956, 299). Germanus, the slave of Marinus, lived in Riotinto in the late 1st century BCE or early 1st century CE, and was a young man at the time of his death at age 15. Others were a slave named Probus, possibly from Mérida; and a *vicarius*, or the slave of a slave, named Theodorus; and a slave named Diogenes, who belonged to a woman named Firmia Epiphania, possibly a freedwoman herself (*CIL* II, 975; Domergue 1990: 339–340).¹⁰⁴

At least eight epitaphs of free people have also been recovered that confirm the presence of immigrants living at Riotinto. While Pérez Macias (1998: 108) and others have suggested that the increase of Italian imports at mining settlements is indicative of an influx of immigrants from the Italian peninsula, the surviving epitaphs primarily attest to immigrants from within the Iberian Peninsula: from Talabriga (Aguedo), Olisipo

¹⁰³ His epitaph reads: “Germanus/Marini ser(vus)/an(norum) XV h(ic) s(itus) e(st). / s(it) t(ibi) t(erra) l(evis).” or “Germanus, slave of Marinus, 15 years old, lies here. Let the earth be light upon you.” Epitaph now located in the Museo de Huelva. 45 x 30 x.018 cm (Blanco Freijeiro 1962: 43; *AE* 1965, 299).

¹⁰⁴ There are a total of 56 published imperial period epitaphs from mining districts throughout the Iberian Peninsula; of these only seven could be clearly identified with slaves and nine commemorate people of indeterminate status. See Domergue 1990: 339-340 and Table XVI.

(Lisbon), Nova Augusta, and possibly Emerita (Domergue 1990: 339). Although Italian immigrants certainly could have participated in the booming mining industry in southwest Iberia (and likely did in southeast Iberia as we saw with the cases of El Gorguel and La Loba), these epitaphs indicate that the economic benefits of mining were not solely confined to an influx of migrants from distant Italy but also reached the native inhabitants of the Iberian Peninsula, likely causing regional population shifts (Orejas & Beltrán Ortega 2010). It is significant that the material assemblage at many mining settlements, including Corta del Lago and Cerro del Moro, reflects similar patterns for the movement of materials: many non-local materials including pottery and coinage came from within the Iberian Peninsula, though there was a consistent supply of goods of Italian origin in mining settlements.

Of the eight inscriptions of free people, three belonged to women. These include, for instance, Licinia Materna, a woman who was interred in the 2nd century CE in a now-lost tomb near Corta del Lago (Domergue 1990: 339; Blanco Freijeiro 1962: 43; *AE* 1964, 300). Her epitaph (Figure 6.22)¹⁰⁵ indicates that she was 30 years old when she died, originally came from Nova Augusta. One final epitaph provides evidence for a family: Helvia Secundilia and Probus from Mérida erected an epitaph for their small baby, Lucius Helvius Lupus, when he was just 8 months old (Figure 6.23). This epitaph dates to the first half of the 1st century CE, and was found near Corta del Lago.¹⁰⁶ It is

¹⁰⁵ The text reads: “Licinia Paterni / f(ilia) Materna / Novaugustana / [a]nn(or)um XXX h(ic) s(ita) e(st). S(it) t(ibi) t(erra) l(evis).” or “Licinia Materna, daughter of Paternus, from Nova Augusta, 30 years old, lies here. Let the earth be light upon you.” 33.5 x 44x .018 cm. See: *AE* 1965, 300. Epitaph now located in the Museo de Huelva.

¹⁰⁶ The text reads: “L(ucius) Helvius Lupus / Emeritensis mens(ium) / VIII h(ic) s(itus) e(st). S(it) t(ibi) t(erra) l(evis). Fac(iendum) c(uraverunt) / Helvia Secundilla m(ater) / et Probus pat[er].” or “Lucius Helvius Lupus of Emerita (Mérida), 8 months old, lies here. Let the earth be light upon you. His mother

clear, then, that immigrants were not just men looking to find their fortunes, but families who came together and raised children in these mining districts.

In sum, while there is positive proof that slaves did live, work, and die in the mines at Riotinto, it is clear from this limited amount of epigraphic and archaeological evidence that the mining community was much more diverse than Jones suggests in reference to La Dehesa cemetery, consisting of slaves, free and freed workers, women, children, and immigrants.

Vipasca (Aljustrel): Taking Care of Business in the Iberian Pyrite Belt

The Roman mining district of Vipasca, located in modern-day Aljustrel (Alentejo, Portugal) in a part of the Iberian Pyrite Belt farther west than Riotinto, provides some of the best epigraphic evidence from the whole of the Roman Empire for the organization of a mining town. There, two metal tablets written in Latin, one dating perhaps to the 1st century and another to the 2nd century CE under the rule of Hadrian, were uncovered in the process of modern mining. These tablets record the procedure and regulations for imperial officials administering activities within the silver and copper mining district during that time.

Aljustrel was located in the Roman province of Lusitania, which was administered directly by the emperor, rather than in Baetica, which remained a senatorial province. These administrative differences do mean that we must take precautions in applying the laws recorded in the so-called Vipasca tablets to other mining districts in geographically distinct locales, or districts that were active in mining during other time

Helvia Secundilla and his father Probus had this made.” See: *AE* 1965, 298. Epitaph now located in the Museo de Huelva.

periods. However, the epigraphic evidence from Aljustrel corroborates the pattern observed in the funerary evidence from La Dehesa and Riotinto more broadly, that a diverse mining community lived together and performed a variety of tasks in and around the mining settlement. Aljustrel also provides more firm evidence for imperial laws and interventions in the social life of mining settlements than is possible to see from the archaeology of settlements alone, and therefore serves as an important testament to the organization of at least one mining settlement under Roman rule.

The first tablet, the *Lex Metallis Vipascensis* (CIL II, 5181 = FIRA I, 105), is known as Tablet A or VIP I (Estacio da Veiga 1880; Estacio da Veiga 1886; Domergue 1983: 41–109; D’Ors 1953: 69–133). This tablet was likely drafted solely for the mines at Vipasca. It was discovered in 1876 in an ancient slagheap where the Transtagana Mining Company was constructing a plant for the artificial leeching of ore (Pérez Macías, Martins, et al. 2012: 76). This tablet dates to the 1st or 2nd century CE, and recent studies confirm that it was made from an alloy containing locally sourced copper rather than bronze, which was the previous assumption. It measures 78.5 x 52.0 x .8.13 cm, and is inscribed on both sides with the same text, which was probably displayed vertically in a public space with only one side showing, just as it now is displayed in the Museu Geologico in Lisbon (Figure 6.24).¹⁰⁷ The text itself lays out the guidelines for rights and duties associated with some of the services offered within the Vipasca mining district, which were strictly overseen by the Roman state. It mentions many professions and

¹⁰⁷ The double sided inscription has allowed for the reconstruction of the text as a whole, and is probably the result of an error in copying on face one, when the tablet was turned over and the text was started again (Domergue 1983: 43). It is somewhat curious that when displayed on one side, the text on the other side is upside down, which gives the impression that only one side at a time was meant to be displayed vertically. The right side was cut, and so the text may be incomplete (and it may have contained more tablets to be displayed alongside it with further legislation).

people of varying status who made up the diverse mining community of Vipasca in the 1st century CE. It serves also to show the hand of the imperial government in regulating the organization of services in this particular *metallum*, possibly based on a model that was used to govern *metalla* across the empire but adjusted for local circumstances.

This tablet, first of all, mentions the guidelines for those involved in the professions of auctioneering, managing the public baths, shoemaking, hair cutting, clothing production and repair, and teaching at the school, among others. Nearly every section involves the frequent mention of lessees (*conductores*), who could have both partners (*socii*) and agents (*actores*) acting on their behalf in negotiations involved in many of these professions. From this, it becomes clear not only that those living in mining settlements had various needs for those skilled in professions beyond mining, but that the imperial government had a vested interest in making sure these various services were available to members of the community. Individuals had to rent the right to practice their professions from the imperial administration. For instance, the section on barbering allows only one person to lease the right to practice barbering for profit at one time. This person was allowed to contract employees, but itinerant barbers were not allowed to practice their trade in the mining settlement. On the other hand, the law concedes that slaves may cut their master's hair in the home (VIP I.5). This indicates that the imperial administration, on the one hand mandated the organization of the barbering trade more than it did in other urban centers where itinerant barbers might be found. But on the other hand, there is no attempt to regulate activity within the home, and the master's right to use his own slaves for domestic tasks, including barbering.

The section on the maintenance of baths, in particular, reveals some significant aspects of daily life in Vipasca. It mandates that the lessee of the baths must heat them from “daybreak to the seventh hour for women, and from the eighth hour to the second hour in the evening for men” (VIP I.3), which may give an indication of different patterns of work and interaction for men and women within the same settlement. Men, perhaps, often worked in the morning during the time when women were allowed to enter the bath, and did not need to enter until later in the day. Further, while everyone was allowed to use the baths, the price varied according to gender and status. Men owed half an *as*, while women owed a full *as* as payment for entrance. In contrast, certain members of the community were allowed to enter for free including freedmen and slaves in the service of the procurator, children, and soldiers. We can surmise then, that those brought in by the imperial government, including officials and the military, occupied a privileged place within the settlement that included certain economic advantages. The reasoning behind the different price of bathing for men and women is less clear; a possible explanation may be that men had to bathe more frequently because they were involved more directly in mining.

Beyond the baths, VIP I provides some idea of the organization of the settlement at Vipasca and the kinds of social and business interactions that took place there, despite the fact that very little archaeological evidence for habitation has been uncovered.¹⁰⁸ We can surmise, for instance, that various public spaces were available including a place for

¹⁰⁸ Aljustrel is one of the largest contemporary mines in modern Portugal. A great deal of evidence for shaft-and-gallery mines has been discovered and is discussed in Chapter 7. While most archaeological publications focus on technology, descriptions of pottery from what has erroneously been termed the “house of the procurator” and other chance finds appear in multiple publications (Viana et al. 1957; Trindade & Dias Diogo 1995; Rodrigues Lobato 1983; Pita 1995; Pita 2001; Pérez Macías et al. 2007). The cemetery of Valdoca in Vipasca has also been relatively well published (Freire de Andrade 1958; Martins 1996; Viana et al. 1957).

public auctions, the bathhouse, and an area where the law tablet was displayed for members of the community. These places served for people to interact with one another socially, but also as locales in which imperial laws and understandings were conveyed. The organization of workshops for making shoes and clothing, cutting hair, or teaching children is not clear from the text. It is possible that these activities were incorporated into domestic buildings, as is the case for many industries at well-studied Roman cities, including Pompeii¹⁰⁹ (Poehler et al. 2011: 5–7).

The second tablet, *Lex Metallis Dicta* (FIRA I, 204) or Tablet B/VIP II, is a series of laws composed in the form of a letter addressed to the procurator of the mine (*Procurator Metallorum*), who was an imperial freedman of the Emperor Hadrian named Ulpian Aelianus (Lazzarini 2001; Magueijo 1970; Domergue 1983: 111–170; D’Ors 1953: 69–133). The mention of Hadrian securely dates the document to his rule between the years of 117 and 138 CE, and this may have been a series of laws for more general application in mining districts that was sent to various places. This tablet was discovered in 1906 in a slagheap in the process of modern mining at Aljustrel by the Société Anonyme Belge des Mines d’Aljustrel. It measures 77 x 55 x 1 cm and is now stored at the Museu Nacional de Arqueologia in Belém, Portugal, but was probably once publicly posted in Vipasca. Like the first tablet, it was made of an alloy containing locally-sourced copper (Pérez Macías, Martins, et al. 2012: 80), which suggests that it is a copy of an original text sent from Rome on another medium that was reproduced on site for public display.

¹⁰⁹ Shops and workshops, or *tabernae*, are often identified as the rooms closest to the street that were accessed through the main entrance. Productive activities could take place in other areas of the house and, in her study of the material culture of Pompeian houses, Allison notes that many of these rooms contain “insubstantial evidence to identify them as commercial spaces” (2004: 174).

This second tablet outlines many specific imperial regulations for mining, including punishments for endangering the safety or integrity of underground mines, practices for handing over profits to the *fiscus*,¹¹⁰ and rules about the pace and scale of work that must be undertaken for individuals to maintain a lease. Many of these are discussed in more depth in the following chapter on labor and technology.¹¹¹ For the purposes of understanding the settlement of Vipasca, however, it is key to emphasize several aspects of this epigraphic document. First of all, these imperial mandates—just as those in the first Vipasca tablet—show a deep commitment of the imperial government to maintaining efficiency and productivity of mining and other activities in the settlement, but they do not necessarily regulate precisely how mining and other everyday activities were to be practiced. Second of all, the laws imply that people’s livelihoods in mining communities were very much linked with their specific, valued skillsets. Punishments for not following the laws outlined often involved being banished forever, not only from Vipasca but from other mining districts as well, which underscores the important connections between specialized labor and residing in mining communities, as well as between imperial officials in each mining district. The names of offenders must have been circulated between officials so that the law could be enforced, presuming, of course, that it was enforced at all. It also sheds light on mobility, indicating that moving from one mining district to another must have been something practiced on a relatively frequent basis. Thus, these punishments are a clear acknowledgement on the part of the imperial government that movement between mining districts was taking place; the law exploits

¹¹⁰ Varied interpretations of this process exist, which are well-summarized in Hirt’s recent volume (Hirt 2010: 262–269). See also: Sanz 2012.

¹¹¹ For a brief summary, see: Orejas Saco de Valle 2002.

these patterns of movement for the purpose of exerting imperial control over behaviors that could interfere with production.

This evidence from Vipasca provides a unique window into the many ways that the Roman imperial government attempted to mandate behavior in this mining district. However, because of the nature of the epigraphic evidence, it is impossible to confirm how strictly these regulations were followed. It is possible that residents of Vipasca covertly participated in regulated professions without the knowledge of imperial officials or neglected safety regulations in mines for their own benefit or profit. As Silliman has noted, these acts of resistance in everyday life in colonial contexts “may have little to do with outright or even impromptu resistance” but represent the “attempts of individuals to stake out a claim in their social worlds” (Silliman 2001: 195). Such subtle acts of resistance have been recorded in many other colonial mining situations, and should not be completely discounted as a possibility in Roman Iberia. In sum, the Vipasca tablets demonstrate one side of the politics of power in this corner of the Roman world, where there was an increasing imperial interest in controlling mining communities for the sake of maintaining production, but where local efforts may have undermined or transformed the enforcement of these laws in ways that we cannot fully imagine.

Discussion

Side-by-Side Practices: Living and Working in Mining Communities

Despite the distinctive nature of each settlement under discussion, including El Gorguel, La Loba, Cerro del Moro, Corta del Lago, and Vipasca, one commonality shared by all of these sites is that there appears to have been a strong tie between domestic and community life and everyday labor that was both directly and indirectly

connected to mining. The link between life in the household and settlement and life as a miner was close, both physically and conceptually. At El Gorguel, for instance, the domestic structures were constructed within the same installation as smelting structures. The sights, smells, and sounds of mining were never far from the household, and must have dictated the patterns of everyday life at this small settlement in southeast Iberia. Similarly, the houses at La Loba indicate that miners stored and repaired their mining tools within their domestic spaces, alongside other domestic activities such as food preparation, social interaction, and sleeping. At Cerro del Moro, metallurgical production happened within the central area of the settlement, situated within a district of civilian housing. There, loom weights and other artifacts attest to subsidiary industries, perhaps textile and rope production for equipment and clothing related to mining. Corta del Lago also contains evidence of smelting and textile production related to processing and subsidiary industries in copper production. The epigraphic evidence from Vipasca is even more telling: the Vipasca tablets laid out law governing the many productive activities happening in and around the settlement related to mining, but also ensured the functioning of various subsidiary industries that ensured a degree of comfort and efficiency within the settlement—the maintenance of baths, a school, a fuller, a barber, and other activities. While these were not necessarily linked directly to mining, it is clear that the imperial government believed that regulation of industries within the settlement served to maintain, support, and—in a sense—control, the mining community.

In the following chapter, I discuss the ways that interactions in the context of extraction and production led to the formation of communities. Because these activities were physically linked not only to the mining landscape but also to settlements and

households, it is key to keep in mind that the very interactions that led to the maintenance of community among miners while they were at work were strengthened and solidified in the places where they dwelled. Further, these interactions in the context of extraction of metals and production of necessary subsidiary industries and activities within the settlement—whether they were production of equipment, clothing, or food—served to bring other members into the mining community who were not directly engaged in mining and metallurgy. Because of their daily interactions and practices, those engaged in supervisory or policing roles (such as military personnel and imperial officials), those involved in agriculture and food production, and those involved in the production of other necessary objects became incorporated into the overall mining community. These settlements were organized in ways that facilitated production, but more than that, the side-by-side practices of interaction within the settlement and within the home and production served to reinforce social ties within each community.

Diversities and Commonalities: Mining as the Common Ground

Next, from this examination of several mining settlements in southeast, south-central, and southwest Iberia, it is clear that mining settlements were comprised of diverse groups of people of disparate ethnic and geographic origins, statuses, genders and ages. In El Gorguel, for instance, the Italian-style architecture and material assemblage with some Italian imports corroborates the claims of ancient authors that Italian immigrants came to Iberia to seek their fortune in mining centers during the Roman Republican period. These were mines, however, that had been worked by indigenous laborers (and possibly slaves) under the Barcids; thus, arriving immigrants inhabited and worked these landscapes with many others of local or regional origin. Similarly, at La

Loba the architecture of one dwelling alongside the import of many goods from the Italy may betray Italian tastes, and possibly indicate the presence of immigrants from outside the Iberian Peninsula there, alongside an indigenous labor force. The composition of mining communities in southwest Iberia is easier to reconstruct because of the preservation of a variety of archaeological evidence, from settlements such as Cerro del Moro and Corta del Lago, to graves and epitaphs from Riotinto, to the detailed Vipasca tablets that governed the settlement there. The archaeology of Cerro del Moro and the epigraphy of Vipasca tablets both provide evidence for the presence of military personnel in mining settlements, the former through architecture similar to that from Roman military encampments and the latter through references to soldiers who lived in the mining district of Vipasca. The second Vipasca tablet also makes reference to the *procurator metallorum*, who in this case was an imperial freedman. At Riotinto, there are attestations of slaves, freedmen (*liberti*), women, and children in a variety of epitaphs recovered from the local cemeteries. The frequent mention of origin on these and other tombstones also attests to the presence of immigrants from many parts of the Iberian Peninsula who came to live and presumably labor in the mining district. Though it is not always possible to determine the precise roles of men, slaves, freedmen, women, children, military personnel, and others in mining communities, the following chapter addresses the possible roles these groups played in the labor force and in enacting the technological processes surrounding mining.

Here, I consider the social impacts that the diversity of mining communities might have had. First of all, the mixed population likely contributed to the maintenance of certain external social and economic connections. People of distant origin may have

maintained communication as well as cultural and economic connections with their homelands. The same trade routes that brought Italian ceramics to Iberian mining communities or foodstuffs from other parts of Iberia could have served to maintain communication networks that linked immigrants with families and friends in their place of origin. Further, peoples' origins and statuses could have served to create internal divisions within mining communities—being a member of one mining community did not preclude people from being a member of an immigrant community, a slave community, or a military community. This may be directly visible, for instance, in the separate areas of military and civilian housing at Cerro del Moro. Finally, people's diverse origins could have impacted their daily practices and choices, thereby affecting the web of interactions that served to create and reinforce mining communities. These could be as obvious and permanent as the construction of marble-decorated *opus signinum* floors at El Gorguel that materially linked the residents with Italian traditions, or the construction of North African-style tower tombs at La Dehesa, which could have served to reinforce distinctions in status or origin in death. Other differences in household practices such as religious practice or specific cooking traditions could have also served to reinforce membership to certain sub-communities within the overall mining community. In sum, mining communities were, in some ways, diverse centers composed of people of mixed statuses and disparate origins, which undoubtedly contributed to diverse practices and identities within each mining community.

On the other hand, this diversity likely contributed to a communal solidarity formed around the only common ground shared by members of the mining community: the extraction and processing of metals. I argue here that the experience of inhabiting

mining settlements within industrial landscapes had a profound impact on the formation of communities and the emergence of a solidarity that could transcend traditional social boundaries that were more clearly preserved in other provincial Roman centers. Specifically, the impermanence of settlements is one truth of life in mining communities that makes them distinct from many other kinds of communities. The physical ties to the house as a place of memory for maintaining family and communal bonds across generations is a common theme in literature on house societies. For instance, Ian Hodder has demonstrated the ritual significance of building and rebuilding houses for the construction of social continuities at the Neolithic settlement of Çatalhöyük in Turkey (Hodder 2006). Similarly, Ruth Tringham has demonstrated the role of the house in maintaining social memory in her diachronic analyses of domestic architecture in Neolithic southeast Europe (Tringham 2000). In contrast, people in mining communities often need to relocate to other areas as metal ores are tapped out, or move their settlements to make room for new mining concessions to open. In the modern Iberian Pyrite Belt this was common: for example, old plans of São Domingos show the first phase of contemporary settlement that had to be destroyed when a new opencast mine was opened in 1868 (Custódio 2013: 8) and families were relocated to a newly designed settlement on the British model.

We must ask, then: what social impacts instability and impermanence had on the formation of mining communities? It has been argued that the impermanence of mining settlements in the American West prevented people from investing in the construction of houses and acquiring materials that would have burdened them, thereby equalizing differences in class, gender, and other differences that otherwise arise (Hardesty 1998:

84). It is conceivable, therefore, that living in ever-changing settlements meant that social status was less marked by material culture in Roman mining settlements than in other Roman urban centers, on the one hand. And, on the other hand, even when status was marked by material culture, perhaps living and working in the context of mining alongside people of various statuses provided the foundation for communal solidarity across groups of various social statuses. This may account for the intermingling of graves of different types alongside one another in the cemeteries of La Dehesa, for instance. People were buried together because of their relationship to the mining community in which they lived rather than because of their membership to a certain social group.

If communities could not depend on their houses and settlements to be maintained as places for social reproduction, they must have looked to different spheres of interaction to fulfill these kinds of social needs. The previous chapter discussed, for instance, the close ties between mining communities and their landscapes, and the ways that interactions with the landscape and with one another to mediate complex relationship with their surroundings could have contributed to the formation of communal solidarity and identity. Further, mining has been called a community of occupation, not a community of place (Muhly 1998: xv). As I discuss in the following chapter, it might best be termed a community of practice. It is possible that communities derived much of their sense of solidarity from the interactions that brought them together in the course of their labors rather than the specific interactions tied to living in a fixed settlement, an issue I discuss further in the following chapter.

Empire and Everyday Life: Relations of Power and Imperial Connections at Mining Communities

The final point to make about mining settlements in Roman Iberia is that the close relationship between the increased levels of metal extraction and the expansion of the Roman Empire facilitated the connection of mining communities to regional and empire-wide social and economic networks. It also strongly marked relations of power within these mining settlements. All of the settlements addressed here were a part of mining districts that were greatly expanded after Roman conquest to fulfill the growing demands of the Roman economy for various types of metals including silver, copper, lead, and gold. These settlements, while located in rural, industrial landscapes, were arguably more closely connected—economically and socially—to Roman imperial networks than other kinds of rural communities, but also more tightly controlled.

While I address the issue of the economy in greater detail in Chapter 8, it is clear that from material assemblages of each of the settlements discussed that residents had access to ceramics, olive oil, and wine from far-off places in Italy during the Republican period, but that they increasingly gained access to goods from closer production centers in the Iberian Peninsula (and, of course, from local sources). These goods from near and far were transported into each of these settlements via maritime and land transport networks that were either established or expanded as part of the Roman imperial agenda. It is true that the Phoenicians and Carthaginians did successively establish trading centers on the coasts of southern Iberia; many of these—including Carthago Nova—grew into cities that became nodes in these Roman economic networks. The legacy of these older episodes of colonization impacted the preexisting economic networks in southern Iberia, and especially in the coastal regions. However, the addition of many roads that lead directly to or passed by major mining centers increased the connectivity of mining

districts with preexisting networks (see Chapter 5), and enabled easy access and transport of metals to other parts of Iberia and the Mediterranean world. In effect, the expansion of trade networks under the Romans to and from mining centers increased the connectivity of these rural, industrial settlements and transformed the interactions of people with new products and materials, as well as with foreign traders and merchants.

While it brought economic and social connectivity, imperial power loomed large in mining settlements in ways that transformed and constrained social understandings and interactions. In the previous chapter, I discussed how the physical changes to the growing mines altered peoples' perceptions of their local landscapes and altered the ways that people interacted within them. Mines served as imperial footprints in the landscape, footprints that were a constant reminder to those living and working in mining settlements of the presence of Roman imperial power. This must have been especially true in places such as Riotinto, where the increase in slag from Roman mining displaced communities and created a need for frequent rebuilding of houses and other built structures. Other new additions to these landscapes, including the new road networks with their milestones, also served as visual markers of imperial possession of mining landscapes, and by extension, control of settlements within these landscapes.

Imperial power, as demonstrated by the Vipasca tablets, also extended to settlement organization and activities beyond mining that took place in the settlement. These documents show that, at least by the 2nd century CE in Lusitania, the imperial government mandated not only the organization of the mines but also the presence of baths, schools, barbers, fullers, and other resources within mining districts. It is difficult to see the evolution of imperial control in mining settlements clearly in the absence of

other epigraphic documentation from earlier dates in Iberia. However, the relatively consistent presence of imperial officials and army personnel attested in mining settlements from the late Republic through the 2nd century lends credence to the hypothesis that the dynamic between empire and extraction strongly and increasingly marked relations of power among those living in mining settlements. Whereas those living in rural settlements geared towards subsistence farming or other industries might deal only infrequently with anyone directly connected to the imperial government, members of these mining communities from all strata of society must have often interacted with Roman officials and/or soldiers. This dynamic, on the one hand, cemented the perception of mining as an imperial activity and, on the other, reinforced imperial power and control over mining communities on an everyday basis. Despite this particular power dynamic, it is important to recognize that other community members had valued skills and local knowledge related to mining that might have afforded them a certain status within the community. The power dynamic was not, then unidirectional, as the imperial government depended on these members of the community for life in mining settlements and continued production to run smoothly.

Conclusions

This analysis of settlement organization and household life in mining communities of southern Iberia has served to illuminate some aspects of everyday life at the smallest scale in mining communities, and especially the communities living at El Gorguel (Cartagena), La Loba (Córdoba), Riotinto (Huelva), and Aljustrel (Alentejo, Portugal). While large-scale patterns in the transformation of landscapes after Roman conquest are visible when mining landscapes are considered in their broad geographical

context, it is only through an analysis of smaller scale evidence at the settlement and household level that some of the most meaningful interactions of everyday life of those living in mining landscapes become clear.

I have argued that, across the landscapes of southern Iberia, there was a close physical and conceptual association between work and domestic life in mining settlements. Further, mining communities were uniquely positioned in their emerging imperial landscapes as groups at once well connected and insular. Mining communities maintained ties through material and social networks with the outside world, while at the same time constructing communities that built solidarity from daily interactions among their residents and with their particular connections to landscape. The solidarity built from living and working in this landscape could reinforce identities associated with the mining across usual social boundaries. Finally, I argued that imperial interest in the extraction of valuable metal resources in Iberia strongly shaped the development of communities in these otherwise rural and isolated landscapes. The connection between Roman imperialism and resource extraction shaped the development of mining communities through the creation of new laws that dictated how people were supposed to interact with one another and contribute to the development of their landscape.

In the following chapter, I examine this very issue in the context of the organization of mining labor and technological practices. If the day-to-day interactions created through living and working in the same place contribute to the formation of all communities across time and space, then labor and technology practices specific to mining are one element of life in mining landscapes that makes these kinds of communities unique. A close look at the organization of labor and the different steps in

the extraction process that brought people interaction with each other and with their landscapes illuminates some of the unique ways that mining communities were formed and transformed in Roman Iberia.

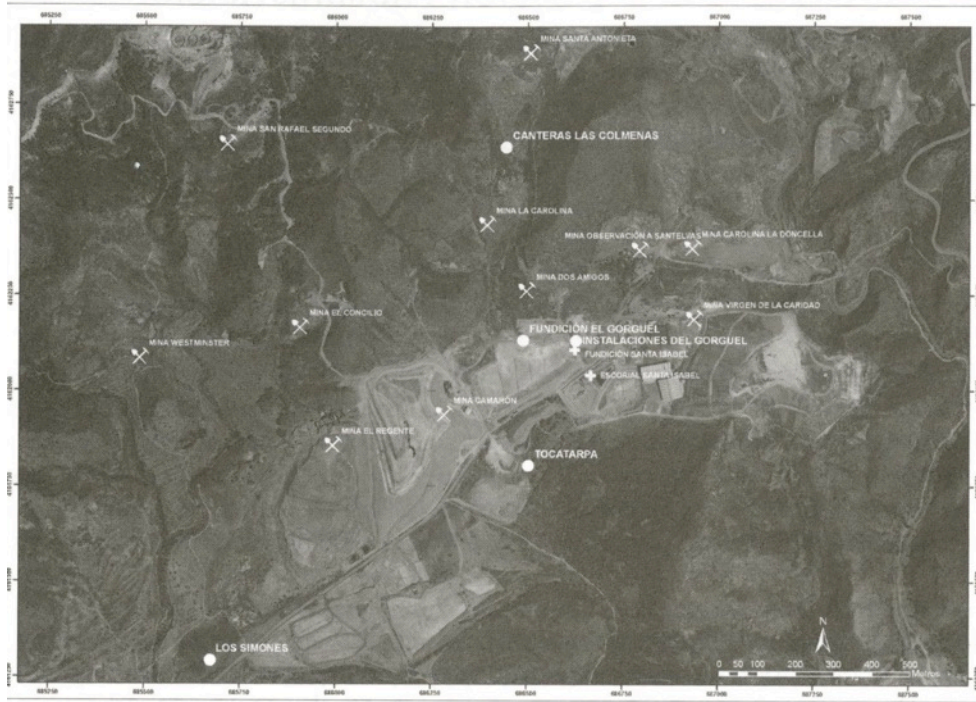


Figure 6.1 Locations of sites at El Gorguel outside of Cartagena (Figure 1 in Antolinos Marín 2012: 64).

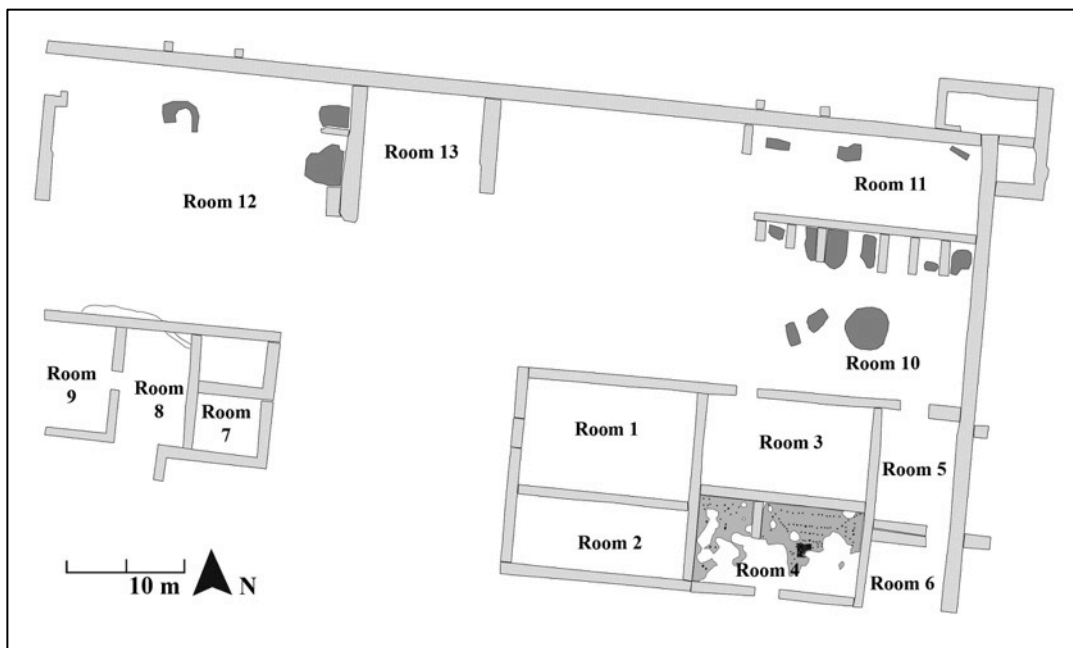


Figure 6.2 The foundry of El Gorguel. Dark grey areas represent traces of smelting furnaces for lead and silver (after Figure 2 in Antolinos Marín 2012: 65).

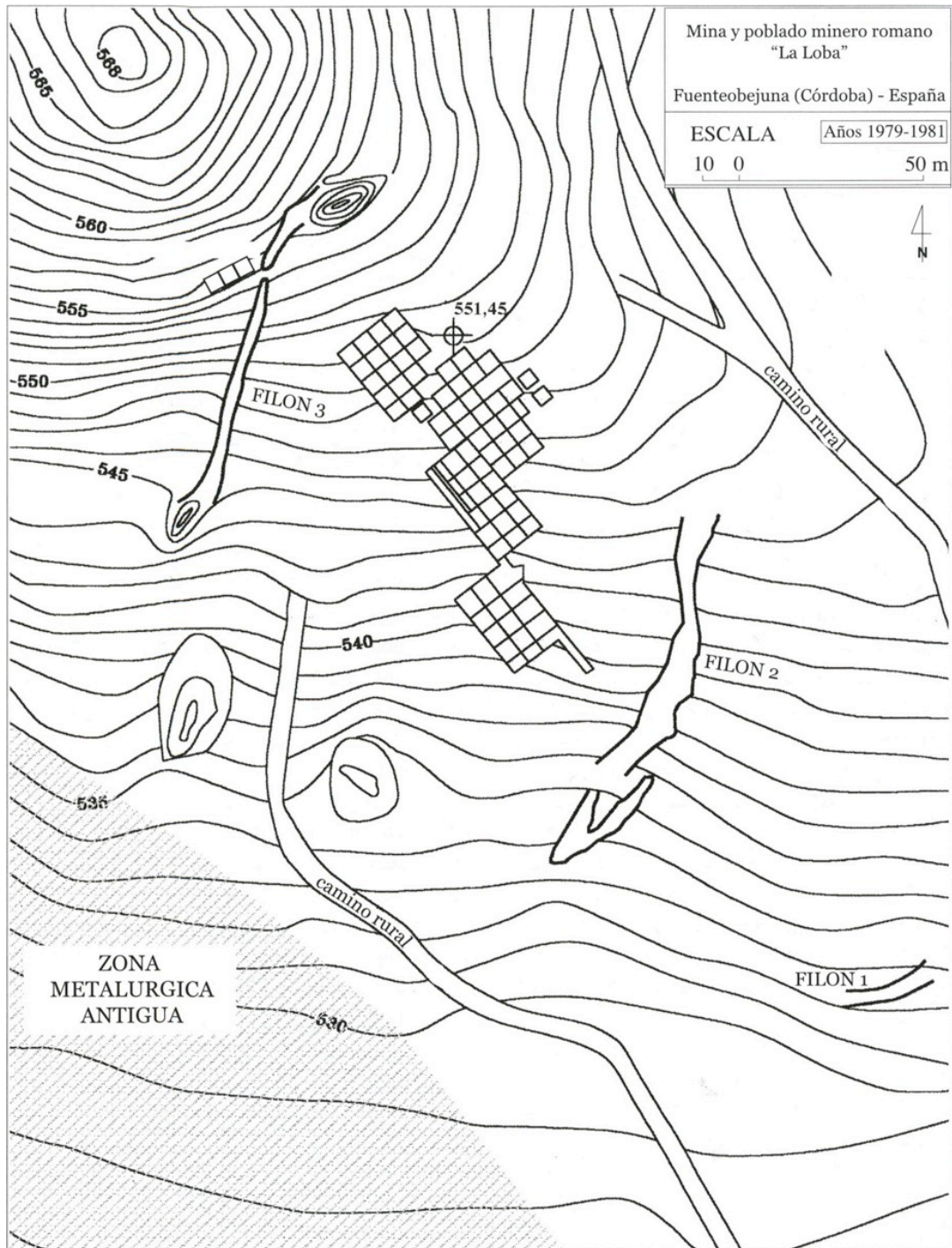


Figure 6.3 Excavated area at La Loba delineated by gridded area in the center, with surrounding landscape features including rural roads and mining areas (Blázquez Martínez et al. 2002: 23).

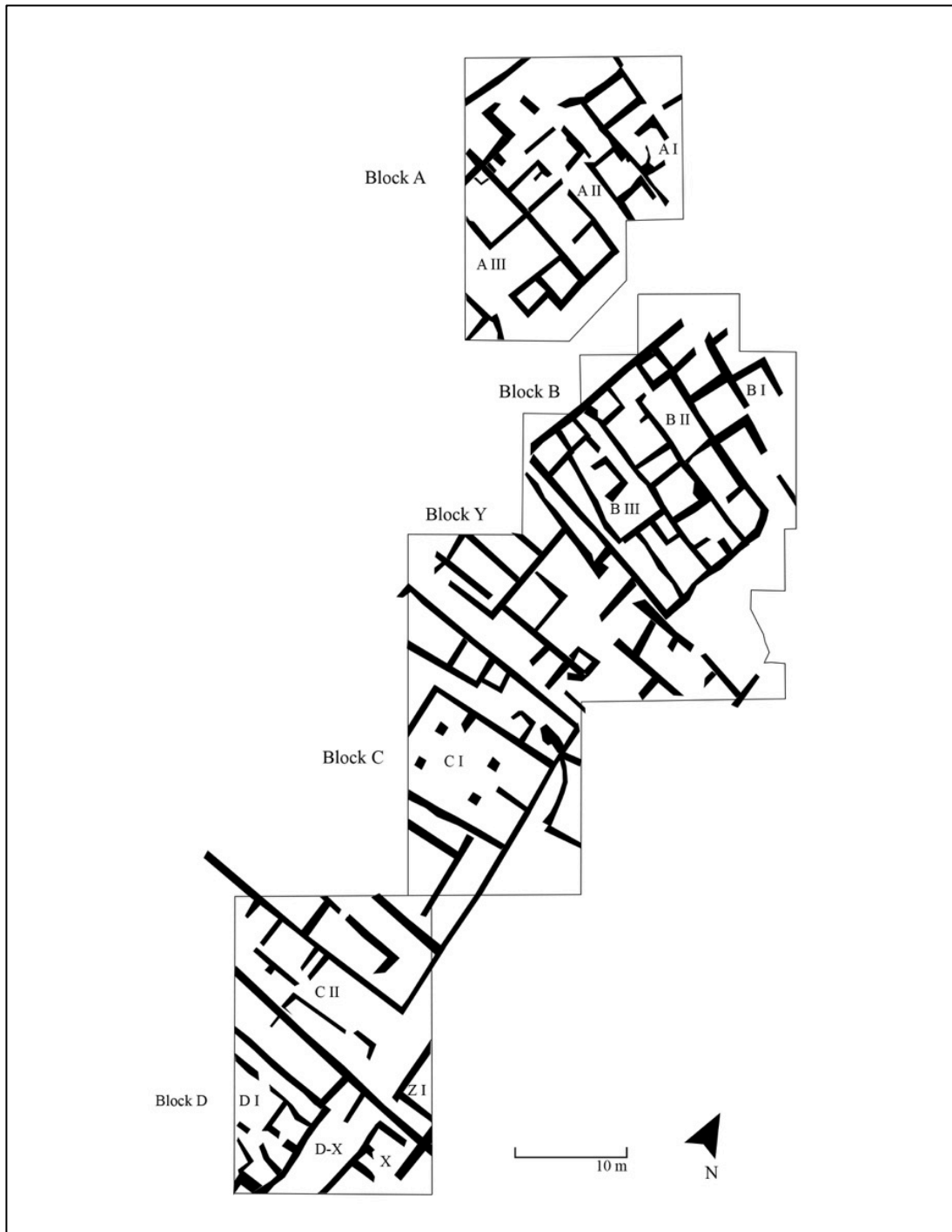


Figure 6.4 Excavated plan of the settlement at La Loba with labels for identified blocks (compiled from various images in Blázquez Martínez et al. 2002).

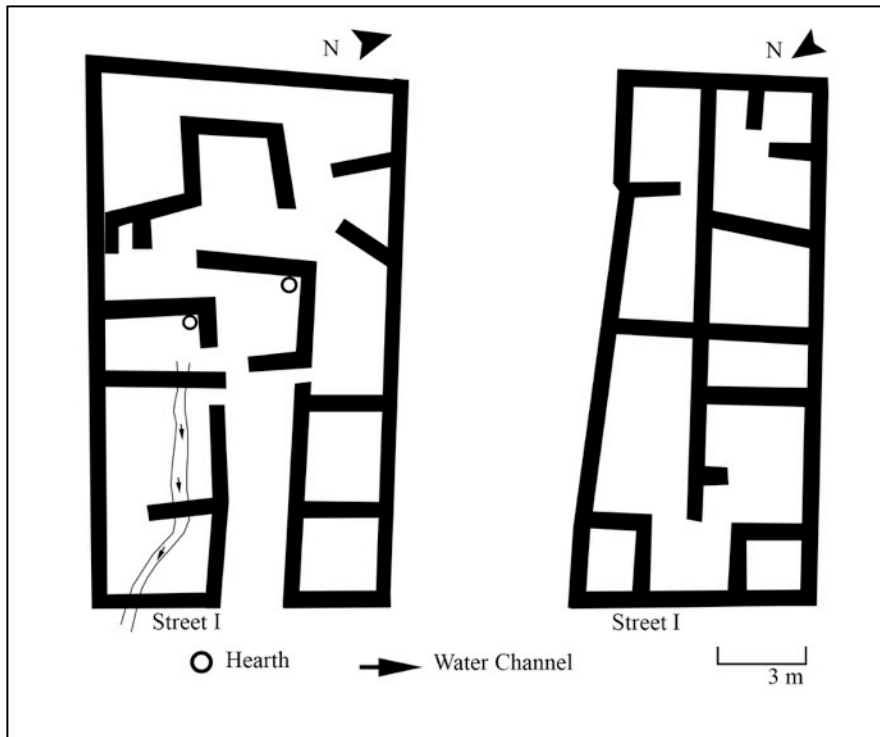


Figure 6.5 Simplified house plan of rectangular houses including A-II (left) and B-II (right) within Blocks A and Block B, respectively, at La Loba (after Figure 86 in Sillières 2002: 146).

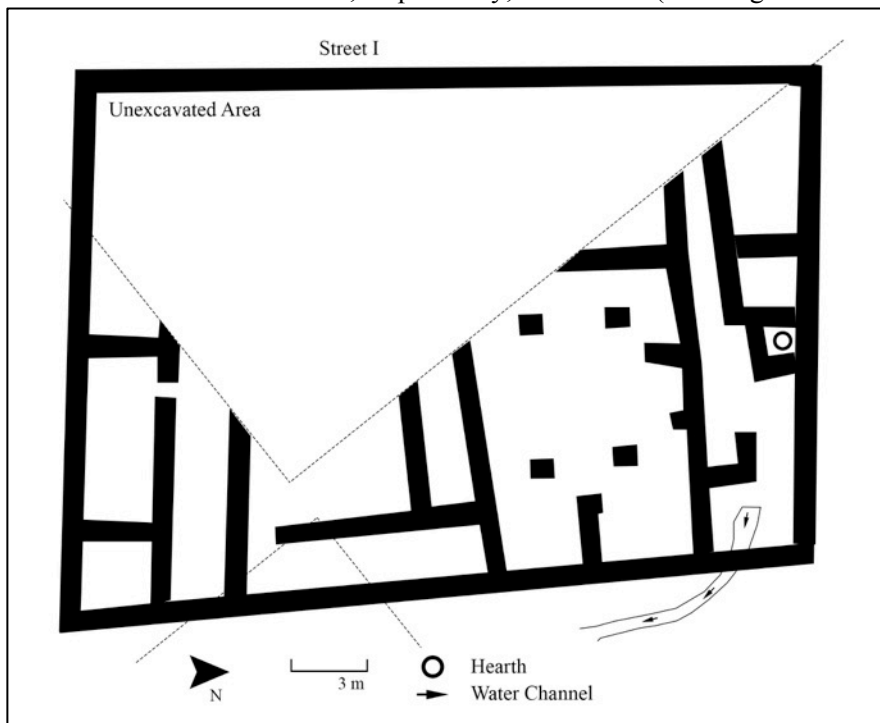


Figure 6.6 Simplified house plan of the large house called C I in Block C at La Loba (after Figure 166 in Sillières 2002: 147)



Figure 6.7 Spatial distribution of tools within the settlement with areas with one or more mining tools marked in grey, indicating the highest proportion of tools in Block A (after Figure 165 in Domergue 2002a: 345).



Figure 6.8 Excavated plan of La Loba settlement with areas in grey showing the presence of copper matte, a residue from the smelting process. (after Figure 42 in Domergue & Tollon 2002: 65).



Figure 6.9 Excavated plan of La Loba settlement with areas in grey showing the presence of tubes (*tubuli*) of *spuma argenti* or litharge from lead metallurgy that forms in the course of cupellation (after Figure 43 in Domergue & Tollon 2002: 72).

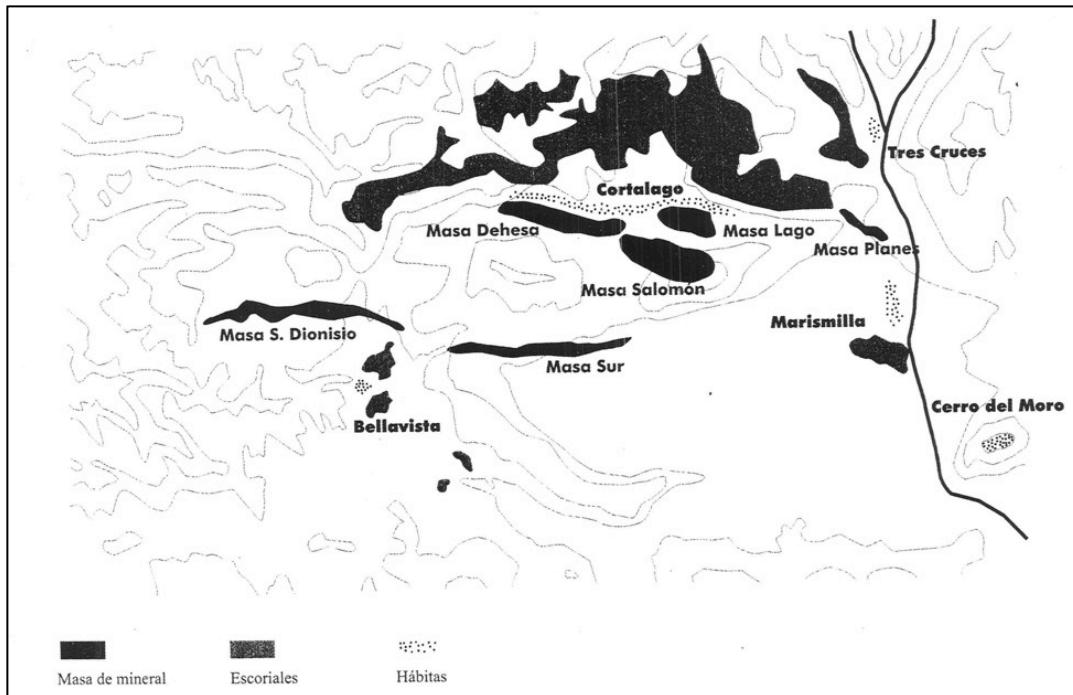


Figure 6.10 General locations of habitation with relation to slag heaps and mineral deposits at Riotinto during the Roman period (Figure 1 in Pérez Macías & Delgado Domínguez 2007: 148).

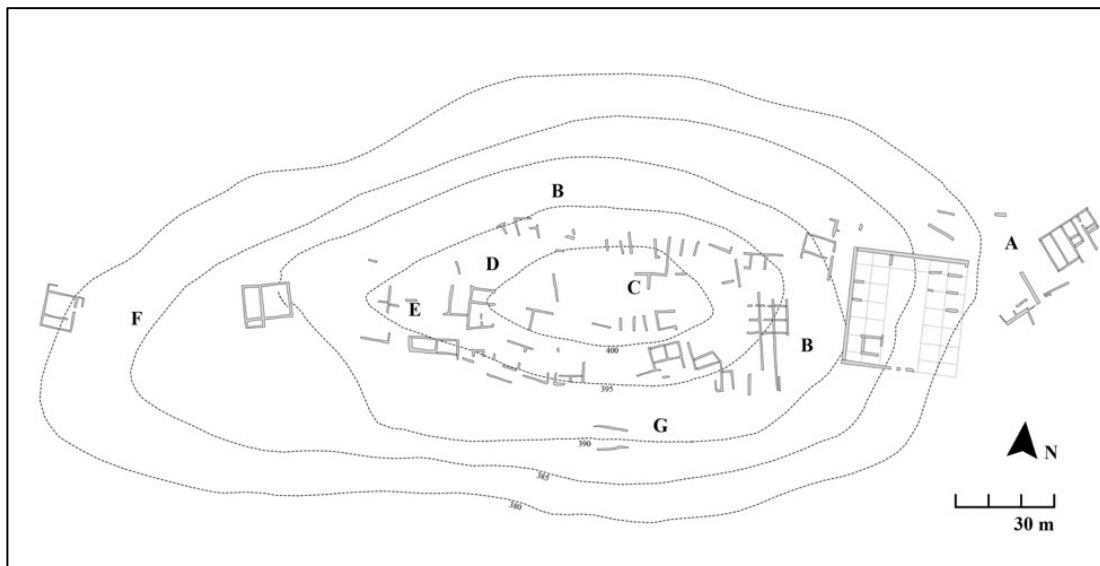


Figure 6.11 El Cerro del Moro basic settlement plan. Scale is approximate. (after Figure 2 in Pérez Macías & Delgado Domínguez 2007: 149).

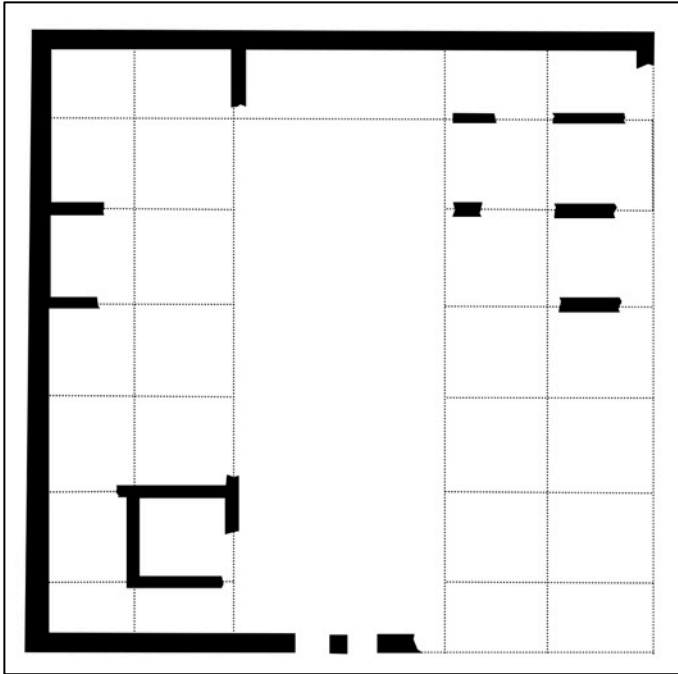


Figure 6.12 Detail of the “Casa Grande” or Building A-3 from El Cerro del Moro. External perimeter measures 32.2 x 36.4 m (after Figure 31 in Pérez Macías & Delgado Domínguez 2007: 178).

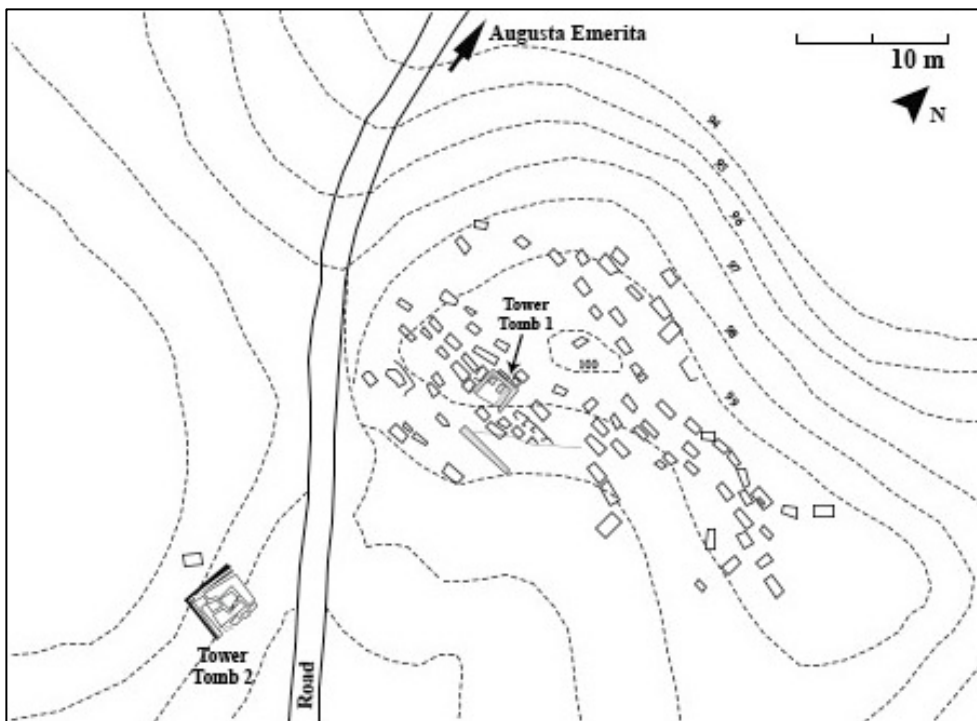


Figure 6.13 Map of La Dehesa cemetery based on the 1975 excavations (after Jones 1980: 155).



Figure 6.14 Remains of La Dehesa cemetery at Riotinto with cremation burials carved into the bedrock, and industrial installations visible in the background. (photo by José Morón, courtesy Instituto Aldaluz del Patrimonio Histórico).



Figure 6.15 Photograph of a semi-cylindrical capstone from a grave at La Dehesa. The niche in the stone once held an epitaph carved on marble or another material. The urn and other grave goods were buried below the capstone in a cavity carved into the bedrock (now stored in the Museo Minero de Riotinto, author photo).



Figure 6.16 Tower tomb in Haïdra, Tunisia (photo courtesy J. Andrew Dufton).



Figure 6.17 British neighborhood at São Domingos with elite housing in the background. The foreground is a large park space, including tennis courts, around which the houses are arranged (author photo).



Figure 6.18 Victorian-style houses in the British neighborhood of Bellavista at Minas de Riotinto (author photo).



Figure 6.19 Row of miners' quarters at São Domingos with a chimney for each house. Originally, a communal oven was located at the end of each row of houses to be shared by people living in the same neighborhood (author photo).



Figure 6.20 The English Cemetery at São Domingos, Portugal (author photo).



Figure 6.21 Epitaph of Germanus. The epitaph reads: “Germanus/Marini ser(vus)/an(norum) XV h(ic) s(itus) e(st). / s(it) t(ibi) t(erra) l(evis).” or “Germanus, slave of Marinus, 15 years old, lies here. Let the earth be light upon you.” Epitaph now located in the Museo de Huelva. 45 x 30 x.018 cm (Blanco Freijeiro 1962: 43; *AE* 1965, 299)



Figure 6.22 Epitaph of Licinia Materina. The text reads: “Licinia Paterni / f(ilia) Materna / Novaugustana / [a]nn(or)um XXX h(ic) s(ita) e(st). S(it) t(ibi) t(erra) l(evis).” or “Licinia Materna, daughter of Paternus, from Nova Augusta, 30 years old, lies here. Let the earth be light upon you.” 33.5 x 44x .018 cm. (Museo de Huelva, author photo).

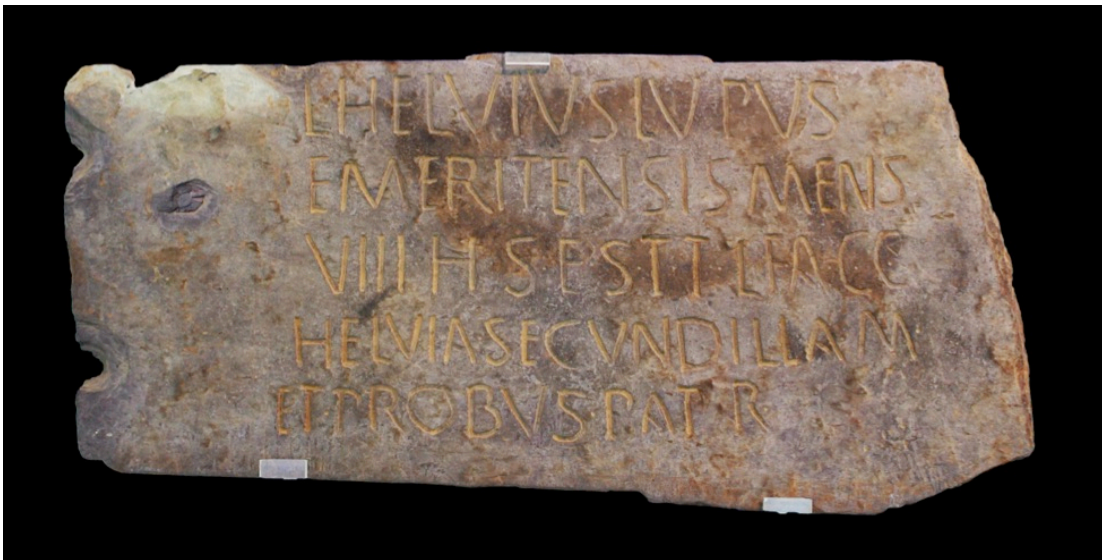


Figure 6.23 Epitaph of Lucius Helvius Lupus. “L(ucius) Helvius Lupus / Emeritensis mens(ium) / VIII h(ic) s(itus) e(st). S(it) t(ibi) t(erra) l(evis). Fac(iendum) c(uraverunt) / Helvia Secundilla m(ater) / et Probus pat[er].” or “Lucius Helvius Lupus of Emerita (Mérida), 8 months old, lies here. Let the earth be light upon you. His mother Helvia Secundilla and his father Probus had this made.” See: *AE* 1965: 298. (Museo de Huelva, author photo).



Figure 6.24 The *Lex Metallis Vipascensis* (VIP I, Vip A) on display in the Museu Geológico de Lisboa (author photo).

CHAPTER 7

TECHNOLOGY AND LABOR ORGANIZATION: LOCATING COMMUNITIES OF PRACTICE IN MINING DISTRICTS

Through investigating technical systems, we aim to understand social systems in a wider sense, in particular relationships and networks that are brought into being through the various steps of making things.

-Katharina Rebay-Salisbury, Anny Brusbaert, and Lin Foxhall (2014: 2)

Introduction

One of the reasons that this chapter follows my discussion of landscapes, settlements, and households is that technology has too often been privileged or singularized as the only archaeological means available for the study of mining communities. I hope to show instead that labor and technology were always deeply imbedded in their social and physical surroundings. Understanding landscape use, resource distribution, and the organization of social groups in households and settlements, then, becomes a necessary foundation for interpreting the kinds of technologies miners and those in related or subsidiary industries chose to employ as well as for understanding the organization of labor. Further, while on first consideration both labor and technology seem so central to the process of mining that each topic might deserve its own chapter, I deliberately group them together to force the association of these two aspects of production that I see as inherently and inseparably intertwined, but which have often been addressed independently.

In this chapter, I first discuss methodological and theoretical considerations for accessing the technologies and labors of daily life in mining communities before turning

to a case study-based analysis of the organization of the labor and practice of technology in southern Iberia. I look initially at the kinds of people (classes, statuses, origins, genders, and ages) who comprised the potential labor force in mining districts. I then turn to a discussion of the technology employed in the full process of mining from prospection and discovery of ores, to extraction, processing and transport. Finally, I bridge these two topics, examining the reciprocal implications that the evidence for technology and our understanding of the organization of labor have for one another and for our overall understanding of the formation of mining communities in southern Iberia.

My aim here is to highlight the implicitly interactive, social dimensions of mining and demonstrate how labor and technology are not separate from but integral to our understanding of interaction, daily life, and relations of power in mining communities in Roman Iberia. The unique relationship of these groups to landscape and resources, and their ability to harness these resources through labor and technology, is a major aspect of what sets mining communities apart from other kinds of communities not directed primarily towards engaging in extractive activities. Ultimately, better understanding this relationship in the wider context of the conquest of Hispania and its integration into the Roman Empire serves to illuminate and complicate the role of local—and often diversely composed—communities in larger political and economic agendas.

Accessing Labors, Practices, and Technologies of Everyday Life

In this chapter, I aim to better understand the formation of mining communities by examining the practices and interactions of those who labored in and around the mines and themselves created and used the technologies necessary for metal extraction. The work enacted in the processes of mining and metallurgy was one aspect of daily life in

mining communities that sets them apart from other communities. Evidence for these labors, which I situate at the small scale of analysis alongside my discussion of households and settlements in the previous chapter, provides one key element for understanding the formation of solidarity among miners, their families, and their communities.

It is first useful to reiterate my approach to labor and technology centered in my larger understanding of communities laid out in Chapter 3. This approach highlights the human and social dimensions of mining communities and the extractive technological processes that members of such communities were responsible for carrying out. In keeping with recent calls in archaeological studies of ancient technology (e.g., Dobres 2000; Dobres & Hoffman 1999; Pfaffenberger 1992), I emphasize technology as an action, a practice, and a process that was part and parcel of daily life in mining communities. Following Dobres, technology can be defined as:

An intersubjective arena of interaction and performance unfolding in, but never simply dictated by, the material world. While artifacts may have a fixed life history, technology is an ongoing and unfinished process—a verb of action and interaction, if you will—through which people, society, and materials together weave and reweave the meaningful conditions of everyday life (2000: 4).

This definition, with its foundations in practice theory, is compatible with my understanding of communities, in which daily interactions between not only people and groups, but also people and things as well as people and landscapes have the powerful potential to create, reaffirm, and reproduce community ties. Addressing directly the processes and labors of technology in mining, interactions “between and among technicians [miners], between individuals and the materials they work [ore], and between these interactions and wider frames of meaning, action, history, and context” (Dobres 2000: 125, *my interjections*) all contribute to the formation of the mining community as a

whole. The idea is to consider technology as one setting of many in which meaningful interactions can take place, rather than as an object or developmental milestone.

This approach is designed to combat several persistent problems with how ancient technology has been often discussed, detached from human agents and social practices. Since at least the late 1980s, scholars in cultural anthropology and anthropological archaeology have realized these fundamental flaws and taken steps to counter them. Pfaffenberger resoundingly critiqued the “fetishization” of objects in technology and suggested that we move toward understanding technology as a “total social phenomenon” (*sensu* Marcel Mauss), at once material, social, and symbolic (1988). He argued against what he termed the “Standard View” of technology, the omnipresent assumption in much archaeological and anthropological scholarship that technology is a linear and positive progression towards advancement (1992). This can be seen in the terminology for “ages” of the ancient past: Stone, Copper, Bronze, and Iron, wherein the adoption of new materials and technologies has come to represent step-by-step, cumulative cultural progress (Dobres 2000: 10). A further major critique waged has been against the impersonal language often used to discuss technology (e.g., the biface was fitted to a wooden rod for the purposes of hunting), perhaps stemming from gendered critiques of archaeology that favored the impersonal construction over choosing a gendered pronoun as actor (Dobres 2000: 30). The effect, however, of using this language has been the production of a brand of dry, hard-science academic discourse on technology and technological objects that is divorced from social theory and interpretation.

Understanding technology as a practice enacted by people and directly linked to social

processes aims to combat these traditional viewpoints, producing a more human-centered perspective of ancient technology.

Problems of this nature continue to hinder the progress of studies of ancient mining and metallurgy in the Iberian Peninsula, which persist in addressing mining tools and technologies as singularized objects and achievements. Although, as Orejas and colleagues have pointed out, at least in studies of prehistory, the connection of mining with cultural “progress” has prompted discussions of the relationship between technology, culture, and social complexity, whereas—in the Roman period—mining is normally treated in isolation (Orejas et al. 1999: 267). As outlined in Chapter 2, since at least the 1970s a growing body of scholarship addresses, through scientific or archaeometric inquiry, questions of where and how mining took place, and what technologies and methods must have been employed to produce the array of material traces left over from the processes of mining copper, lead, silver, and gold in antiquity. While these studies are useful in their own right, they are often lacking the social context necessary to begin to address questions about the organization of labor, knowledge and skill transfer among miners, and the larger impacts of political and economic change on the scale, techniques, and goals of extraction and production following Roman conquest.

On the other hand, the study of labor in *Hispania* and in the Roman world more broadly often lacks a material, archaeological side that could greatly enhance (and complicate) studies based primarily on the accounts of classical authors about how and by whom work was carried out in Roman-era mining districts. Scholars have often relied uncritically on reports of labor practices drawn from classical literary sources (see: Humphrey et al. 1998) which has caused a persistent unquestioned belief in the use of

slaves and convicts as the primary source of labor in mines in *Hispania*. This, for instance, prompted Blázquez to describe La Loba as akin to a concentration camp in early discussions of the mining settlement (Blázquez Martínez 1981), though this interpretation was not supported by the archaeological record and later revised in the monograph about the site (Blázquez Martínez et al. 2002). Moreover, this over-reliance on the classical sources has led to an underestimation of the role of indigenous mining techniques, knowledge of local landscapes, and preexisting social structures during Roman-era mining (though we must not forget that critical readings of Pliny's work on gold mining have revealed possible instances of local labor and local vocabulary (see page 142)!).

Various conceptual solutions have been proposed to counter such problems, each bridging material and social models of interrogation. For instance, Costin and Wright's edited volume sought to highlight the creation of social identities among craft producers and artisans (1998). Specifically, by examining the activities involved in craft production and the identities of the crafters, Costin and colleagues sought to examine the role of agency of artisans in the organization of production (1998: 3). While this work revolved around the concept of social identity, which I previously argued is difficult to access archaeologically (see page 60), it represented an important and often-cited reorientation of studies of production towards a more social framework. Pfaffenberger has advocated examining "sociotechnical systems" in both the context of technology (1992) generally and in the context of mining in particular (1998). The concept, derived from science and technology studies rather than anthropology, views sociotechnical systems as "instinctive technological activity that stems from the linkage of techniques and material culture to the social coordination of labor" (Pfaffenberger 1992: 497). In this vein,

Dobres provides a practical and practice-based solution (2000; 1999), wherein technologies are “fundamentally about people, mindful communities of practice, and social relations of production” (2000: 97). Significantly, Pfaffenberger and Dobres advocate using the *chaîne opératoire* model as a research framework,¹¹² which examines each step of production processes in order to illuminate patterns of conventionalized or learned technological sequences (Dobres 1999; Pfaffenberger 1998; Leroi-Gourhan 1943; Lemonnier 1992; Lemonnier 1986; Lemonnier 1983). Such studies can aid in the identification of human agency at various stages and scales (individual, family, community, etc.) and pinpoint instances of technological choices, opportunities, and alternatives in each stage of production. Especially in colonial situations, where different individuals and groups are coming together—each bringing different knowledge bases, skill sets, and agendas—such choices can serve to express or manipulate identities, expressions of power, or pragmatism in the face of shifting political and social ideologies.

There are two fundamental ways, methodologically, to put these concepts into practice and counter the inherent problems with many previous studies of both labor and technology in Roman Iberia. Ultimately, my intention is to refocus mining technology and labor studies around the concepts of practice and interaction in order to apply them to discussions of the formation of mining communities. First, I forefront the human aspects of labor and technology, beginning the discussion with questions such as: Who was present in mining communities? What was the possible labor pool for various technological endeavors? And how can we assess what people of different origins,

¹¹² Studies using the *chaîne opératoire* have begun to be adopted more often in classical antiquity (e.g., Benton *forthcoming*; Rebay-Salisbury et al. 2014a).

statuses, classes, ages, and genders might have been doing? It is with these questions in mind that I turn to the process of extractive technology from start to finish—from prospection and discovery, to extraction, to processing, to transportation. This second element of the discussion allows for an analysis of the *chaîne opératoire*, loosely defined, at various mines in southern Iberia. Bringing these two elements of labor and technology together without dehumanizing the connection of people to the mining process highlights possible interactions between people and ways that communities of practice in and around mines took shape. This approach brings to light various aspects of mining communities at the small-scale level of analysis, which can then be linked to broader questions of social and economic change over time in Roman Iberia.

Labor and Work in Mining Communities

The archaeological and epigraphic evidence from households and settlements in southern Iberia presented in Chapter 6 goes a long way in illuminating who lived in mining districts in Hispania: indigenous people, immigrants, slaves, imperial officials, soldiers, among others including women and children of various statuses. These groups made up the possible labor pool for the various tasks involved in the process of mining and subsidiary industries. Here, I highlight how this labor pool varied over time and by region, so far as it is possible to determine. My aim in the remainder of this chapter to demonstrate how the steps involved in extracting and processing metals brought these diverse groups of people into interaction with one another in ways that incited the formation of mining communities.

Slaves and Convicts

Greek and Roman historical and literary sources have often described the criminals and slaves who toiled in mines and quarries in the Roman world, and these sources continue to color the perception of labor in mines throughout the Mediterranean in antiquity.¹¹³ While there is no doubt that slaves and criminals did work in Roman *metalla*—both mines and quarries—they were not necessarily the only or even the primary source of labor in all places and all periods. Slaves and convicts are notoriously difficult to track because these are juridical statuses with few material correlates.¹¹⁴ The written record, however, suggests that the pool of labor from these sources fluctuated over time, with the number of slaves probably decreasing and the number of criminals rising from the Roman Republic to the Imperial period (Thompson 2003: 156–157).

Written legal sources¹¹⁵ make frequent mention of criminals condemned to labor in mines until their death, who were called *damnati in metallum*, *damnati ad metalla*, or *damnati in opus metalli*, or *ministerium metallicorum*. There may have been slight differences in the terminology with *in metallum* requiring heavier chains than *in opus metalli*. Those condemned to *ministerium metallicorum* may have been only female convicts who worked in *metalla* but not necessarily in extraction. Condemned criminals who received this punishment came from both free and enslaved groups, but never from upper classes. It is likely that such criminals worked in mines directly overseen by the

¹¹³ For instance, Diodorus' passage (*Histories* 3.12-14) that discusses slaves working in the quarries in Egypt's Eastern Desert in the 1st century BCE has often been applied uncritically not only to other epochs of Egyptian history, but to mines and quarries throughout the Roman Empire (Shepherd 1993: 59; Meyer 1998), including to Iberia.

¹¹⁴ Chains, shackles, and slave collars are occasionally found in Roman contexts but few in contexts related to mining, metallurgy, or quarrying. Even in contexts such as Greek Laurion, where slaves are attested in the literary record, it is very difficult to differentiate slaves from free using burials or other material evidence (Morris 2011). Various authors have discussed slavery and material culture (George 2011; Joshel & Hackworth Petersen 2014; Thompson 2003)

¹¹⁵ For a complete review of condemned criminals in Roman legal and historical sources, see Millar 1985.

state, since they normally lost their freedom and forfeited their property to the *fiscus*. They were considered *servi poenae*, slaves of penalty, which meant that they could not be sold to work elsewhere or buy their freedom (*Digest* 28.1.8.4). Most written evidence for condemned criminals in mines dates to later periods, primarily from the 2nd century CE onward and often—though not strictly—in the eastern Mediterranean, though the scarcity of sources makes it difficult to distinguish the origins of the punishment or its geographic distribution. Some have associated the rise in criminals condemned to mines with a need produced by the decrease in the pool of slave labor at this time (Hirt 2010: 97–98; Millar 1985: 137–143). There is as of yet not a single piece of direct evidence for condemned criminals in mining districts in the Roman period in Iberia (Mangas & Orejas 199: 212). For instance, the Vipasca tablets only detail legal practices related to free laborers and slaves, but condemned criminals are conspicuously absent from the text. Criminals were an insignificant, or at least undetectable, part of the overall labor pool in mining districts in southern Iberia.

In contrast, there is solid literary and epigraphic evidence for the presence of slaves in mining districts in Iberia. The proportion of slave to paid labor varied a great deal over time, however, as well as according to the organization of mining itself and whether the state was in indirect or direct control of labor organization. In other words, large gangs of state-owned slaves were probably only used soon after Roman conquest. Mines were increasingly leased by private individuals or societies from the 2nd century BCE on, and these groups were responsible for recruiting their own labor. Thus, it may have been more financially feasible to employ a mixed pool of paid, skilled laborers alongside some slaves—as was the practice in many craft industries and agriculture in the

imperial period (Morley 2011: 267). After all, employing paid laborers enabled them to be contracted based on seasonal or periodic need, and meant that concession owners need not worry about the constant care and supervision of enslaved populations.

These patterns are corroborated more or less by the extant evidence. For instance, ancient authors claim that after the conquest of southeast Iberia in 206 BCE, the Romans took 2,000 prisoners of war (Polybius 12.1, Livy 26.47), and scholars have suggested that some of these people became slaves in the mines there that were at that time directly controlled by the state (Mangas 1971: 75). Strabo (3.2.10), citing Polybius, claims that up to 40,000 slaves were toiling in the mines of Carthago Nova around the year 133 BCE. This number is no doubt exaggerated, however, as the population density in the area is not reflected archaeologically (see page 204).

In the course of the 2nd century BCE, mining concessions were leased to private hands (see page 182), which required a shift in the organization of labor. I have already made reference to the influx of Italian immigrants in the Republican period to southeast and south-central Iberia, who Diodorus claims bought large gangs of slaves to work in their mining concessions. Epigraphic evidence from ingots as well as patterns in imported material culture and architectural design seem to corroborate the presence of Italian populations, or at the very least local populations who adopted certain Roman consumption practices. While societies and private individuals likely employed some portion of slave labor, there is very little evidence for the “gangs of slaves” that Diodorus mentions. At La Loba, for instance, the architecture and inscriptions on ceramic seem to indicate the presence of local or at least Iberian populations living in household units rather than groups of enslaved laborers. These laborers appear to have been paid, given

the preponderance of coinage at the site, with instances of coins in all residential areas (not just larger, elite housing). This does not mean that slaves were absent, only that they were not only source of labor.¹¹⁶

Patterns in southwest Iberia also confirm the presence of both slaves and free workers. I previously discussed four slave epitaphs from Riotinto (see page 270), a small proportion of the extant funerary epitaphs from the mining district. The Vipasca tablets provide an indispensable source for the presence of slaves in mining districts in southwest Iberia in the 2nd century CE, and show that slaves could be bought and sold at auction in Vipasca (Vip I.2; Appendix III.A). Here, it is important to note that these slaves were not state-owned property, but essentially domestic slaves who were owned by private entrepreneurs and used in leased concessions. Further, these legal tablets make apparent that slaves, freedmen, and free people performed many of the same labors within the *metalla*, and that servile status only became a large factor in the case of assigning punishment for breaking a law. In other words, mining and related labor was not something inherently the domain of slave laborers. Slaves could be trained to perform specific tasks, and could become highly valued as a result of this training, but there was no “peculiarly slave labor” (Bodel 2011: 312) in mining or in other industries. Further, slaves could be emancipated by their masters or buy their freedom, becoming *liberti*, or freedmen who had been slaves, who are well attested in mining districts (Hernández Guerra 2013: 80–81). Certainly, other scenarios for labor recruitment aside from slaves

¹¹⁶ Most rural houses involved in agriculture—an economic sector that is said to often have used slave labor—do not contain any specific arrangements for housing slaves (Bodel 2011: 319), so we might not expect to see slaves clearly in the settlement organization.

and convicts were possible, and sometimes more profitable or more convenient in the case of southern Iberia, however.

Free Labor: Italians, Indigenous Populations, and Iberian Immigrants

Write Humphrey, Oleson and Sherwood: “Because of the dangerous and degrading character of the work, miners were often slaves or condemned criminals who had no choice in their employment” (Humphrey et al. 1998: 173). The epigraphic and archaeological record confirm, however, that mining could be a source of upward mobility in Roman provincial society. Immigrants came from both distant locales within the Iberian Peninsula and from Italy to participate in the industry. Aside from immigrant populations, there is ample evidence in the form of continuity of local ceramic and architectural traditions in many parts of southern Iberia to suggest the presence of indigenous free laborers in many mining districts (Domergue 1990: 342–346).¹¹⁷

Immigrants from Italy during the Republic and early empire, mentioned by Diodorus and attested in the material record in both southeast Iberia and the Sierra Morena, are also evidenced by the stamps on lead ingots from these mining districts. Ingots were typically produced in the final stage of metallurgy as a way to facilitate shipping. From the mid-2nd century BCE on, they were also stamped with names of private individuals involved in their production, including lessees, societies, or families became commonplace (Domergue 1985: 93). Recent onomastic analysis of lead ingots from Carthago Nova uncovered on shipwrecks throughout the Mediterranean suggest that families with names originating in northern Campania and the Bay of Naples make up at

¹¹⁷ The presence of coins throughout the settlement of La Loba, alongside the occurrence of Iberian inscriptions on pottery, is an especially compelling piece of evidence to suggest this circumstance in the Sierra Morena, for instance.

least 63% of those named on ingots, with 18% coming from other locales in Italy and 19% from unknown origin (Stefanile 2015: 176). Thus, southern Italy provided many of the immigrants that Diodorus mentions (Stefanile 2013; Stefanile 2009). Domergue, in his analysis of 1st century CE lead ingots from the Sierra Morena discovered on shipwrecks, suggests that stamps can be identified with *mercatores* and *negotiatores* who were involved in regional and imperial trade networks (see Chapter 8). These are often *tria nomina* names belonging to Roman citizens (Domergue 1998: 201–203, 214).¹¹⁸ While some stamps bore the name of cities such as Carthago Nova and later often had the names of emperors by the time of Hadrian, the overwhelming presence of private, Italian names in the Republican period and early empire does suggest the presence of Italian immigrants who came to Iberia to participate in the booming industry.

The primary source of information for immigration within the Iberian Peninsula comes from epitaphs from the 1st and 2nd century CE. I have already noted instances of immigration to Riotinto, where immigrants from places including Talabriga (Aguedo), Olisipo (Lisboa), Nova Augusta, and Emerita (Mérida) are attested (Domergue 1990: 339). A recent study by Claire Holleran, maps some of the patterns of immigration attested in mining districts in Iberia (Holleran 2016). Generally speaking, most documented cases involve immigrants from the western part of the peninsula as well as the northern Meseta to mining districts in the south, and especially southwest. These, of course, were but a fraction of overall populations made up primarily of local workers (Orejas & Beltrán Ortega 2010: 413).

¹¹⁸ The process for marking ingots may have been similar to that used on Baetican oil amphorae destined for Rome as part of the *annona*. The *tituli picti*, or commercial inscriptions (usually painted), on Baetican oil amphorae have been studied extensively (e.g., Remesal Rodríguez 2011; Blázquez Martínez & Remesal Rodríguez 1999; Remesal Rodríguez 1989; Blázquez Martínez 1992).

Imperial Officers and the Roman Army

During the imperial period, mines fell under the legal designation of *metalla*, and there is ample evidence for the administrative personnel associated with these mining districts. Officials in supervisory roles were normally members of the *familia Caesaris*—slaves, freedmen, and freedwomen in the service of the Roman emperor (Weaver 2008 [1972]), people of equestrian rank in the emperor's service, military officers and potentially civilian engineers (Hirt 2010: 105).

The *procurator metallorum*, normally an imperial freedmen and often bearing a name Greek in origin,¹¹⁹ was essentially the head of operations for mining districts controlled by the Roman state. Mining procurators could rotate between different mining and quarrying districts as they gained experience. For instance, one procurator called Saturninus is attested in the epigraphic record in Asturia and Galicia as well as at Aljustrel (Hirt 2010: 123). Hirt suggests that procurators need not have lived within mining districts, but could command various personnel from Roman administrative centers and make visits to the *metalla* that brought them into interaction with those living and working near the mines (2010: 163). Outside of the epigraphic record, there is little evidence for mining procurators or their staff who comprised the *officinal metallorum*, which must have included various slaves and freedmen trained in administrative duties.

Finally, members of the army were part of the labor pool in mining districts who served not only in supervisory roles but likely were involved with various engineering tasks. Such work could also have been carried out by civilian engineers, but the fact that

¹¹⁹ In the Danubian provinces recorded procurators are normally of equestrian rank, especially beginning in the 2nd century CE, but this does not appear to have been the case in Hispania (Hirt 2010: 146)

the army was trained in the construction and maintenance of infrastructure and that they are attested in many mining communities of the imperial period including Las Médulas, Vipasca, and Riotinto suggests that they carried out some engineering tasks. Overall, however, evidence for the Roman army is much reduced in southern Iberia as opposed to Las Médulas and other gold mining districts in the northwest (Hirt 2010: 186–190).

Families, Women, and Children

While there is an overwhelming association in ancient literature and modern perceptions between mining work and adult male labor, women and children could have been members of each of the groups I discussed above. Recent work in anthropology has emphasized the function of the family in mining communities, as well as the various contributions of women to the workforce at mines. For instance, in the American gold rush, women who came west with their husbands were often responsible for duties such as inn keeping or cooking meals for passers by and members of the mining community (Moynihan et al. 1990: xvi–xviii). These entrepreneurial activities provided families with a more reliable source of income than the risky venture of gold mining. Unmarried women who arrived to mining camps alone could make a living working in brothels, as has been well documented in the American west and in Australia and New Zealand (Laite 2009; Simmons 1998). It is worthwhile to consider the potential role of women in subsidiary industries in mining communities in Roman Iberia, from everything to producing textiles and baskets, to ceramic production, to cooking, to caring for livestock.¹²⁰

¹²⁰ In colonial silver mining haciendas in Zacatecas, Mexico, women made up 41% of the overall population and participated in small-scale trade and market activity, cooking, child-rearing, and could even

Beyond these activities, which were subsidiary to mining but well integrated into the overall social and economic organization of mining communities, instances of women participating in the process of mining are now well attested in many ethnographic cases. For instance, in colonial Potosí (Peru) and in contemporary Bolivia, women often participated in the final stages of mining above ground, sorting and processing ores, and participating in the process of resmelting ores in an attempt to extract ore from discarded materials (Nash 1979: 55; Velasco Murillo 2013: 10). In addition, the presence of children miners is well attested in anthropological studies. Young children and adolescents are well suited to certain aspects of underground mining because they are smaller and better able to fit into small underground passageways. The tombstone presented in the beginning of Chapter 3 of four-year-old Quintus Artulus is often cited as the most compelling piece of evidence for child labor in the mines of *Hispania*, as he is portrayed in a miner's tunic and carrying miners tools including a pick and a bucket. Certainly other instances of children in the Roman mines of Hispania exist. For example, at Riotinto, the epigraph of Lucius Helvius Lupus mentioned in Chapter 6 (see page 270) is that of a young baby commemorated by his parents. This is positive proof that families lived in Riotinto and raised children there, so a workforce of multiple ages and genders was available to for the labor force at Riotinto and probably at many of the mining communities under consideration in southern Iberia.

As I discussed in the previous chapter, many of the known mining settlements for which we have basic plans, including La Loba and Cerro del Moro, provide compelling evidence for the presence of houses much more reminiscent of family homes than

hold stake in mining. Velasco Murillo suggests that women could serve as particularly strong community members and family leaders because of high rates of male absenteeism (Velasco Murillo 2013).

quarters. At the very least, they are not constructed in ways that resemble the barracks of Roman forts or buildings that would imply a large group of men living together in mining settlements or encampments. In some ways, we might expect this kind of labor situation in the gold mining districts that were directly overseen by the imperial government and the military, and even there settlement organization indicates the persistence of family groups living together and performing a variety of tasks associated with gold mining (see page 131). This could have benefits. June Nash, in her work on contemporary Bolivia, notes that after nationalization of the industry, mining administrators encouraged the formation of stable families in mining communities, attributing families to “a more dependable workforce” (1979: 59). It may be that women and children not only contributed to certain essential tasks within Roman mining communities, but that families were encouraged to reside in mining communities together in order to maintain social stability.

In sum, workers for the various tasks and subsidiary industries could be drawn from groups of free, paid workers of local origin, immigrants, slaves and freedmen, possibly convicts, imperial officials, as well as the Roman army. Both because of the emerging emphasis on women and children as part of the labor pool in mining in many other times and places, and because of the archaeological record from mining settlements in Hispania, it is also essential to imagine these groups as a part of the diverse labor pool in mining communities. In the following pages, I turn to the technologies of mining before returning to a discussion of the organization of labor and interactions in mining.

Technologies of Mining

The fragmentary nature of the archaeological record in and around mines means that it is not possible to study the *chaîne opératoire* at each site at the level of detail that would be ideal. Nevertheless, it is a worthwhile pursuit to examine the extant evidence from various sites in southern Iberia under consideration in order to look at the technology necessary for each step of the mining process. Here, I focus analysis on the overarching *chaîne opératoire* used for the extraction and processing of ore: prospection and discovery; excavation and extraction; and finally processing and transportation. Organizing information in this manner allows for an examination of the actions that went into extracting minerals successfully. When mining is seen as a process, it then becomes easier to connect the actions—or labors—that were necessary for carrying out the various steps involved.

This approach reorients the analysis away from a discussion of unique finds of ancient machines and technological devices, which have often been a focus in studies of ancient technology and of mining in particular (e.g., Oleson 1984).¹²¹ Discussions solely of the mechanical workings of technological objects tend to suggest that such objects as water wheels are inevitable technological advances in the development of “civilization,” thereby eclipsing continuity and tradition in other aspects of the overall technological processes. At least in colonial contexts, traditions and continuities in technological practice—even alongside the adoption of new devices—can have cultural significance (Ridington 1999). As Dobres has written, “The phenomenological scale of everyday life was not only the scale at which culture was made and remade through a web of

¹²¹ These kinds of studies are foundational work in understanding what technologies were employed and how they worked but often stop a few steps short of discussing social aspects of production in detail; I take them as a starting point rather than end point of this analysis of technological practice and labor.

meaningful and material practices; everyday life was also likely a stimulus to macro-scale technological innovation” (2000: 180). Therefore, instead of emphasizing the results of technological innovation (e.g., water lifting devices), I here place greater attention on the everyday practices in the *chaîne opératoire* of mining, and ways that these everyday practices and needs stimulated innovative use of technologies in Roman mines of southern Iberia.

Prospection and Discovery

The first stage in mining was, of course, finding metal deposits to extract. While southern Iberia was famously rich in metals—copper, silver, lead, iron, and gold, among others—the process of locating these minerals was not altogether straightforward. Resources were unequally distributed by region, and could vary considerably at the local, micro-scale. Healy contends that the Romans had a greater practical knowledge of geology than did the Greeks, suggesting that they relied on the color of the earth for locating subsurface minerals (1978: 85–87). In the case of gold prospecting, Pliny wrote that *segullum*, a recognizable type of gold-bearing soil, was washed for gold to estimate the subsurface gold content (*HN* 33.67). Determining the presence of silver from surface prospecting, on the other hand, was more difficult: Pliny wrote, “it is found only in shafts, and occurs without giving any indication of its presence” (*HN* 33.95). Discussion of processes for prospection of other kinds of minerals in southern Iberia is largely absent from historical sources, and precious little can be determined about the specific techniques employed in prospection for minerals from archaeological remains. Indeed,

when mineral-rich deposits were discovered and mines opened, the initial traces of prospection were normally obliterated (but see: Domergue 1990: 391–400).¹²²

The dearth of evidence for Roman-era prospection techniques can be explained, in part, by the fact that the Romans chose to take over mines that had already been actively mined in previous periods. In Cartagena/Mazarrón, sources¹²³ indicate that the Romans commandeered mines that were then being exploited under the Barcids, and there was a more or less seamless transition of continued exploitation after Roman conquest. Of course, mines in the region had already been exploited since the Bronze Age, and the local inhabitants of the landscape had knowledge of where rich mineral deposits were prior to Phoenician or Punic/Barcid-era mining activity. Similarly, mining in the Sierra Morena produced ores that were used in Ibero-Punic coins, and the mines in that region were likely active from the Chalcolithic period (see page 197).¹²⁴ Although there was a gap in large-scale extractive activity in the Iberian Pyrite Belt immediately preceding Roman conquest, minerals were exploited in southwest Iberia from at least 4000 BCE and were heavily exploited during the period of Phoenician activity in the region (Salkield 1987; Rothenberg & Blanco-Freijeiro 1981). The point to be made here is that

¹²² There are pieces of scattered evidence for unsuccessful prospection, including, for example, a small shaft at Três Minas in northern Portugal that was abandoned when it was found to contain low gold content (Markus Helfert, personal communication). Other deep shafts at Três Minas and elsewhere that have been interpreted as part of shaft-and-gallery mining could have initially served as prospection for deep vein mining (Matías Rodríguez 1999: 164).

¹²³ Pliny wrote: “It is an extraordinary fact that mines throughout Spain opened up by Hannibal (221-219 BCE) still remain in use. They take their names from the individuals who discovered them; among these, the one today called the Baeblo, which provided Hannibal with 300 pounds of silver every day, now dug 1,5000 paces [2,200 m] into the mountain” (*HN* 33.96-97); translation in (Humphrey et al. 1998: 175). Diodorus Siculus also reports that most of the Roman mines in Iberia were previously worked by the Carthaginians (*History* 5.38; Appendix IV)

¹²⁴ Even in areas of discontinuous mining activity, the material traces of previous mining activities could provide clues as to the location of mineral deposits. As Blázquez, Domergue, and Sillères have noted, “Desde siempre las huellas de los trabajos antiguos han constituido una buen agüía para prospectar minas” (Blázquez Martínez et al. 2002: 399).

the presence of rich deposits of minerals in southern Iberia was never a mystery either before or after Roman domination. Local populations throughout each region had been active in mining and metallurgy for millennia, and undoubtedly had intimate knowledge of the landscapes in which they lived and labored, which was passed down for generations. While additional prospection took place in the expanded mining districts under Roman control after the 3rd century BCE, it would be impossible to explain the immediate high output production of metals, especially silver, without attributing much of this success to the pre-existing mining activities and the help of indigenous and Ibero-Punic populations.¹²⁵ Once mining was well underway, further systematic prospection did occur in active areas to increase production in mining districts. This is indicated, for instance, in the regulation at Vipasca that prospection could not be carried out within 15 feet of a water drainage ditch (Vip. II.11, Appendix III.B). Within this very active mining district, prospection was an activity happening alongside subterranean mining of areas of known copper and silver deposits.

In the not dissimilar case of Spanish colonial mining in Bolivia, Godoy found that indigenous peasants, rather than geological prospectors or “trained” personnel, were responsible for “all of the major geological discoveries over the past 500 years,” and, in reference to the first three decades of Spanish colonial rule (from 1545 to the mid 1570s), native people were in control of all aspects of mining from prospecting, to smelting, to marketing the ores (1985b: 104, 115). Although there are, of course, local and historically contingent specificities to each case, it is plausible to expect that newly arrived Romans

¹²⁵ This was not a strategy only used in the Iberian Peninsula. Similarly, Roman exploitation of large mining districts elsewhere including Egypt, Macedonia, and Dacia were preceded by long-term exploitation by local populations (Matías Rodríguez 1999: 161).

(either Italian entrepreneurs in the Republican period or, later, members of the imperial administration and/or army) relied on those with local knowledge of their landscape and its resource distribution for the initial stages of prospecting. There is power in knowledge, and indigenous populations of each of these sites must have exploited this power after the Roman arrival, as they may have in Phoenician and Punic times as well. An arrangement wherein local people participated in this early stage of mining had the potential to be a mutually agreeable situation: in this scenario, the indigenous populations absorbed the prospecting risk while maintaining some power and control over their specialized knowledge. It has even been argued that practical but non-material knowledge about landscapes (including the location of resources) can in itself be a technology (Ridington 1982; Ridington 1999; Dobres 2000: 103). For these reasons, we must not discount the possibility of indigenous people being involved in this stage of prospection.

Finally, evidence suggests that even in areas of active underground mining, prospecting probably occurred systematically in the wider landscape as one of many aspects of mining labor in order to discover future deposits to be worked when currently active subterranean mines were fully exploited. For instance, at Tharsis, at least 800 shafts were discovered in the process of modern mining operations, many of which do not connect with any underground galleries and have been interpreted as “exploratory” (Checkland 1967: 46). It is reasonable to assume that prospecting within precisely laid out concessions required various known Roman cartographic tools other instruments. This kind of prospection, or at least aspects of it, may have been implemented by engineers in the Roman army, who had access to these tools and the specialized knowledge to use them. This kind of highly technical prospection was likely used at

increasing rates from the time of Augustus to the 2nd century CE, when the imperial *fiscus* took on a more and more direct supervisory role in many of the mines of Iberia.

Subterranean Mining

Subterranean mining had already been practiced in Iberia and elsewhere for several thousand years by the time of Roman conquest.¹²⁶ Throughout the Mediterranean, people had learned that small shafts sunken into the ground were an efficient way to extract metals such as silver, gold, copper, and lead that can be found in subsurface veins embedded in hard rock. The same technique was also used for extracting chert for stone tools from the Neolithic onwards. The scale of this type of mining greatly expanded under the Romans, which allowed for higher levels of production and the ability to reach minerals that were deeper underground, such as the level of copper ore buried below the silver-rich layer of the Iberian Pyrite Belt. With this expansion in the scale and scope of mining came the need for more complex technologies. Major advances included the use of complex systems of water management and ventilation that allowed miners to advance deeper and stay underground longer than had previously been possible (Craddock 2008: 97; Pérez Macías & Delgado Domínguez 2010: 9). Despite these innovations, many of the basic techniques for subterranean mining had been long established. Rather than experiencing a complete transformation, the techniques, equipment, and tools used in subsurface mining underwent a process of standardization in addition to instances of selective borrowing of new technologies, which facilitated mining at increased scales and speeds. It follows that this increased scale necessitated a larger labor force of both skilled

¹²⁶ A well-published example of this is the Bronze Age mine of Tina in the Negev Desert in southern Israel. There, thousands of shallow shafts were excavated, sometimes within a few meters of one another (Conrad & Rothenberg 1980).

and unskilled workers. Alongside the types of subsurface mining described below, open air—or opencast—mining continued to be practiced to extract minerals not far below the surface. This could be done in subsurface mining as was the case at La Loba, where both open air pits and underground tunnels were employed simultaneously (Domergue & Tollon 2002). Ultimately, this provided a higher output in keeping with the demands of the imperial economy.

Excavation

The primary means of underground mining is termed shaft-and-gallery mining or deep-vein mining. Using this technique, miners opened vertical shafts from the surface, which they then extended into horizontal, subterranean galleries. Shafts often began as prospection trenches to access the deep geological stratigraphy and determine whether it would be useful to mine in a particular location (e.g., Figure 7.1), but once mines were opened they served as the means of entrance and exit for both miners and materials as well as for providing ventilation. Galleries were carved at various levels and connected through a complex series of shafts that ultimately led back out to the surface. When shafts and gallery mines were installed in hills or mountains, adits—or horizontal passages—extending from the side of the slope were sometimes added to connect with the internal galleries and shafts, increasing the overall subterranean space and the opportunities for air flow and water drainage.

Shafts themselves were carved in either circular or rectangular sections. Square or rectangular shafts were common in cases where wood was used for shoring, whereas when stone proved the most convenient shoring material, circular shafts were more often constructed (Davies 1935: 23). Miners entered these shafts from the surface and climbed

down either by means of niches carved directly into the rock or using wooden stairs, which have been found in the mines of southern Iberia, including at Cartagena, Riotinto, and Aljustrel (Figure 7.2; Gossé 1942: 54). Horizontal galleries had profiles shaped similarly to shafts, and their width varied depending on the scale of operations, the abundance of ore discovered in the particular area, and the particular function of the passage, whether it be ventilation, transport, or mineral extraction.

Ample literary and archaeological evidence attests to the elaborate systems of shaft-and-gallery mines in southern Iberia. Writing about Republican-era mining in the southeast, Diodorus Siculus described the winding subterranean excavations, which he suggests were carried out by slaves who were overseen by Italian immigrants:

But later on, when the Romans took control of Iberia, a crowd of Italians filled the mines and bore of great wealth through their lust for profit. After purchasing a multitude of slaves, they turn them over to the overseers of the mine workings, and these, opening shafts up in many places and digging deep into the earth, search for the strata rich in silver and gold. They carry on not only for a great distance, but also to great depth, extending their diggings for many stades and driving on galleries branching and bending in various directions, bringing up from the depths the ore which provides them with gain (*History* 5.36; trans. J. Humphrey, J. Oelson, and A. Sherwood).

Although there is little direct evidence for slave labor in excavation, this part of the mining process required strength, dexterity, and mobility in small subterranean passageways but did not necessarily require knowledge of engineering or metallurgy.

Whether these were slaves or paid laborers, underground work was very dangerous and probably given to lower status members of the community (Friedman 2008: 1–2).

Diodorus says that these conditions must have made death more desirable than life (*History* 5.38).

Recent archaeological work in southeast Iberia has confirmed the existence of mines fitting this description at La Rambla del Abenque in the Sierra de Cartagena, the

first late Republican-era mine to be systematically documented in the region. There workings extend for over two kilometers to a depth of 55 meters, and cover an area of four hectares in total (Figure 7.3; Antolinos Marín & Rico 2012: 151).¹²⁷ Underground mines have also been uncovered in south-central Iberia as well as in southwest Iberia, usually in the course of modern opencast mining. In the Sierra Morena, operations at El Centenillo reached up to 230 meters underground.¹²⁸ In the southwest, the mines at Riotinto extended up to 100 meters underground and at Aljustrel up to 120 meters (Domergue 1990: 431). Roman shafts and galleries are often visible today in modern workings for instance at the Corta de São João do Deserto (Aljustrel) (Figure 7.4) and at São Domingos (Figure 7.5).

The excavation of these underground passages required a broad range of tools and equipment for advancing operations, carrying out ore and discarded stone, and protecting the miners as they performed these duties. These included metal tools such as picks, hammers, and buckets; leather ropes, pulleys, and belts; esparto grass baskets, ropes, sandals, and hats; and a variety of wooden tools and instruments. The primary tools used in excavation were made of iron with wooden handles (Figure 7.6). Because they preserve well and were left behind in abandoned shafts with relative frequency, iron tools are some of the most common Roman-era instruments found in contemporary operations, with examples from every major mining district in Cartagena/Mazarrón, the Sierra Morena, and the Iberian Pyrite Belt (Domergue 1990: 402–40). These include simple picks, wedges, hammer picks, double-pointed picks, hoes, tongs, chisels, and adzes,

¹²⁷ Other mines in the Sierra de Cartagena and Mazarrón reach depths of 250 meters and 340 meters, respectively. These were not systematically recorded but are published by Domergue (1990: 431; 1987).

¹²⁸ For a description of this and other mines in the Linares-La Carolina district of the Sierra Morena see especially: Arboledas Martínez 2010.

among other forms (Delgado Domínguez & Pérez Macías 2014: 394–398). Such instruments were used to break up hard rock and minerals, hammering them into smaller pieces so that they could be later transported out of the shafts and galleries.

Prior to the Roman period, most subterranean excavation was done using stone axes and other tools made of wood and bone (Figure 7.7). These tools were gradually replaced by iron because it was efficient in breaking hard rock and easier to repair. It is important to note, however, that stone tools have sometimes been uncovered in underground mines thought to date to the Roman period and later periods, or associated with Roman ore-processing areas outside of underground mines. These have often been interpreted as residual materials from previous mining episodes (Delgado Domínguez & Pérez Macías 2014: 395), but may also have been pragmatically reused in later periods (Rothenberg & Blanco-Freijeiro 1981: 165–166). In Islamic-era mining, the presence of stone tools has sometimes been interpreted as a loss in technical ability to produce iron tools (see various chapters in Canto García & Cressier 2008). While both interpretations are plausible, there is an important alternative to acknowledge: it is becoming increasingly recognized that lithic technology was still employed alongside metal tools in historic periods throughout the Mediterranean, so the possibility of continued use of stone tools—albeit at lower frequencies—in Roman-era and later mining in Iberia should not be discounted. It is problematic to date mines to prehistoric eras simply because of the presence of stone tools in them.

One technique used alongside manual use of picks, hammers, wedges, and other tools to open new shafts and galleries was firesetting. Hard rock¹²⁹ was heated with fire, and then rapidly cooled by throwing or pumping water onto the newly burned rock face in order to weaken its structure through thermal shock. Firesetting was not an innovation of the Romans but a technique used in mines throughout the prehistoric Mediterranean and Middle East,¹³⁰ and indeed until the invention of explosives to serve a similar purpose (Ambert 2002: 711; Willies & Weisgerber 2000: 131). Pliny also describes the procedure as it was practiced in Roman times, claiming that vinegar was used instead of water to more effectively break up the rocks (*HN* 23.57; 33.71).¹³¹ This technique required burning wood and was often used in opencast mining or in shallow shafts where the smoky air could easily dissipate. In underground mining, firesetting could only be employed in areas where it was possible to escape the heat and smoke during the first part of the process; this made subsidiary ventilation shafts and corridors essential in large subterranean mines. In southern Iberia, firesetting was used in the Sierra Morena at the Cerro Muriano and in southwest Spain at Riotinto and Tharsis (Davies 1935: 22).

In firesetting, water or vinegar could simply have been thrown on the heated rock using metal buckets, of which there are many archaeological examples from these regions. Additionally, force pumps may have been used to increase the pressure and

¹²⁹ This method is most effective on rocks containing quartz, or rocks with large quantities of feldspars, micas, oivine, and other ferromagnesium minerals. Burning temperatures had to reach about 300° C for any effects to take place, but temperatures between 400° C and 600° C are more highly effective. These temperatures are easily reached by burning firewood (Willies & Weisgerber 2000: 146).

¹³⁰ Firesetting has been in limited use since the Neolithic, especially for extracting flint nodules. Throughout Europe and the Middle East, it was common practice to use firesetting from the Early Bronze Age to extract metal ores, especially copper, but also lead, silver, and zinc (Willies & Weisgerber 2000: 146; Craddock 1992).

¹³¹ The utility of this practice has been confirmed through experimental archaeology (Shepherd 1992; Healy 1999: 131–133).

distance of water as it was sprayed. Force pumps, the invention of which Vitruvius (10.7.1-3) attributed to Ctesibius of Alexandria (c. 270 BCE), were devices made of metal—usually bronze—or wood used to gather and spray water in a pressurized system. In the simplest versions, water flowed up a one-way valve into a cylinder, and then was pushed out by a piston through another valve into a delivery pipe. More complex force pumps involved two cylinders, two discharge pipes, and other modifications (Oleson 1984: 305–307; Foerster Laures 1986; Shapiro 1964). Pumps had diverse applications in Roman imperial times¹³² including use as fire extinguishers, supplying water for irrigation, as bilge pumps in ships, and in wells to raise water (Foerster Laures 1986; Oleson 1984: 323–325). In southern Iberian mines, two examples of force pumps have been uncovered: the first a bronze pump in the mine of Sotiel Coronada, and the second a lead pump mining district of La-Unión, Murcia (this one discovered during 20th century quarrying activity) (Matías Rodríguez 1999: 169; Domergue 1990: 454–460). The bronze force pump from Sotiel Coronada is the largest known example at 95 cm in height and 41 cm in length (Figure 7.8); it was found perfectly preserved inside a mine shaft where it was probably used for fire setting (Oleson 1984; Domergue 1993). Force pumps, while probably not in common use, must have helped to quicken the practice of advancing

¹³² Most surviving archaeological examples of force pumps come from Europe and date between the 1st and 5th centuries CE, though their origin was in the Hellenistic east. Oleson has suggested based on literary and archaeological evidence that their use in the Hellenistic period was purely experimental—for investigations of pneumatics, and it was not until the Roman period that they began to have practical applications for manipulating water in urban, agricultural, maritime, and mining contexts (Oleson 1984: 301–305). Variation in survival could also be attributed to the fact that many surviving examples from the west were made of wood, whereas those in the east may have been more frequently cast in bronze, which was more often melted down for reuse. At least 18 wooden examples and only 13 metal examples are known, all in bronze except for the one from La Union. The only instances of use in mining are the two finds from Spain (Stein 2004: 246–249; Stein 2007: 7; Wilson 2008b: 354). Stein provides the most up-to date catalog of Roman water pumps to date (2014).

shafts and galleries through firesetting in select subterranean mines; they serve as one example of the innovative Roman pairing of a Hellenistic technology with pre-existing mining technique to the increase scale and efficiency of extraction.

Water Removal

During the Roman period, galleries reached new depths to extract minerals from deeper and deeper underground, especially in the case of the deep copper deposits of southwest Iberia, which meant that they often extended below the natural water table. In order to continue the process of extraction, methods for removing underground water had to be devised. The easiest of these required no mechanical devices at all, but simply the construction of inclined galleries or adits that naturally lead water to a lower level outside the surface of the mines. Inclined galleries were used in each region of southern Iberia, for instance at El Centenillo in the Sierra Morena, La Fortuna in Mazarrón, and at Riotinto (Luzón Nogue 1968: 101). They are also described in the Vipasca Tablet II as “*cuniculus qui aqua metallis subducet*” (VIP II, 18; Appendix III.B). Pliny also describes men manually bailing water out of the galleries by hand (*HN* 33.97). When the structure of mines required other solutions, miners employed a series of devices of varying complexity: water lifters, water wheels, and Archimedean screws.¹³³ Oftentimes these were used in combination with one another and with inclined galleries.

Water lifters, or bucket chains, were buckets attached at intervals to circular metal chains or fiber ropes. These chains were affixed to a rotating point, usually a wooden rod, at the top of a shaft and lowered down below the water table (*Vitr.* 10.5). When the rod

¹³³ For a summary of ancient water lifting devices and their history of development see: Oleson 2000; Oleson 1984.

was manually rotated, the buckets were lifted and let their water out into a higher level of the mine or into an inclined gallery. Buckets were usually made of metal, such as the copper and bronze examples found at Sotiel Coronada (Figure 7.9; Figure 7.10; Luzón Nogue 1968: 111–112). Buckets and containers were sometimes made of other materials;¹³⁴ wooden examples have been found at Aljustrel and Riotinto, for instance. Esparto grass baskets with water-tight pitch interiors have been found in southeast Spain, including at Coto Fortuna (Mazarrón) (Domergue 1990: 440–442) and bronze rings that probably served as the frames for esparto grass baskets have been found at Riotinto (Figure 7.11; Palmer 1927: 305). Because many of these buckets have been discovered in isolation rather than in association with chains, it is not always possible to tell whether they were a part of bucket-chain devices or for more simple lifting by hand (Palmer 1927: 305). Bucket chains were by no means exclusive to mining—they were used, for instance, to draw water from wells in Roman London (Blair et al. 2006) or for bilge-pumping in ships (Wilson 2008b: 354)—but this technology was readily adopted for the constant need for water removal in subterranean mines.

Water wheels, known as *norias* or *rotae aquariae*, were large wheels constructed primarily of wooden elements with one bronze piece at the axis (Figure 7.12). Such wheels measured between 3.6 and 4.6 meters in diameter, with a series of wooden radial rods and wooden buckets lined with wax or pitch. They were carried underground in pieces and assembled *in situ* so that they would fit into small passages, and each element was likely produced in a uniform fashion in order to facilitate quick repairs to parts of the

¹³⁴ Ceramic buckets were also commonly used between the 1st and 3rd centuries for bucket chains in Egypt, because wood was a rare commodity and ceramic was cheaper and easier to use in this region (Wilson 2008a: 353; Oleson 1984: 354). There is no evidence for ceramic used in bucket chains in Roman Iberian mines, though it is possible that they were used.

machine (Delgado Domínguez & Pérez Macías 2014; Healy 1978). Like bucket-lifters, water wheels functioned by raising water from a lower level through rotary motion to a higher level, where it was either drained from the mine or continued through a series of other water wheels to higher levels. A variety of types are known from antiquity, which in Roman times were used primarily for irrigation and water manipulation in agriculture, in baths and drinking water tanks, and for draining mines. Some were powered by men who treaded on cleats or rods attached to the outside of wheels, other were powered by animals yoked to a gear attached at a right angle, and others were powered by the force of running water in streams and rivers (Wilson 2008b; Oleson 1984).

Water wheels were common in southwest Iberian mines in the 1st and 2nd centuries CE; examples have been found at Riotinto, Tharsis, São Domingos, and Aljustrel—all uncovered in the process of modern opencast mining. Between 1850 and 1860, 10 water wheels were uncovered at São Domingos (Allan 1965: 11; Allan 1970: 16). In 1875, 10 were found in the north lode at Tharsis (Checkland 1967: 46), and at Riotinto more than 50 have been found over the years. In the south lode at Riotinto, 14 pairs of waterwheels were found in 1910 and eight more pairs were found from 1919 to 1921, which provide the best documented examples of water wheels in mining and together raised water over 29 meters (Figure 7.13; Figure 7.14; Domínguez & Ortega 2012; Delgado Domínguez & Pérez Macías 2014: 400–401). In this case, each pair of wheels rotated in opposite directions to allow for continuous movement, where water was discharged into a launder that carried water into the sump, or collecting tank, of the next

pair. Miners had to be positioned on the wheels, treading to keep them in motion (Palmer 1927: 301–304).¹³⁵

Another mechanical device found with relative frequency in southern Iberian mines is the Archimedean screw, composed of a hollow wooden cylinder with a spiral in either wood or metal in its interior (Figure 7.15; Vitruvius 10.6.1–4). In underground mines, the cylindrical device was placed on an angle, between 15° and 35°, and rotated by a single operator in order to draw water from one lower level into a higher container, which in turn was emptied by an Archimedean screw placed at a higher elevation until the water was finally discharged out of the mine. Like water wheels, Archimedean screws were used more commonly in agricultural contexts, and indeed were used in Egypt until very recently (Healy 1978: 94–96; Luzón Nogue 1968: 111–116; Domergue 1990: 450–454). Diodorus describes their use in Iberian mines:¹³⁶

Most incredible of all—they draw off the streams of water with the so-called Egyptian screw, which Archimedes the Syracusan invented when he lived in Egypt. By means of these devices, set up in an unbroken series up to the mouth of the mine, they dry up the mining area and provide a suitable environment for carrying out their work. Since this device is quite ingenious, a prodigious amount of water is discharged with only a small amount of labor, and the whole torrent is easily discharged from the depths into the light of day (*History* 5.37; trans. J. Humphrey, J. Oelsson, and A. Sherwood)).

The fact that such screws were relatively mobile and functioned with only a single operator, rather than the two or three that were needed for water wheels, might have made them a more appealing device when labor and space were of paramount concern. Examples have been uncovered at El Centenillo (Jaén), Diogenes (Ciudad Real), Santa Bárbara (Posadas), and Sotiel Coronada (Huelva), the latter a series of three Archimedean

¹³⁵ Mining engineer Frank J. Bodenham has suggested that wheels were lifted up rather than pulled, since galleries in were larger on one side where a man could have stood, but this explanation has been generally discounted (Palmer 1927: 301).

¹³⁶ See also Strabo, *Geography* 3.2.9.

screws combined with a bucket chain (Delgado Domínguez & Pérez Macías 2014: 401).

The use of water lifting devices enabled more efficient work underground requiring fewer laborers, as one Archimedean screw or water wheel could lift many times what one miner could do by hand.

Like the force pump, water wheels and Archimedean screws have origins in the Hellenistic East, and seem to have originated or at least were first described by 3rd century BCE scientists of Alexandria including Archimedes and Ctesibius (Dalley & Oleson 2003). Significantly, however, most of these machines saw their first practical applications, improvements, and use in mining in the Roman west (Oleson 1979: 665). In the case of Roman mining in Iberia, the specific circumstances and the expanded scale of underground operations presented mining engineers and laborers with new and expanded need for water-lifting technologies. The specific knowledge they drew from to produce these mechanical devices came not from Roman scientific innovation but from borrowing of ideas from the Eastern Mediterranean. The adaptation of these technologies for every life and the practical needs of mining operations was an opportunity for interaction at various scales. Romans interacted at once with Hellenistic scientific writings and with local mining landscapes. On the other hand, the practical construction and application of these devices also required significant interaction with local laborers to acquire wood, bronze, and other materials and to train miners in the operation and maintenance of these devices. Ultimately, this kind of interaction served to create and maintain technical and specific knowledge at the level of the mining community.

Safety Measures: Shoring, Reinforcement, and Ventilation

Underground mining necessitated constant shoring and reinforcement of shafts, galleries, and adits that had weakened the structure of the earth. The most common way to accomplish this was through the use of wooden shoring frames constructed of locally sourced materials. In other cases, especially in wide galleries, masonry walls were constructed of discarded rocks from the process of mining or other durable stone material that was easy to transport into the mines' interior. Simpler solutions included leaving bulky, pillar-like deposits in galleries that stabilized the overall structure without requiring any additional elements (Domergue 1990: 417).¹³⁷ When shafts or galleries had been abandoned, these areas were sometimes filled with rubble created in the process of opening new areas. This served the dual function of clearing the active workspace and cutting down on transport time for discarded materials while also shoring up possibly precarious abandoned tunnels (Matías Rodríguez 1999: 165–166).

In southwest Iberia, at least by the period of Hadrian's rule, safety was not something regulated on an ad-hoc or local basis but an immediate concern of the state. The second Vipasca Tablet mandated that the *colonus* was responsible for replacing old or decaying shoring structures. The punishments for damaging pillars and props or rendering the mine unsafe were severe. If the offender was a slave, he was beaten (at the discretion of the procurator) and sold from his master. In contrast, when the offender was free, the procurator was allowed to seize his property on behalf of the *fiscus*. Both free and slave offenders were banished from Vipasca and could not relocate—or be sold to work in—any other mining district (Vip. II.9-10; Appendix III.B). This law suggests,

¹³⁷ This technique was also used to support tunnels excavated in alluvial gold mining in the initial step of *ruina montium*. Pliny wrote that arches were left at frequent intervals to support the overhead weight (*HN* 33.21.71).

firstly, that there was an interest at the state level in maintaining safety and order in mines, even when they were leased to private individuals. Secondly, that banishment from all mining districts was one element of the punishment suggests some individuals were highly specialized and valued for their particular skills related to mining. A desire to remain in the industry must have been an incentive for free individuals to obey mining law and safety regulations, or for *coloni* to take care to supervise their slaves' behavior in this regard. This is a further indication that migration between mining districts was not uncommon.

Despite these precautions, rock-falls and collapses posed a constant threat to the safety of miners. Even in the best of circumstances, mining was dangerous and disasters inevitably occurred. Statius described a horrific example of a miner being caught underground and crushed in a mine in an unnamed Spanish hill (*Thebaid* 6.880-885). In a few instances, human remains of unlucky miners have been uncovered in the collapsed shafts of Roman mines. One famous example of this is the 1845 discovery of 17 skeletons in the underground mine of Potosi (Guadalcanal, Andalusia, Spain) (Rickard 1928: 132).

Similarly, ventilation of underground shafts was of paramount concern. The environmental conditions below ground meant that noxious fumes and lack of oxygen could cause both immediate and long-term health problems for underground miners.¹³⁸ The same shafts that were used for entrance and evacuation of ores provided an opportunity for the circulation of oxygen in and out of mines; oftentimes, twin shafts are

¹³⁸ Numerous ancient authors comment on the danger of underground air and fumes in mines in Greek and Roman antiquity. See: Strabo, *Geography* 12.3.40; Lucretius, *On the Nature of Things* 6.808-815; Theophrastus *Concerning Fire*, 24; Pliny *HN* 31.49).

found in southwest Iberia that are interpreted as one mine with one shaft for extraction and the other for ventilation (Domergue 1990: 460–461). Smaller shafts were also sometimes sunk at various intervals so that fumes and gasses could be released to the surface. Pliny describes an air quality test in which an illuminated oil lamp was lowered underground; if the flame was quickly extinguished the subterranean air was considered dangerous and new shafts had to be sunk and ventilation encouraged by waving linen cloths upon reentrance (*HN* 31.49).

Illumination

Mining necessitated a consistent source of light to illuminate shafts and galleries and allow for proper visibility as miners labored underground. The primary means of lighting was through oil lamps, which were placed on niches carved at intervals in underground tunnels. These were usually clay lamps produced in styles similar to Roman domestic oil lamps, though often in slightly larger dimensions and with fewer decorative elements. It was also possible to use torches, though lamps were likely the better choice because they produced less smoke and were easier to maintain (Healy 1978: 93). Several examples of bronze oil lamps are known from Aljustrel (Viana et al. 1957: 5). Lamp niches were usually carved at the level of the head or shoulders of the standing-height of miners at a spacing of three or four meters, though sometimes more frequently or in pairs (Figure 7.16; Delgado Domínguez & Pérez Macías 2014: 402). The need to keep these lamps illuminated during the course of work might have given some rhythm to the daily labor cycles, where miners would break to change oil and wicks or alternate lamps (Matías Rodríguez 1999: 165). It is possible that the enlarged size of oil lamps found in sites such as Riotinto was meant to increase the duration of the burning of such lamps and

therefore the length of the work cycle, though the frequent occurrence of lamps of smaller sizes in the same mines and throughout southern Iberia indicates that this was not always a top priority.

Transport and Processing of Ores

Once excavated, metal ore and discarded rock had to be transported out of the mining shafts and processed into a form that could be shipped. In some cases, discarded material could simply be left in abandoned shafts and galleries, but in most instances carrying heavy baskets and buckets out of the underground mines was a constant activity. Buckets in bronze, copper, wood, and esparto grass are commonly found in subterranean Roman mines—these were sometimes used for water removal as part of bucket chains (see page 340) they were also used to collect and carry ore out of mines. At Aljustrel, for instance, esparto-grass baskets without lining were likely used for lifting ores up shafts using pulleys (Figure 7.17). Baskets have occasionally been found with attached wooden tesserae inscribed with names, providing small clues about the organization of labor in some mines. Examples have been found at Aljustrel as well as in southeast Spain at Coto Fortuna, and have been variously interpreted as the names of the owners of the concessions or the names of the miners themselves (Viana et al. 1957: 5–7; Domergue 1990: 410; Gossé 1942: 53; García Romero 2002: 253–256; D’Ors 1953: 106; Antolinos Marín et al. 2013: 92). Pulleys similar to those used in bucket lifters were probably used to raise buckets; one particularly well-preserved example of a wood-lined rectangular shaft and wooden pulley system on each side of the shaft was excavated at Algarès in 1920–21 (Viana et al. 1957: 11–13).

Once transported out of the mine, raw material had to be processed in order to isolate the pure metal. In the case of metals including tin and alluvial gold—the type unearthed at Las Médulas—metal only had to be mechanically extracted from the rock through breaking, hand sorting, crushing, sieving, washing, and rewashing (Shepherd 1993: 43). Copper and argentiferous galena required highly specialized processes to separate the metal out and ultimately form it into ingots or other goods to be transported out of the mining district. While this process is elaborated in more detail in other works (Craddock 1995; Tylecote 1987; Forbes 1950), I here discuss the basic stages insofar as they relate to the overall *chaîne opératoire* of the mining process and the organization of labor at mines in southern Iberia.

First, newly extracted ore was separated from the gangue, or waste material. This was achieved through a process called crushing, which employed a variety of stone anvils, mortars, and mills to break apart and grind up the raw material. Discarded anvils and mortars are often found in mining landscapes, which are similar in shape to flour mills known from Pompeii. These had to be operated manually by up to six men or by draught animals. Once crushed, the material went through a washing process to separate lighter metal from heavier rocks. The best-known washeries have been recorded in Classical Greece, especially Laurion and Thorikos (Healy 1978: 142–148; Craddock 1992: 101). In southern Iberia, simple washeries have been uncovered at Riotinto that take the form of tanks lined by stones, which were flooded with water to concentrate jarosite silver ore (Craddock 2008: 101). At El Gorguel, part of the building complex with an elaborate drainage system was probably also a washery (see page 245).

Once ore was separated, sorted, and washed, the volume of material that needed to be smelted in a furnace was greatly reduced.

Smelting involved putting the ore into a furnace in order to expose it to high temperatures, thereby further separating the targeted ore from impurities. The process of smelting required a great deal of fuel, which has been cited as a contributing factor to deforestation in many parts of the ancient world including southern Iberia (Healy 1978: 148). Furnaces were heated to approximately 1000° C (though temperature needs varied by metal) by burning charcoal or wood, and then the ore was added. Simply put, the heat caused the molten ore to separate and form drops of molten metal, with the waste products forming a molten slag. The process of smelting, including burning temperature, furnace form, and other factors, varies by material. For instance, with the argentiferous galena common in southeast and south-central Iberia, lead was first smelted according to the process described above. To remove the silver from lead, a process known as cupellation was necessary, where the smelted lead was heated in a cupel (usually a clay vessel or possibly bone ash with a binding agent)—again to about 1000° C—and exposed to a strong burst of air. This caused the lead to oxidize, forming litharge which attached to the cupel, and the silver to become molten metal, which was collected and cooled (Craddock 1995: 221–231). This process is described by Pliny, who claims that the silver appears “like oil on water” in the final stage of cupellation (*HN* 33.95). With ores such as the jarosite silver ore at Riotinto that contained no lead, lead had to be imported from other locales to make the extraction of silver possible. This is attested by the presence of lead ingots from Carthago Nova at Riotinto (Salkield 1987: 15; Craddock 1995: 216–221).

Finally, metal produced during the smelting process often had to be resmelted in order to remove further impurities. In this final stage, the ore was melted down again in an open crucible, which caused undesired inclusions to separate. In the case of resmelted copper and iron ores, oxide inclusions floated to the surface and could be skimmed off or adhered to the walls of the crucible to form a slag (Craddock 1995: 202–204). In this way, ore could be refined and shaped into ingots for easy transportation out of the mining district, a topic I discuss in more detail in the following chapter. The purity of smelted metals became especially important when metals such as silver and copper were destined for use in silver and copper-based coinage in the Roman imperial period.

The processes and strict requirements of metallurgy seem to suggest that it required a high degree of technological specialization and training, although the tasks could be accomplished by people of various age and status. We do know that cupellation was already practiced in Iberia before the arrival of the Romans, however, and therefore need not associate this skill set with foreign immigrants or specialists from elsewhere. Interestingly, however, there is no evidence for cupellation in the Bronze Age in southern Iberia (i.e: silver objects from the 2nd millennium BCE do not contain lead, which is present in silver obtained through cupellation), and the technological knowledge seems to have been taken up at a time contemporaneous with the arrival of the Phoenicians. If this is true, this technological knowledge did enter the peninsula through colonization, trade, and interaction with foreign craftspeople, but the transfer of knowledge happened long before the Romans entered the scene (Hunt Ortiz 2004).

Aside from laborers specialized in metallurgy, a great deal of ethnographic evidence attests to artisanal metal production occurring alongside officially sanctioned

metallurgical activity. In China and Bolivia, for instance, reworking of waste material around mines to extract more ore at the hands of women and children can provide an extra source of income to families in mining communities (Godoy 1985b: 112). Small-scale unofficial production of metals and subsidiary products such as dyes and medicines may have also happened in Roman mining communities in southern Iberia, as the presence of *tubuli* at La Loba suggests. At Vipasca, there is some evidence to suggest reworking materials was practiced habitually and that the imperial government sought to regulate and profit from this activity. VIP I (VIP I.7; Appendix III.A) contains a section detailing the fees for working and reworking the materials in slag heaps and rock deposits, indicating that it must have been common practice.

The massive quantities of slag still present today in many mining districts attest to the fact that minerals were usually processed and refined for shipment near the locations of subterranean mines, which facilitated fast and inexpensive transportation of the raw materials in the form of ingots. At Riotinto, for instance, slag and traces of smelting furnaces extend widely in the landscape, with at least 1 millions tons of copper slag in and around the site of Corta del Lago (Pérez Macías 1996: 47). Similarly, at El Gorguel, the mines from which argentiferous galena was extracted were within daily walking distance of the various metallurgical installations and residences of those laboring in foundries. At Vipasca, a foundry of a similar design was uncovered nearby the underground mines (Cauuet et al. 1999). This pattern attests to the close association between the labors of the extractive end of the *chaîne opératoire* of mining and the above ground labors involved in the practice of metallurgy at the final end of the production process. This connection must have brought underground miners in frequent interaction

with others specialized in aspects of ore processing including smelting and refining, interactions that contributed to the social connections among those practicing mining, and ultimately to a sense of communal solidarity and identity connected to the practices and processes of mining from one end of the process to the other.

Subsidiary Industries and Above Ground Interactions

Apart from the interactions and the organization of work involved in the technological practices of underground mining from start to finish, a variety of subsidiary industries needed for continued production provided the opportunity for the creation of community bonds across all residents of the mining community—both those directly involved in mining and those not.¹³⁹ Mining, therefore, created a landscape that linked people with various professions, statuses, genders, and ages because of the requirements of the industry.

The hard work of excavation inevitably left tools broken and dull. Repairs required both the work of miners themselves to sharpen equipment and of ironsmiths in mining communities who were specialized in producing and repairing iron tools. Whetstones for sharpening iron blades are attested in many mining districts, which were usually simply pieces of sandstone that were covered with oil, water, or saliva; oil was apparently most effective (*HN* 34.144). Miners drew iron blades across these stones in order to sharpen them. Pliny (*HN* 36.47) recounts that whetstones came from all over the empire including Laconia, Naxos, Armenia, Cilicia, and Italy, but that the stones from Laminium (Hispania Citerior) were of the highest quality. It is likely that many

¹³⁹ While certainly the lines between such work could be blurred (a miner might be responsible for the repair of his own set of tools, for instance), other activities such as ceramic production or the creation of the mechanical equipment described above may well have been more specialized tasks.

whetstones were sourced from sandstone deposits in southern Iberia, since they were of good quality and did not have to be transported great distances. Examples from Riotinto and Huelva more widely suggest that stones were used and reused over long periods of time, and filled with multiple grooves as they were worn down (Figure 7.18).

While whetstones were probably employed by miners themselves for daily maintenance activities, more specialized production and repair was likely done in dedicated iron workshops. In the case of Las Médulas, inhabitants of the site of Orellán exploited the iron ores found in the hill on which the settlement is built in order to fabricate tools for use in excavating shafts for alluvial gold mining (see Chapter 4, page 134). In southern Iberia, not all mining districts for extraction of lead, silver, and copper were located in close proximity to deposits of iron. Regional production centers for iron mining and metallurgy appear to have emerged in certain areas that flourished during the height of mining in Hispania in the early empire. One of these is Munigua (Andalusía, Spain), a city that supported an iron mining industry in southwest Iberia that probably served, in part, to supply other kinds of mines with tools necessary for extraction, or more likely supplied them with iron ingots that could be melted down for production of new tools by blacksmiths on site (Schattner 2003). The need for locally-produced iron tools at mines dedicated to other types of extraction explains the presence of iron slags at sites such as La Loba in the Sierra Morena (Blázquez Martínez et al. 2002) and Riotinto, as well as the presence of iron ingots at Riotinto that do not derive from local ores (Delgado Domínguez & Pérez Macías 2014: 395).

Just as the need for the production, repair, and maintenance of metal tools was essential to mining operations, the need for a constant supply of lamps must have created

a demand for local potters, or, alternatively, at least a consistent regional trade in oil lamps. Riotinto provides one piece of tantalizing evidence for a local lamp potter who came from Olisipo (Lisbon, Portugal) and was buried near the mining settlement: At the cemetery of La Dehesa, the grave of L. Iulius Reburinus was uncovered fortuitously in the process of highway construction (Luzón Nogue & Ruiz Mata 1970: 137). The cremation burial, surrounded by a stone wall and covered with a slate slab, produced a small epitaph on marble that read:

D(is) M(anibus) S(acrum).
L(ucius) Iulius Reb/
urrinus Olisip(onensis)
an(norum) XLI h(ic) s(itus) e(st). S(it) t(ibi) t(erra) l(evis).
Fortunata con/
tubernalis f(aciendum) c(uravit). (*CILA* I, 38; Figure 7.19)¹⁴⁰

The *Reburini* family has been associated with potters workshops in the Iberian Peninsula (Rubio Alija 1959: 99) and this particular epitaph likely dates to the 2nd century CE during the height of mining at Riotinto. Further, the initials L.I.R. have been commonly found on the underside of oil lamps in Riotinto, Cerro Muriano, and Aljustrel (Figure 7.20; Luzón Nogue 1967). For these reasons, the man in this grave has often been linked to the production of this particular type of lamp. Though this link certainly cannot be proven definitively (Cardim Ribeiro 2015), it is nevertheless likely that certain artisans came from disparate places to fill the needs of booming mining settlements: here

¹⁴⁰This reads: “D(is) M(anibus) S(acrum). L(ucius) Iulius Reb/urrinus Olisip(onensis) an(norum) XLI h(ic) s(itus) e(st). S(it) t(ibi) t(erra) l(evis). Fortunata con/tubernalis f(aciendum) c(uravit).” This can be translated as, “To the divine shades, Lucius Iulius Reburinus, from Olisipio (Lisbon), 41 years old, lies here, let the earth be light upon you, his companion Fortunata had this made.” This piece came from the area of La Dehesa in Riotinto and is now stored at the Museo de Huelva. It measures 35 x 41 x 2.5 cm.

Reburrinus may have relocated from Olisipo to take advantage of the particular economic opportunity provided by the large silver and copper mines at Riotinto.

Another key subsidiary industry for mining was carpentry. Many elements of underground mining required wood, especially infrastructure for movement through the spaces including shoring and stairs, as well as mechanical devices for water-lifting and transporting minerals and stones. Additionally, wood was required for burning in both firesetting and smelting. Various kinds of wood were harvested from surrounding areas—at São Domingos wooden elements were made of oak, whereas wooden pieces collected at Riotinto and around Huelva include walnut and pine buckets, fir rods, and other elements of cork (Delgado Domínguez & Pérez Macías 2014: 400–401). Although little is known about the organization of forestry and carpentry, there is no doubt that the requirements of mining would have created a constant need for precisely-made materials drawn from the local landscapes. Further, the need for wood as fuel—either burned directly or turned into charcoal for use in furnaces—made necessary other subsidiary industries involving wood including the production of charcoal.

Other necessary materials including baskets and clothing were made from esparto grass, leather, and fabric. The tombstone of Quintus Artulus (Figure 3.1) depicts the young boy wearing a fabric miners' tunic. Another piece of iconography that sheds light on miners' clothing is the Palazuelos Relief (Figure 7.21). This is a small piece of sandstone carved in relief, which was found in 1875 in Palazuelos in the Linares mining district in the Sierra Morena (Domergue 1987: 276–277). Supposedly, at its time of discovery it was “being used by an old woman engaged in scrubbing linen upon it” (Palmer 1927: 327). The stone depicts a group of men who appear to be wearing tunics

and aprons, possibly made of leather. The larger man has often been described as the overseer of a group of miners, possibly slaves but potentially freedmen or paid laborers. Sandals and protective headwear were commonly made of esparto grass (Figure 3.2, Figure 7.22). Although these objects were for use in Roman-era mines, there was a pre-existing tradition in Iberia of making baskets and sandals from esparto grass. While this material does not preserve well, intricate basketry has been recovered from La Cueva de los Murciélagos (Albuñol, Granada) dating to the Middle Neolithic, which is now on display at the Museo Arqueológico Nacional in Madrid. Because of the availability of esparto in southern Iberia, it is probable that the material was used continuously for locally-produced and used crafts, and that such production could be tailored to the needs of miners.

It is clear then, that the success of mining depended directly on subsidiary industries from the production and repair of metal tools, to the manufacture of oil lamps, to carpentry, to weaving. In the previous chapter, I discussed the ways that productive activities within mining settlements and households reinforced the connection of people who were not actively involved in mining to the overall mining community. Artisans of these crafts ensured that miners' were clothed, that tools were available, and that mines remained safe through illumination, wooden shoring, and the use of mechanical water lifting devices. Further, the production of some kinds of tools and devices required interaction across crafts, as many iron tools required wooden handles and wooden water lifting devices likewise had metal elements. These interactions are visible in the material record of the technologies used in the mines themselves, but also in the archaeology and epigraphy of the mining settlements discussed in the previous chapter. For instance,

evidence from Cerro del Moro and Corta del Lago indicated that weaving was taking place within these settlements. At La Loba, miners brought their tools home for storage, maintenance, and repair. At Vipasca, epigraphic evidence even suggests that the imperial government played an active role in ensuring that various subsidiary activities were available within that particular mining settlement, and one of these was fulling—perhaps associated with the production and repair of miners’ clothing or for components of tools such as bucket lining. By necessity miners interacted with those specializing in these crafts, and artisans interacted with those skilled in other kinds of industries in order to produce the tools and materials required for mining.

Discussion: Labor, Technologies, and Communities of Practice

Through this discussion of the *chaîne opératoire* of mining, it has become possible to imagine the many ways that underground miners, specialized metallurgists, engineers, administrators, and craftspeople were brought into interaction with one another, with their landscapes, and with the products of their labors. The requirements of extracting and processing metal brought laborers of all kinds into contact with each other at each stage of the process from prospection and discovery, to extraction, to transport, to processing. Interactions that happened in the process of mining, I argue, were a unique and essential part of the lived experience of laboring in mining communities. In short, the physical practices involved in mining technologies contributed to the social construction of mining communities.

The concept of “communities of practice,” which asserts that common practices and traditions (*habitus*) contribute to the formation of communities (Wenger 1998; Lave & Wenger 1991), is a useful way to frame these interactions. While each region of

southern Iberia under consideration had a long tradition of mining in the Bronze and Iron Ages, the scale of production after Roman conquest was significantly increased in ways that required a mix of innovative solutions to technological practice alongside the persistence of local traditions. This necessitated cooperation across groups with varying knowledge bases, skill sets, and experiences who lived in mining landscapes. On the one hand, knowledge could be locally-specific, held by indigenous populations and related to transportation routes and the distribution of ore, fuel, water, and other resources. On the other hand, the borrowing of Hellenistic tools and machinery demonstrates the presence of people with practical knowledge derived from eastern Mediterranean scientific traditions. Further, other engineering feats including the construction of roads and aqueducts as well as surveying required specialized knowledge and training that was probably the domain of the Roman army and/or specialized engineers. It is just this innovative combination of knowledge and skillsets that made large-scale mining possible in this imperial context. While the balance of power was inevitably unequal among those laboring in mining landscapes, it is important to acknowledge that each cross-section the labor pool brought essential knowledge, skill, and manpower to mining operations. Further, each of these groups could exercise a degree of agency in the ways they chose to enact whichever practice or role they were responsible for in the mining process. Closer attention to interactions and practices involved in mining technologies at a site-specific level could reveal even more compelling instances of agency, compliance, and innovation in daily technological practices.

In addition, subsidiary industries brought people into interaction with a variety of materials, and brought miners into constant contact with artisans and producers of these

material goods, machines, and tools. These material and social interconnections—or crossovers—were essential to the formation and reaffirmation of mining communities. As

Dobres points out:

Crossovers matter to understanding ancient technologies and craft systems, whether the crossovers are between different types of raw materials applied to the production of a single end product, between tools of the trade applied across craft traditions, between different *chaînes opératoires*, or between different types of objects made using similar *chaînes opératoires* (2014: 200).

These productive activities and interconnections were not peripheral to the practice of mining, but in fact essential to the *chaîne opératoire* of mining described above, which required constant interaction with and intervention of those practicing subsidiary productive activities. It is therefore essential not to marginalize the importance of other industries practiced in mining districts from studies of the technological practices employed in the mines. Activities in the home and the workshop alongside those that happened underground in mines contributed to the transfer of technological knowledge, the exchange of material goods, and the social connections that were an essential element of community formation at these locales.

A final point to keep in mind is that the lived experience of working in mining landscapes in southern Iberia was something shared by everyone, regardless of their origin, status, gender, or age. In some ways, struggling to imagine the tasks that people were assigned in mining districts misses the point. The reality is that mining landscapes in the Roman period in southern Iberia were the unique creations of those who lived and worked in these continually changing environments. Speaking of the American West, Moynihan and colleagues have written: “the distinctively new environment of the West actually required an adaptation to primitive physical conditions from which no one escaped” (1990: xii). The challenges of laboring in mines and related industries, I argue,

was part of the shared experience of life in mining districts; these challenges contributed to the formation of communal solidarity across normal social boundaries. This does not mean, however, that power was equalized among laborers of inherently unequal status. The difficult life of laboring in dark underground passages for little pay or as a slave was a much more brutal one than the life of army personnel who were involved in surveying or dividing mining concessions. Likewise, the experiences of imperial officials and especially of mining procurators were almost certainly associated with a higher standard of living that came with imperial authority. Thus, the shared experiences of these groups of various status could certainly cross-cut and undermine (yet coexist) with that of the mining community broadly conceptualized in ways that were compatible with the emerging Roman social order in these mining districts.

Conclusions

In this chapter, I aimed to reorient studies of the technologies and labors of mining and subsidiary industries in Hispania. I argued that the practice of technology is implicitly social, and that studies of labor and technology must go hand in hand in order to more clearly understand the formation of communities of practice surrounding mining. Further, the interactions that take place in the context of mining labor contribute to the formation of mining communities in ways that set them apart from other kinds of communities. The labor pool—comprised of people of varying status (free, slave, freed), origin (indigenous, Italian immigrants, Iberian immigrants), gender (men and women), and age—varied over time and space in the centuries under discussion. I argued, however, that the needs of metal extraction, processing, and subsidiary industries brought these people into interaction in ways that cross cut social boundaries. Still, the

increasingly tight imperial control over mining practices from the Republic through the early empire served to reaffirm emerging social inequalities among those involved in mining labor in other ways, which can be observed in the allocation of difficult and dangerous tasks to those of lower status and more profitable/desirable tasks to skilled laborers, the army, and Roman imperial officials.

Together, the past three chapters have served to illuminate the interactions of people, landscapes, and materials in mining districts, interactions I argue lead to the formation, transformation, and maintenance of communities in these locales in southern Iberia. I emphasized the importance of examining such interactions at multiple scales, including the broad scale of landscape, the medium scale of settlements, and the small scale of households. Labor organization and technological practice likewise serve to illustrate the significance of the interactions involved directly in the practice of mining in the social construction of communities. While these chapters have highlighted processes of community formation within Iberia, the final substantive chapter turns finally to an analysis of the economic significance of mining communities at local, regional, and imperial scales. It shows impact of empire on local and regional economies within the Iberian Peninsula, but also the economic impact of the work of mining communities in the Roman imperial economy.



Figure 7.1 Roman shaft excavated into the gossan layer in the area of Aljustrel (Vipasca), now filled, that appears to have been abandoned after it was dug for prospection or limited extractive activity because it does was never enlarged or connected with galleries. Discovered while building a road connecting the neighborhood of Santa Barbara with the mine of Algarés (Aljustrel, Portugal) (Martins 2008: 12) (author photo).



Figure 7.2 Wooden stairway in oak for climbing in and out of a mining shaft from the mine of Algarés in Aljustrel, Portugal. 1st century CE. Scale is approximate. (author photo, Museu Geológico, Lisbon).

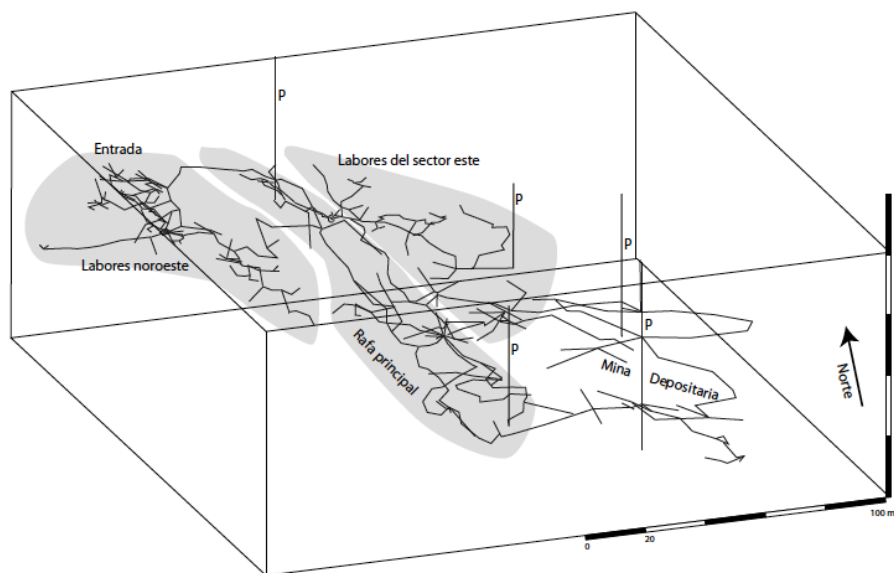


Figure 7.3 Three dimensional projection of underground mining works at La Rambla del Abenque in the Sierra de Cartagena in southeast Spain. These are the best archaeologically documented underground mines in the region (Figure 3 in Antolinos Marín et al. 2010).



Figure 7.4 Roman-era passages visible in the rockface of abandoned 19th century workings at the Corta de São João do Deserto, Aljustrel (Vipasca, Portugal). The larger shaft at ground level is medieval or modern, however (author photo).



Figure 7.5 Roman gallery exposed in the edge of the opencast mine at São Domingos, Portugal that was operated by the Mason & Barry Company from 1854 to 1966 (author photo).



Figure 7.6 Array of Roman-era tools made of iron on display at the Museo Minero de Riotinto (author photo).



Figure 7.7 Mining hammers from prehistoric contexts in the Guadiana River valley on display at the Museo de Huelva (author photo).

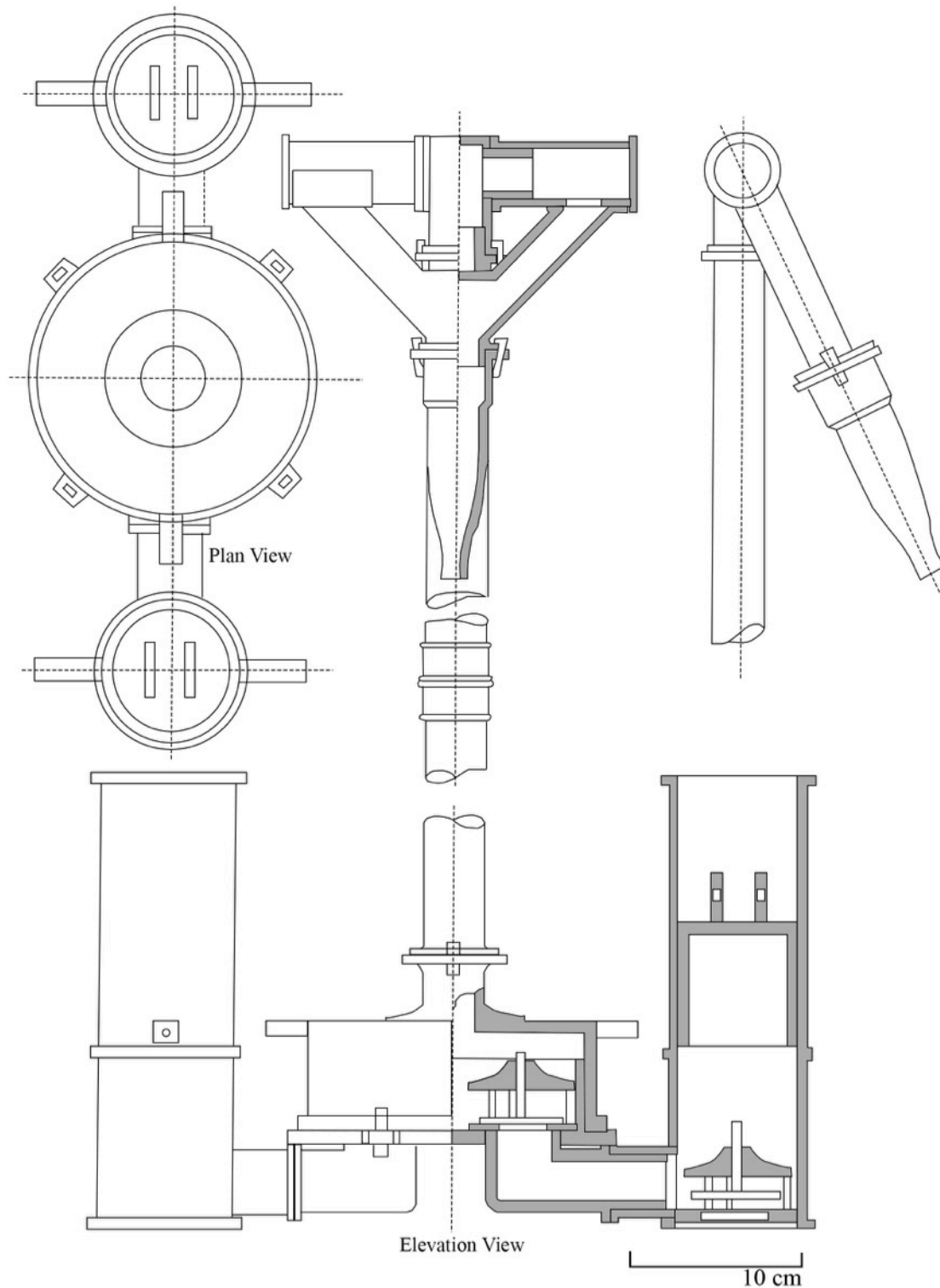


Figure 7.8 Schematic drawing of Ctestibian force pump based on the bronze pump uncovered at Sotiel Coronada and now on display in the Museo Arqueológico Nacional, Madrid (after Figure 35 in Domergue 1990: 548).



Figure 7.9 Bronze bucket from Riotinto, 1-2nd century CE (author photo, Museo Provincial de Huelva).



Figure 7.10 Oak bucket from Algarves mine, Aljustrel, Portugal (author photo, Museu Geológico, Lisbon).



Figure 7.11 Bronze rim for an esparto grass basket. External diameter c. 17 cm (author photo, Museo Provincial de Huelva).



Figure 7.12 Image of the central wheel for attaching radial rods from Riotinto (author photo, Museo Provincial de Huelva)

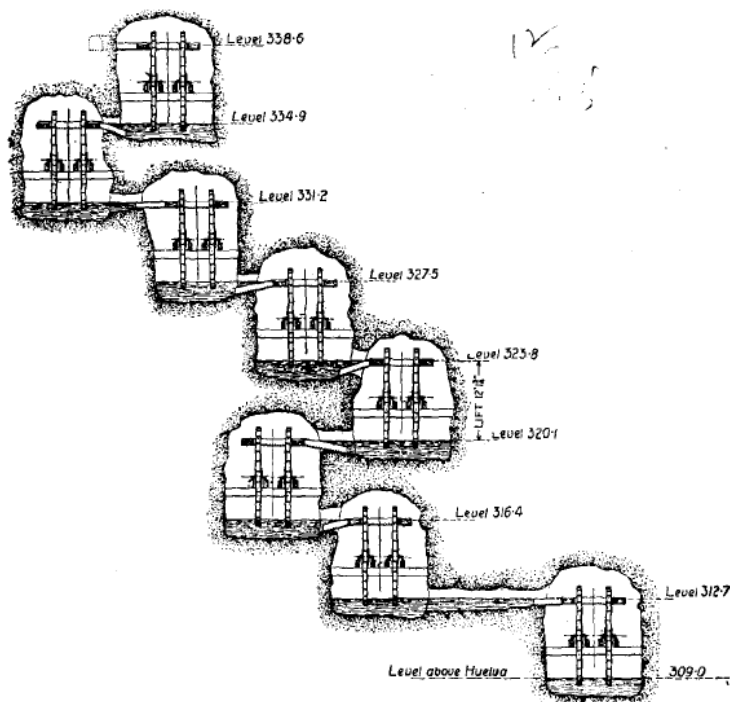


Figure 7.13 Section drawing of the eight pairs of water wheels uncovered at Riotinto from 1919 to 1921 (Palmer 1927, Figure 74).



Figure 7.14 Discovery of a water wheel in the south lode of Riotinto in opencast mining, 1910 (A-3/277 AFRT).

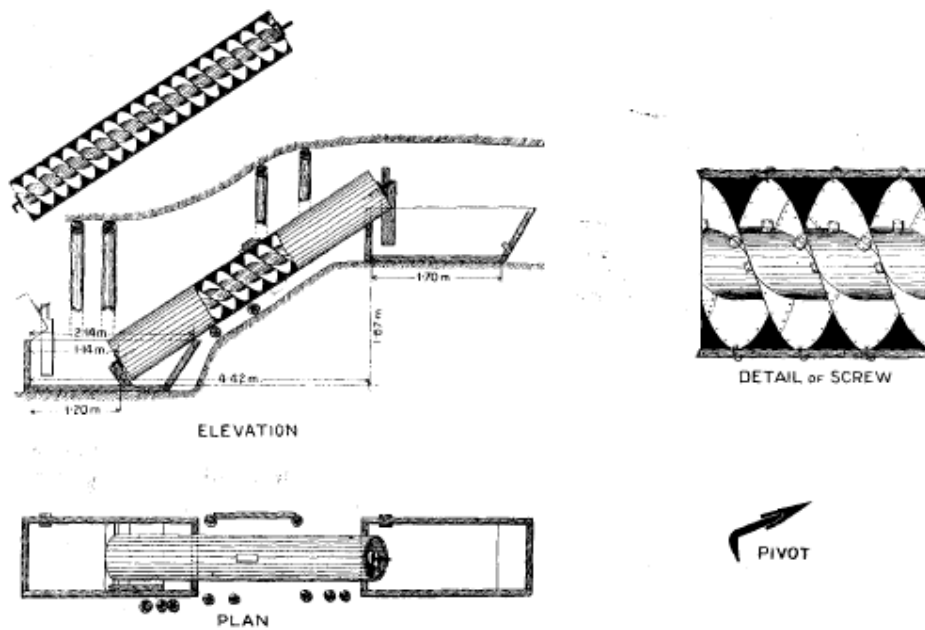


Figure 7.15 Diagram of an Archimedean Screw (water lifter) (Palmer 1927, Figure 87).



Figure 7.16 Niche for a lamp in the wall of a 1st century CE mine at Três Minas, Portugal (author photo).



Figure 7.17 Esparto-grass basket from Algarés, Aljustrel for lifting ore and other material out of mining shafts (author photo, Museu Geológico, Lisbon).



Figure 7.18 Image of a whetstone for sharpening iron tools made of sandstone from the area of Huelva. Actual size c. 20 cm long (author photo, Museo Provincial de Huelva).



Figure 7.19 Epitaph of Lucius Iulius Reburinus, a possible potter living at Riotinto who migrated from Olisipio, lived to be 41 years old, and received this dedicatory inscription from Fortunata, a slave woman with whom he lived in contubernium. This object is from La Dehesa cemetery in Riotinto. White marble (35 x 41 x 2.5 cm), 2nd century CE. Dimensions 35 cm x 41 cm x 2.5 cm (author photo, Museo de Huelva).



Figure 7.20 Top view of oil lamp (left) from 1st-2nd century CE alongside an oil lamp (right) of the same form inscribed on the bottom with the maker's mark "L.I.R." of the 2nd century CE. Both lamps c. 13 cm long (Luzón Nogue 1967: 145) (author photo, Museo Provincia de Huelva).



Figure 7.21 Palazuelos Relief, depicting a group of miners from Palazuelos in south-central Iberia. This relief was found in 1875 in Palazuelos and was being used by a woman to scrub linens, so has no archaeological context. This has been interpreted as a foreman (left) carrying a truncheon in one hand and a jar for oil in the other, and a group of workmen carrying a pick (center-left) and an oil lamp (center-right) (Palmer 1927: 327–328) (Bergbau Museum, Bochum).



Figure 7.22 Miner's hat made of esparto grass from the mine of Algares, Aljustrel, Portugal (Vipasca) (author photo, Museu Geológico, Lisbon).

CHAPTER 8 BETWEEN LOCAL AND IMPERIAL ECONOMIES

Introduction

Mining, perhaps more than any other ancient industry can serve to show “the extent to which [the Roman economy] was both stimulated and distorted by imperial imperatives” (Mattingly & J. Salmon 2001: 6). That is to say, mining in Roman Iberia only grew to the vast scale it did because of the increased demands of the Mediterranean-wide market and the specific requirements of the Roman imperial apparatus. Mining in each area of southern Iberia under consideration pre-dated Roman-era exploitation, but was practiced on a smaller scale in accordance with local and regional demand (and indeed on an increasing scale in response to Phoenician and Punic trading in the region from the 8th century onwards). There is a clear correlation between the dramatic rise in the scale of mining after Roman conquest of the Iberian Peninsula at the end of the 3rd century BCE, the establishment of settlements dedicated or at least directed towards supporting the growing mining industry in the various metal-rich regions southern Iberia, and the growing demand of the Roman economy for metals.

In this chapter, I look at how this increase in the scale of mining impacted and transformed economies at the local and regional levels, and the specific ways in which the metal extracted from Iberia fed the imperial economy outside of Hispania. As with my analyses of mining landscapes, settlements and houses, and labor organization and technology, my perspective on Roman economies is embedded within a larger analysis of

the interactions in and around mining districts that led to the formation of communities. Here, I ask how everyday economic practices at the local, regional, and imperial scales led to the formation of locally situated communities with Mediterranean-wide economic reach. The economy was deeply imbedded in social life in the ancient world just as it is today, and—as a result of this—I have already discussed economic interactions at least peripherally in the previous three chapters. This includes, for instance, how new roads in the landscape facilitated trade (Chapter 5), the kinds of foreign imports and local products that were available in mining settlements (Chapter 6), and the importance of subsidiary activities and labor that supported the mining industry in southern Iberia (Chapter 7). I return to data already presented alongside additional material traces of economic interactions and bring it to bear on a discussion of how the economic impacts of mining contributed to the formation of communities.

I turn first to a general overview of work on the Roman economy, and the ways that this analysis of mining fits into emerging bodies of scholarship on multi-scalar and material-based approaches to the economy. Then, I consider data from southeast Spain, the Sierra Morena, and the Iberian Pyrite Belt at the local and regional scale, and I discuss the many ways that the work of mining communities in Iberia was fundamental to the economic success of the Roman Empire. This elucidates some of the ways that mining communities were both connected to imperial economic networks, but were also constrained by Roman directives and institutions. Ultimately, it becomes clear that the connection between mining in Iberia, the formation of the Roman Empire, and the imperial economy were impacted by and in turn impacted the formation of communities in mining districts. Specifically, the imperial economy was dependent upon local and

regional economic activity performed by mining communities that sustained large-scale mining. Further, being incorporated into the imperial economic sphere brought about material and social connections that both connected and constrained economic activities in mining communities.

Situating Mining in Roman Economies

Scholarship on the Roman economy has a long, and often fraught history in Roman history and archaeology. While it is impossible to discuss this whole history, I will situate my work within larger and emerging bodies of scholarship on the Roman economy before turning to material evidence from southern Iberia.

Much of the scholarship over the past 40 years has surrounded debates about the nature of the economy, many of which stem from the seminal work of Moses Finley, *The Ancient Economy* (1999[1973]). Finley, a gifted scholar of Roman law and ancient history, studied economic history under Karl Polanyi at Columbia, also an influential figure of the 20th century. Taking a stand against the “modernist” perspective of prominent economic historian Mikhail Rostovtzeff and others, who believed there were few qualitative differences between the economies of the ancient and modern world, Finley argued that the ancient economy was fundamentally different from its modern counterpart. In his seminal work, Finley made a series of arguments for this “primitivist” view. For instance, he claimed that the Greeks and Romans lacked the major technological developments that drive economic systems,¹⁴¹ that there were few profits or

¹⁴¹ One offshoot of this debate, and something that is quite relevant to the economies surrounding mining is the question of technological progress and the ancient economy (see: Schneider 2008). Finley’s view that technology stagnated in the Greek and Roman world seems to have been colored by a misunderstanding or ignorance of archaeological evidence. Writing on mining, for instance, he claimed: “The few tools needed

surplus that might enable the growth of industries, and that supply systems primarily supplied local and regional trade around urban centers (rather than long-distance trade). Further, Finley supported a “substantivist” view of the ancient economy: economy and culture were inextricably intertwined, rather than the “formalist” idea that the economy exists outside of and independent from other aspects of culture and society. As Morris has explained:

Social relationships, not abstract laws of supply and demand, fixed values; and these relationships made the rational choices of the maximizing isolated actor of economic theory irrelevant in most societies (Morris 1999: xii).

These debates have been recorded in more detail in many other works (Morris 1999; Scheidel & von Reden 2002; Mattingly & J. Salmon 2001; Scheidel 2012a), and it is not my intention to recount the whole history of scholarship here. Suffice it to say that many of the discussions surrounding the ancient economy have been hindered by lack of integration between ancient written and material evidence, and that the unproductive arguments about the substantivist/formalist and primitivist/modernist dichotomies do not contribute in a meaningful way to the discussion at hand. Here, I highlight approaches that are heuristically useful for understanding the role of mining in Roman economies.

The Material Turn for the Ancient Economy

In the decades since the 1980s, studies of the ancient economy have benefitted from the discovery, consolidation, and publication of an enormous quantity of

were already developed long before the Greeks, and little improvement was possible until the invention of explosives” (Finley 1965: 30). He drew from evidence from Laurion (Greece) and “the western and northern provinces of the Roman Empire” but in his discussion he underestimates the variety of technologies used, the innovation (e.g., conversion of Ctestibian force pumps from wood to metal in mines) and standardization (e.g., production of iron and wooden mining tools rather than single use rock hammers), and the scale (e.g., not just the occasional water pump, but dozens in single mines). Notable critiques to Finley’s perspectives on technology include a Greene’s rebuttal article written 35 years later (2000) and Wilson’s work on water power and the ancient economy (2009).

archaeological and epigraphic data. Kevin Greene first published *The Archaeology of the Roman Economy*—which emphasized the potential contributions of archaeology to historical debates in the ancient economy—in 1986 (Greene 1986), and scholarship in this vein has become widespread, especially in the United Kingdom since that time. This recent work demonstrates that the scale and complexity of ancient trade operated on levels far beyond what Finley and others operating on the primitivist model deemed possible from their view based primarily in written evidence (Scheidel & von Reden 2002: 3; Zuiderhoek 2015: 9). Further, close analysis of archaeological evidence has allowed for examinations of the Roman economy to move beyond a focus on top-down processes, urban centers, and elite activities. This has had positive impacts on both investigations of the rural economy and economic organization of industries outside of agriculture, including mining.

Archaeological surveys of rural landscapes throughout the Mediterranean have expanded the evidence we have for non-urban economic activity, and catalyzed for more detailed studies of agricultural and subsistence economies (Bowman & Wilson 2013; Leveau 2008: 653–658; Greene 1986: 98–141). Recent work drawing from new survey evidence—as well as integration of archaeological data with documentary evidence—has examined agricultural economies in the Roman Empire broadly speaking (Bowman & Wilson 2013), in specific environmental conditions such as the Egypt’s Mendesian nome in the Nile Delta (Blouin 2014), and in relationship to legal developments that can be traced through epigraphic, papyrological, and other written evidence (Kehoe 2007), for instance.

Another positive development has been a new and sustained interest in economies outside of the realm of agriculture, and a burgeoning number of comparative studies of different industries as well as specific studies of singular, non-agricultural industries. These include, for instance, the volume *Economies Beyond Agriculture in the Classical World* (Mattingly & D. Salmon 2001), an examination of multiple industries including quarrying, monumental construction, the brick economy, and textile production. A more recent volume, *Ownership and Exploitation of Land and Natural Resources in the Roman World* (Erdkamp et al. 2015), takes an integrated perspective, considering connectivity between the exploitation of various kinds of natural resources in multiple categories of land (hunting, gathering, grazing, logging, farming, mining, quarrying, and exploiting clay, sand, chalk, etc.). Although the volume certainly includes sections on agricultural production, these activities are discussed in the context of many significant and overlapping ways that people made use of natural resources in the Roman past. Other industry-specific volumes on the organizational and economic aspects of quarrying (Russell 2009; Russell 2013; Sekedat 2012); the exploitation of marine resources (Marzano 2013); fulling (Flohr 2013); and, of course, mining (Hirt 2010) have added much to debates about the ancient economy through discussions that are grounded in archaeological, epigraphic, and archaeometric evidence.

All of these developments are positive from the perspective of integrating historical and archaeological research from multidisciplinary perspectives in order to shed light on the nature and organization of the ancient economy. However, it is important to acknowledge that much of the work on the archaeology of the Roman economy has been driven by two research hubs, which has contributed to the relatively

insular nature of intellectual debates on these topics. These include the Oxford Roman Economy Project (OREP) and Stanford University. Certainly, other scholars have been major players in economic studies over the past decades, including David Mattingly and W.V. Harris, among others (e.g., Harris 1993; Mattingly 2007; Harris 2011).

First, the Oxford Roman Economy Project, organized by Andrew Wilson and Alan Bowman, has been a driving force in many archaeological studies of the Roman economy in the past 10 years. Through this project, databases and bibliographies are compiled and put online for open access. These include specific topics such as quarries, mines, shipwrecks, coin hoards, olive oil and wine presses, and water technologies. OREP also organizes regular conferences on economic topics, which are published in its series alongside monographs, many of which are cited in this chapter. These volumes, which focus on the Mediterranean world under Roman rule between 100 BCE to 350 CE, provide “carefully quantified archaeological and documentary data [that are] integrated to help ancient historians, economic historians, and archaeologists think about economic behavior collectively rather than from separate perspectives” (Bowman & Wilson 2015). Second, a great deal of research has come from scholars based in the Department of Classics at Stanford University, including Walter Scheidel, Ian Morris, and Richard Saller. These scholars have been involved in the writing and organization of important synthetic volumes and handbooks that have also driven perceptions of the ancient economy in the Anglophone world (Scheidel & von Redden 2002; Scheidel 2012b; Scheidel et al. 2008). While these two vast bodies of scholarship produced a lot of valuable literature, studies of the Roman economy would also benefit in the future from the inclusion of more voices in mainstream debates. At the very least, bringing to bear

more comprehensive analyses of regional and local archaeological data on these larger bodies of scholarship will only be beneficial, which is precisely what I have aimed to do in this dissertation.

New Institutional Economics

In addition to the fresh debates brought about by this material turn in archaeological and historical studies of the ancient economy are new perspectives from economic historians working within the framework of New Institutional Economics (NIE). This body of scholarship, built on the work of Douglass North, Ronald Coase, Oliver Williamson, and others, grew out of a dissatisfaction with the discrepancies between models of economic behavior and real-world outcomes (Williamson 2000; Daunton 2010; North 1993; Coase 1998). These scholars suggested that institutions within a given society account for differences in efficiency and growth of economies, and are not always factored in to economic models. Societal institutions are able to lower the transaction cost of economic activity in turn stimulate economic growth. North specifically defined institutions as “the rules of the game in a society or, more formally...the humanly devised constraints that shape human interaction” (North 1990: 3). Such institutions can take the form of formal constraints such as tax law, or informal constraints such as conventions dictated by shared systems of value or worldviews (Zuiderhoek 2015: 11–12).

NIE has been adopted with some success by a number of scholars working on Greek and Roman economies in recent years, including the various entries in the volume on ownership and exploitation of land discussed above as well as the dense and

comprehensive Cambridge Economic History of the Greco-Roman World (Erdkamp et al. 2015; Scheidel et al. 2008). Write Frier and Kehoe in the latter volume:

The landscape of the Greek and Roman economies (as of all other economies both past and present) is invariably configured, not just of individuals, but also of institutions, the organized activity of production and commerce. If population and technology established the basic limits within which the economies of the Greek and Roman worlds could develop, it also seems clear that law and other institutions surrounding the economy represented an exogenous factor affecting productivity in the Greek and Roman worlds (2008: 113).

In many ways, approaches to modern and ancient economies using NIE are necessarily divergent, owing to the quality and quantity of the data available. However, NIE can still be heuristically useful in that it provides scholars of the ancient economy a new way to consider the multifaceted aspects of the ancient economy outside of the old debates. Significantly, it provides an opportunity for a reconsideration of aspects of the ancient economy that “initially strike us as bizarre or even counterproductive” (Frier & Kehoe 2008: 144), which can be attributed to specificities of Roman or other cultural institutions. Below I outline the ways that NIE, combined with a multi-scalar examination of economies is useful for understanding the structures and constraints of Roman economies surrounding mining.

A Multi-Scalar, Practice Based Approach to the Ancient Economy

The underlying structure of this dissertation is grounded in a consideration of evidence for Roman mining in Iberia from a multi-scalar perspective. I have argued, in the context of landscapes, settlements and households, and labor organization and technological practice, that habitual practices and interactions between people, things, and landscapes contributed to the formation of mining communities. In keeping with this line of thought, but drawing on current debates on the Roman economy, I believe the

impacts of mining on the economy can only be understood when considered from multiple scales of analysis. Further, it is important to look not just at *what* economic interactions happened, but 1) *how* such interactions in the context of mining were distinct from those in other economic sectors and 2) *how* the particularities of these interactions driven by economic needs of mining could contribute to the formation and maintenance of mining communities.

It is first important to address the multi-scalar nature of the ancient economy. In a great deal of research on the ancient world, the question of the economy is mostly addressed at a large-scale and cerebral level, divorced from social questions about how individual people or groups experienced the economic sphere. Graphs about the GDP, population estimates, and economic growth over time do not reveal very much about local specificities or human experiences under the Roman Empire.¹⁴² In recent decades, however there has been a call to recognize the multi-scalar nature of economic activity across the Greek and Roman world and beyond. For instance, Paul Cartledge questioned “whether Athens and Sparta themselves can be said to have had a single economy or, rather, to have comprehended a plurality of micro-economies” (Cartledge 2002: 13). Recent edited volumes on the economies of the Hellenistic world have also employed the plural “economies” to discuss economic interactions from the 3rd to the 1st century BCE

¹⁴² On quantifying the Roman economy: I remain skeptical of scholarly attempts to quantify the scale of the Roman Economy as well as those focused on demography. These large-scale, quantitative analyses are built upon datasets that are often incomplete and incomparable across regional divides, which I believe produces flawed—or at best dubious—hypothetical values. I have purposefully not engaged in questions of just how many people were involved, just how big mines were, or just how much material came out of them. The point better made here is that mines *did* involve enough people, grew to be large enough in the landscapes, and produced enough metal that we find signs of its scale across many kinds of evidence. Ancient authors wrote about it. Archaeological landscapes bear the scars of ancient mining. Roman coins, ingots, pigments, and innumerable utilitarian and luxury objects from all over the Mediterranean attest to the reach and large scale of mining. For the questions I am asking, this is enough.

(Archibald et al. 2011; Archibald et al. 2001; Archibald et al. 2005). Increasingly, scholars of the Greek and Roman Mediterranean are straying from questions about the nature of a singular ancient economy because it is now recognized that there were a diversity of culturally specific practices and that such practices impacted people and institutions at a variety of scales from household to Mediterranean-wide levels (Storey 2004: 105). I wholeheartedly concur, which is why this chapter is organized around a multi-scalar approach to economic activities.

Secondly, I advocate not just looking at the structural aspects of the ancient economy, but also the ways that the actions and practices of people and their place or occupation specific relationships conditioned the kinds of economic interactions that were possible or probable. This perspective is in line with my wider practice-based perspective to understand communities that is rooted in the work of Bourdieu, but is also complementary to a discussion in the terms of the New Institutional Economics approach. Here, institutions (e.g, Roman tax systems, markets, economic law) function as the structuring structures of the economic interactions surrounding mining. But, importantly, “institutions”—to borrow the prevailing term—include much more than the administrative framework of the Roman Empire. As I addressed above, institutions can also encompass value systems, and worldviews, among other informal structures. In the 1st millennium BCE through 2nd century in Iberia, institutions and worldviews surrounding metals and other commodities were changing.¹⁴³ While it is not always easy to trace these changes, it is important to keep in mind the ways that local systems of

¹⁴³ Michael Dietler has outlined the ways that value systems surrounding alcohol changed in southern France during the Iron Age with Greek colonial influence. Specifically, the introduction of wine—brought in from elsewhere and easily preserved for long durations of time—disrupted local practices of communal consumption of beer to cement social ties and gather groups for large labor projects (Dietler 1990).

knowledge (indeed, local institutions) collided with Roman institutions, and diverse groups of peoples sought out solutions to maintain efficient production—which could include a number of locally-specific technological and labor practices combined with, or supplanted by, the implementation of new Roman practices. Aside from these human, institutionally created constraints to the economies of mining, landscapes also functioned as constraining structures in mining. The natural distribution of ores had as much to do with settlement patterns and land use for large-scale mining ventures in the Roman world as did either Roman institutions or local practices. It is with these foundational ideas about the economy in mind that I turn to a discussion of the evidence for economic interactions surrounding mining at the local, regional, and imperial levels.

Local and Regional Economies in Mining Districts

This dissertation has focused on mining districts that were incorporated—by virtue of the desirable metals they contained—into to the Roman imperial economy,¹⁴⁴ including those in the Republican period that were targeted and exploited at a large-scale soon after conquest. However, the previous three chapters have illuminated many of the ways that mining was significant not only to the imperial economy, but also to local and regional economies. Mining stimulated connections between these economies at the local, regional, and imperial levels, but it also moderated and restricted them in ways that are

¹⁴⁴ A great deal of mining in the Roman Empire—especially that targeting metal for tools and other utilitarian objects—was intended for local or regional consumption. Here, I have deliberately chosen case studies for this dissertation that operated at a large scale following Roman conquest, and provided ores that were distributed and outside of the Iberian Peninsula. In the Imperial period, many mines in southern Iberia were also administered as *metalla* directly by the imperial fiscus. In this respect, mining differs from studies of Roman quarrying, in which extraction was overwhelmingly intended to supply local and regional construction projects rather than far off markets (Russell 2013: 5). Clear exceptions to this are the quarries of the Eastern Desert in Egypt, including Mons Claudianus and Mons Porphyrites, which were administered by and supplied stone for imperial construction projects outside of Egypt (Maxfield 2001).

particular to the industry. In the following pages, I explore these seemingly contradictory statements. Ultimately, I argue that interactions that took place in the context of economic exchange, just as interactions in the context of domestic life and industrial labor, stimulated and reinforced the creation of mining communities in southern Iberia and identities associated with the practices and processes of mining.

Connected Economies and Subsidiary Industries Subsidiary Mining-Related Industries

In Chapter 7, I discussed many of the necessary subsidiary industries that supported mining (see page 353). The production of tools used in underground mining required the work of ironsmiths, basket makers, loggers, carpenters, potters, and fullers, among other professions. Further, many people involved in these various industries had to cooperate or collaborate across crafts in order to make the complex equipment necessary for deep-vein underground mining. Indeed, water wheels, Archimedean screws, and even handheld picks were comprised of wooden and metal elements that must have been produced by different craftspeople in cooperation with one another. Unfortunately, it is difficult to determine with any certainty how the economies surrounding these industries functioned, and there was likely a great variety in how the markets and local production worked across time and space in southern Iberia as well as variation within each subsidiary industry. What is important in this context, however, is that an examination of subsidiary industries serves to show many of the ways that local and regional economies interacted with imperial economies.

Domestic production and household industry are increasingly recognized as key components to ancient economies. Katherine Harrington has recently argued for the importance of household industry and domestic production in the overall economic

success of ancient Greece in the Classical and Hellenistic period (2016). Outside of classical archaeology, D'Altroy and Hastorf's work on the relationship of the Inca Empire and the domestic economy in the 15th century Andes serves as a compelling example of the ways that small-scale economies are intertwined with large-scale political economies (D'Altroy & Hastorf 2001). Other studies on the importance of household productive activities to the wider economy in various cultural contexts are becoming more widespread.

Though there is a dearth of well-excavated household contexts, the same can be assumed of domestic production in mining settlements in southern Iberia. At Riotinto, the settlements of El Cerro del Moro and Corta del Lago both contained many of loom weights, indicating that weaving was an activity that took place in the house. Likewise, at La Loba, the large quantity of tools in the smaller houses seems to indicate that—even if tools were purchased or supplied from regional markets—they were brought home for maintenance on a regular basis. Economic activities such as these at the domestic level, then, were essential to day-to-day life in mining districts and were necessary to support the large-scale mining that produced goods for the imperial economy. The habitual economic interactions required by various people living in mining districts to produce and acquire tools used in mining must have helped to sustain and reinforce social ties between miners, craftspeople, and producers who were all a part of mining communities. It is also important to consider that productive activities at the household or workshop level did not necessarily go unregulated, at least in principle. Below, I explore other economies not directly related to mining, and various imperial regulations and institutions within which local and regional economic activities of all kinds operated.

Food Supply and Other Industries

In addition to subsidiary production and economic activities directly connected with mining are the many kinds of production that were only indirectly connected with the industry, but were nevertheless important to sustaining mining communities. These included the production of foodstuffs through agricultural production, the exploitation of marine resources, and pastoralism, among other kinds of local and regional economies (Ponsich 1998). In northwest Iberia, I discussed some of the subsistence strategies employed in and around Las Médulas to support the mining industry. These included, for instance, diversifying crops to decrease risk in order to feed the population year round. Additionally, chestnut trees were cultivated, which were native to the region but never formally cultivated in the Iron Age (see page 154). In southern Iberia, the dearth of excavated domestic contexts where archaeobotanical or faunal studies have been published makes it difficult to trace similar patterns. However, it is logical to assume that land in and around mines must have been given over to some of these activities for the production of food to supply the mining population.

Mining and agriculture were fundamentally intertwined. This has been demonstrated in other imperial *metalla*, including the copper mining district of Wadi Faynan (Jordan). In a recent study of the area, which was run as an imperial *metallum* beginning in the 2nd century CE, Hanna Friedman convincingly argued that the terraced agricultural fields along the floodplain of the wadi were substantially altered in the Late Roman period coinciding with the rise in industrial activity. While in the preceding Late Nabatean period, the fields had been divided and used by a series of farmsteads, they were transformed with interconnected feeder channels that were a part of a large

integrated system. The area of farmed land as well as the intensity of cultivation increased at the same time that the landscape was transformed into an imperial copper mine. While olives, grapes, and cereals were grown on the terraces, Friedman notes that these agricultural landscapes became increasingly impacted by pollution from nearby mining that is still detectable today. This probably decreased the overall productivity of the agricultural fields, as plants cannot produce as many seeds when they are exposed to heavy metal pollution. Despite the elevated levels of agricultural production, then, food also had to be imported from farther afield because of the high caloric demand of the mining community, which grew larger in size than other Roman communities living in the arid deserts of this area (Friedman 2013: 308–322).

While southern Iberia was rich in agricultural land and many of the environmental constraints seen in the case of Wadi Faynan do not apply here, evidence suggests that food was supplied to mining districts through a combination of agricultural and pastoral activities in the nearby landscapes when the specific environmental conditions allowed, and importation of goods from supra-local locations. The demand for certain products was at least partially driven by local tastes and consumption practices, though the overall trends in food supply networks in mining districts are not so different from that observed in other areas of southern Iberia.

In the absence of archaeobotanical studies, amphorae can serve as a proxy for the importation of certain kinds of food products, especially olive oil, wine, and fish products. In Chapter 6, I discussed changes in food supply sources and other imported products that are demonstrated by the material assemblages, including such amphorae (see page 288). It is clear that during the Republican period, mining communities had

access both to locally produced goods but also ceramics, olive oil, and wine from far-off places in Italy and elsewhere. The trade routes that brought these products in were the same ones through which metals were transported out of the region. Many of these changes, however, were not specific to the mining industry, but were happening throughout southern Iberia. For instance, in and around Cartagena, Roman conquest brought about a swift and large-scale change in many kinds of local production. Following soon after Roman conquest, Italian tableware—especially Campanian A black glaze ware—replaced local industries at many settlements. In addition, Italian wine amphorae are present in high proportions at many sites in the region (Murcia Muñoz et al. 2013: 126). Although there was more of a continuity of local products in settlements farther from the coast, these regions too had perhaps elevated access to foreign goods.

During the imperial period, the material assemblages at mining settlements and in the region in general demonstrate the importance of regional production centers for acquiring these foodstuffs, rather than Italian or North African centers. Indeed, Rome itself began to import products from Baetica to supply its population, as was the case with olive oil that contributed to the *annona*. The large hill of Monte Testaccio constructed of amphorae from southern Spain located in Rome attests to the scale of this activity (Blázquez Martínez & Remesal Rodríguez 1999; Remesal Rodríguez 1998). The material record of mining settlements in the Iberian Pyrite Belt at Riotinto show an increased access to goods from nearby production centers in Baetica and Lusitania. Significantly, the rise in regional migration to mining districts also took place in the early imperial period (Holleran 2016). Thus, this was a time when the movements of both people and

goods within the Iberia Peninsula were key to the economy of mining districts, which in turn sustained the Roman economy on an imperial level.

Circumscribed Mining Economies

Thus far, I have emphasized many of the ways that elevated economic activity increased connectivity between mining districts and other parts of Iberia and the Roman Empire. It is also key, however, to consider the ways that mining—and the Roman institutions involved specifically in the industry—restricted economic activities and circumscribed the kinds of economic interactions that were possible. As I argued in Chapter 6, mining settlements were at once well connected and insular. The organization of the mining industry changed over time and space in southern Iberia, which necessarily means that economic organization was not static. However, two trends and commonalities can be observed. First, the elaboration of a distinctive mining industry with particular needs created economic connections between mining districts, both in terms of labor supply and the supply of material goods in and out of these places. Second, the direct interest of Rome in mining districts caused economic activities in them—even those only peripherally linked to mining—to be increasingly regulated by imperial directives and Roman institutions.

Turning first to the connections between mining districts, it is possible to trace material connections that attest to the ways that mining districts were intertwined, not just in southern Iberia, but across the Iberian Peninsula. (I suspect, also, that other connections outside of Iberia would also be possible to detect in terms of labor and personnel supply, and this would be in interesting line of future research). One particularly compelling instance of a regional connection between southwest and

southeast Iberia has to do with the technology of production: it was necessary to use imported lead in the extraction of silver from jarosite ores, which were found in the Iberian Pyrite Belt. Because lead was not found in the region, it was imported from elsewhere, and this brought about regional trade connections between Roman mining districts in Iberia. Two lead ingots with the stamp “NOVA CARTAGO” were found in the slag heaps at Riotinto. These had been transported from southeast Iberia where they were produced for use in the silver smelting process, among other uses, and these particular ingots were somehow lost or discarded (Craddock 1995: 209; Butcher & Ponting 2014: 177). The distance between Riotinto and Cartagena is approximately 550 kilometers, so this was no small feat, though certainly ship cargos could have brought other products between these locales and to different port cities along the coast of southern Iberia. While these ingots were chance finds and the quantity and origin of lead used for silver smelting at Riotinto is not altogether clear,¹⁴⁵ they are an important material attestation to the ways that Roman mining districts in southern Iberia were connected through material networks of exchange. Further, specific material connections such as this between the mining districts in southeast and southwest Iberia are not attested; indeed, the administrative framework of the Roman Empire and its administrative structure no doubt facilitated these material connections and social connections that must have accompanied them.

Aside from the trade of lead, the exchange of other products between mining districts may have also increased material—and by extension—social connections linked

¹⁴⁵ Though, aside from the actual find of stamped ingots, products from Riotinto such as red pigments bear chemical traces of their production involving a combination of lead from Carthago Nova and silver jarosite ore from Riotinto (Walton & Trentleman 2009). This is elaborated below (see page 407).

to the industry. For instance, a certain type of lamp produced in southern Iberia is found so frequently in mining districts that it has come to be known as “*lucerna minera*,” mining lamp (Luzón Nogue 1967). Indeed, I discussed the possible local production of a sub-variety of such lamps at Riotinto by Lucius Iulius Reburinus in Chapter 7. It is now widely recognized that lamps of this general form were both produced and used in various places in southwest Iberia from the late 1st century BCE to the 2nd century CE, so their use was not only restricted to underground mining or even to use in mining districts broadly speaking. However, they do appear *most* frequently in mining districts as well as in the larger Roman cities of the region, Augusta Emerita, the capital of Lusitania (Bustamente Álvarez 2014). That a singular form of lamp was appearing in mining districts and the major trade centers of the region is an additional testament both to the connection between mining districts incited by the emerging imperial economy, as well as the links between centers of extraction (mines) and centers of distribution (cities) in the region. Interestingly, many mining lamps, including a large portion of those specifically associated with Riotinto and Aljustrel, were recovered from Tróia, an important Roman fish-salting center at Grândola, Portugal. This attests to material connections between various industries that fed the imperial economy, and possibly to the fact that they were associated with industrial work in general not just mining (Martins 2014: 105–107). Together, these material connections show ways that the economies of mining districts were connected to one another in unexpected and even bizarre ways that can only be explained by the institutional structure of the Roman economic sphere in Iberia. These economic connections, brought about by mining economies being

incorporated into and directed towards the imperial economy, produced material and social connections between mining communities across Iberia.¹⁴⁶

Rome, of course, had an interest in controlling the local and regional economies in mining communities in order to ensure high levels of extraction and glean the highest profit possible from such districts. The best evidence of this comes from the Republican period in the Sierra Morena. Various types of “mining coins”—usually in bronze or lead—are found in or associated with mining districts there. For instance, mints in Cástulo produced coins that circulated exclusively in the mining districts and have been found at El Centenillo, La Loba, and Diógenes, among other mining centers of the Sierra Morena. Another variety of mining coin consists of normal coins from mints in Hispania Citerior (often from *Kese*) in the 1st century CE that were countermarked with the symbols of mining societies, such as the *Societas Castulonensis* or the *Societas Sisaponensis*. These include most commonly the lettering “S.C.,” but also “S.S.” and “M.S.S.” García-Bellido, Orejas and Mangas, and others have argued that these countermarked stamps indicated that they were valid only within the closed economies of mining districts. A final type of coin found in this region are those that could have functioned more as tokens than money for special payments, entrance fees to baths or other public amenities, or even identification to enter within mining districts (Mangas & Orejas 1999: 261–265; Chaves Tristán 1986).

If indeed these mining coins functioned as currency for use in the closed economies of mining districts, then the everyday economic interactions of people living

¹⁴⁶ Connections need not only have been made through the circulation of materials but also through the circulation of people. I previously discussed patterns of migration and immigration surrounding mining, as well as the possibility of migration between mining districts implied by the punishments for crimes outlined in the Vipasca tablets (see page 276).

in mining settlements were curtailed by Roman governance of these places and regulation of local economies. This system must have stimulated increased instances of economic interaction not just among residents of a single mining settlement, but among residents across mining settlements where these coins had purchasing value. By contrast, these groups would have interacted considerably less in the economies of places outside of mining districts. Economics interactions were constrained by the Roman system, but these very interactions contributed to social relationships between people who employed the currency (and, therefore, the formation of communities through economic exchanges in their everyday lives).

This phenomenon of increased regulation is well attested in contemporary mines, which should not serve as a direct comparison, but do show the economic benefits (to companies, empires, and corporations) derived from increasing control over trade markets. For instance, the proverbial company store, in many recent cases, served as a means of control over local economies for corporate and/or imperial interests. In the case of 19th century Peru, for instance, peasant laborers were required to spend a part of their salary in the company store, where the mining company supplied goods they bought in bulk and raised the prices above market value for their own employees (Deustua 1994: 45). While this superficially provided miners and their families with consistent access to food and other goods, it also prevented them from the choices normally available in the market economy and cemented the connection of miners to their places of work.

A second attestation of the way Roman governance impacted local economic practice comes from the Vipasca tablets, written during the reign of Hadrian (117-138 CE). As discussed in Chapter 6, the pair of tablets set out imperial rules mandating not

only the organization of mining activity, but also the organization of baths, schools, barbers, fullers, among other resources. At Vipasca, practitioners who cut hair or mended clothing, among other tasks, had to lease the right to practice their profession from the imperial administration. While this must have been a minor source of revenue for the Roman Empire, it also had the effect of ensuring the regulation and availability of necessary industries that sustained the mining communities, and therefore ensuring the smooth operation of mining activity, which is where the most economic gain lay. Because the Vipasca tablets are such singular documents—without comparable inscriptions from before or after, or from a different location in the Roman Empire, it is hard to properly trace the phenomenon of imperial control over economic, and other, activities in mining districts. However, the very fact that mining became separate legal territory (*metalla*) from other provincial territory after the time of Augustus suggests an increasing Roman interest in the regulation of economic activities within mining districts in the early empire.¹⁴⁷

In sum, economic activities surrounding the mining industry were increasingly controlled by Roman-directed trade networks and the institutions of empire during the centuries under consideration. These mechanisms of control both gave mining districts access to a wide variety of regional and imperial imports, but also curtailed the kinds of everyday economic interactions and activities that were possible in mining settlements. These peculiarities of local and regional economies surrounding mining contributed to

¹⁴⁷ On the other hand, it is important to remember that we do not know to what degree economic limitations were actually enforced. Speaking of the Maya world, Patricia McAnany has warned, “Assertions of elite hegemony over economic spheres tend to say more about the perspective (or cultural logic) of an archaeologist than about the sufficiency of archaeological data” (McAnany 2010: 4). If we had a more complete picture of the past with more lines of evidence, more instances of local resistance to Roman economic control or exploitation could be revealed.

economic interdependence—both between mining areas within Iberia and between southern Iberia and other parts of the Roman Empire. Ultimately, they also contributed to the formation of communities linked to the industry. Let us now consider the role of the output of mines in the wider Roman Empire.

Imperial Economies

As Ben Russell recently wrote on the Roman stone trade, “Few major studies of the Roman imperial economy now fail to include at least a brief nod in the direction of stone” (2013: 4). The same can be said for studies of mining and metallurgy. However, though it is widely acknowledged that mining was a key to imperial economic growth, specific studies of metal and the economy tend to focus on the far end of the *chaîne opératoire*: the production and use of Roman metal objects, especially coinage.¹⁴⁸ In order to understand the role of mining in the Roman imperial economy, it is necessary to view the process of mining from its beginnings rather than look exclusively at its products. Further, it is important to acknowledge variation in the economic systems surrounding mining rather than expect homogeneity across time and space. It is for these reasons that I have focused much of this dissertation on the local and regional impacts of imperial mining, the processes involved in carrying it out, and the various manifestations of community organization to support this industry in different parts of Iberia over the course of Roman occupation of the territory. In keeping with this multi-scalar orientation, I reiterated above the many ways that local and regional economies were transformed through their incorporation into the Roman imperial economy. Bringing the argument full

¹⁴⁸ Though, even then, much traditional scholarship is about chronology and iconography, rather than metal sourcing and distribution networks. This trend is beginning to change.

circle, and beginning and ending this project with the scale of empire, I return now to a discussion of how mining in the Iberian Peninsula was integral to the Mediterranean-wide, Roman imperial economy. Ultimately, the connection between mining and the imperial economy played an important role in the formation of empire at the largest scale, and the formation mining communities at smallest scale.

What were the metal needs of the Roman Empire? Metal was required for everything from minting coins, to the production of metal pipes and other infrastructure for urban construction projects, to shipbuilding, to military equipment, to utilitarian objects, to jewelry. A certain quantity of metal was brought into Roman possession as booty and the spoils of war during the many centuries of imperial expansion (López Sánchez 2015: 322). The growth of the empire, in addition to bringing these readily accessible metals into Roman holdings, also brought metal-rich landscapes into Roman provincial territory. Mining in these landscapes, including those in the Iberian Peninsula, became increasingly important as the speed of conquest waned and the empire began to consolidate its territory and resources. With expanded territory and larger population, the demand for metal products increased. Further, metals were constantly lost through activities such as payments to client kings, hoarding of coins and other valued objects, everyday wear and tear, and loss. This necessitated the extraction of new metals in various mining districts throughout the Roman Empire on a consistent basis, and especially in Iberia, where many of the most plentiful and accessible metal resources were located.

While the following sections examine the use of metals in coinage, shipbuilding and urban projects, and subsidiary products, it is important to acknowledge that the

process by which minerals left mining districts, were shipped, and and were transformed into commercial goods is a large and understudied topic. It is undoubtedly one that varied greatly according to the kind of extracted mineral, time period, political and economic organization of each region, and specificities of local production. In other words, studies of the context of production and the context of consumption have always been conducted in separate arenas, and an effort to reconstruct links between these two arenas on a broad scale is beyond the scope of this chapter and must be saved for future research. Many more detailed material analyses will need to be conducted to even begin to understand the quantities of metals shipped to different places and the sources of the metal in known metal objects; it would be an expensive undertaking, and it is unrealistic to imagine that such studies will ever be completed in a systematic fashion. Nevertheless, the following pages highlight some of what we do know about the ways that Iberian metal was used in the wider Roman Empire. This reveals some of the material connections that linked mining communities in Roman Iberia with wider economic and social networks in the empire.

Coinage

Part of the motivation for the increased scale of mining in Iberia under Roman rule was the growing empire's need to produce new coinage, including silver, gold, and copper-based denominations. López Sánchez has rightly noted that there was a link "in ancient and medieval times between a robust and stable imperial institutional system, the successful exploitation of mines, and the creation of a functioning monetary system" (2015: 315). It is useful then to trace the ways that Iberian metals were used in Roman coinage from the 3rd century BCE to the 2nd century CE.

The use of coinage in Iberia pre-dated Roman conquest: coins were first minted in the Greek colonies of Emporion and Rhode by the 5th century BCE. However, the expansion of the Roman territory into Iberia, and indeed into other new provinces, had the “numismatic corollary in the ending and withdrawal from circulation (whether gradual or not) of most of the existing non-Roman precious metal coinages” (Howgego 1992: 7). After the Roman conquest of Iberia, up to 160 local mints existed in the 1st and 2nd centuries BCE, especially in Mediterranean coastal areas where the impacts of colonial contact and trading were felt most strongly (Ripollès 2012). During the Republican period and until the reign of Claudius (41-54 CE), colonies and municipalities in Iberia minted coins bearing local names and iconography (e.g., Chaves Tristán 1998). After this time, coins were minted by the Roman state at imperial mints, but using metals sourced from various provincial mines. While many important volumes have been devoted to Roman coinage,¹⁴⁹ I here detail the role of Iberian mines in the production of gold, silver, and copper-based coinage for the Roman Empire.

Gold and Silver Coinage

Northwest Iberia was the primary source of gold in the early imperial period, especially before the conquest of Dacia in the early 2nd century CE.¹⁵⁰ As such, much of the gold extracted from mines in the region, including Las Médulas, went into the creation of the *aureus* beginning in the late 1st century BCE under Augustus’ new gold

¹⁴⁹ See especially: Harl 1996; Howgego 2005; Metcalf 2012; Howgego 1995; Howgego 1992.

¹⁵⁰ While my analysis of gold mining has focused on the area in and around Las Médulas, both because of the mine’s significant in antiquity and because of its magnificent preservation today, it is important not to discount other key sources of gold. In northwest Iberia, many gold mines are known from sites such as Trêas Minas and other places (Wahl 1993). Other primary sources outside of Iberia included Bessa in the Piedmont Alps and Limousin during the Late Republic, as well as Illyricum in the early Imperial period. In addition to this, minor sources of gold are known in southern Gaul, the Pyrenees, the Balkans, Bulgaria, the Chalchidike, and in Egypt (Wilson 2007: 110).

standard (Harl 1996: 73). Estimates have it that around 190 tons of gold were extracted from northwest Iberia during the years of highest exploitation from the Augustan conquest through the 2nd century CE. One gold *aureus* typically weights 7.75 grams (Figure 8.1).¹⁵¹ Thus, all told, northwest Iberia could have contributed the material for up to 1,255,800 *aurei* per year during its period of operation (Wilson 2007: 133), though these estimates must not taken as exact. In Chapter 4, I discussed the many ways that this large-scale production transformed local castro communities and their landscapes, reorganized indigenous economic systems, and brought foreigners (army and administrators) and foreign products into the region.

Southern Iberia provided much of the silver for Roman coinage,¹⁵² and indeed for local/Punic coinage that pre-dated Roman conquest of the region. As outlined in Chapter 5, both the region of Cartagena/Mazarrón and the Sierra Morena provided vast quantities of silver alongside other kinds of ores from the late 3rd century BCE through the early 1st century CE and beyond. The silver *denarii*, equivalent to 25 *aurei*, was produced at relatively pure levels—with traces of gold, bismuth, lead, and other elements—from the time of Augustus' coin reform through Nero's reign, after which the silver content fluctuated and ultimately declined in the 2nd century CE (Wilson 2007: 116–117; Butcher & Ponting 2014).¹⁵³

¹⁵¹ One *aureus* was worth 25 silver *denarii*, and it was Augustus who fixed the weight of this denomination of Roman coinage at 7.75 grams around 19 BCE. While this number remained relatively consistent during the first two centuries CE—and significantly this is during the period of major operations at the Iberian gold mine, the weight declined to 4.82 grams by 250 CE. Under Constantine, the *aureus* became the *solidus* and weighed between 4 and 4.5 grams (Wilson 2007: 113–114).

¹⁵² Other lesser sources included Upper Moesia (Kosovo and the Kosmaj region), Laurion (Attica, Greece), Sardinia, and Britain. Laurion was, of course, a larger supplier to Athens in the classical period, but some later activity is attested there (Wilson 2007: 114).

¹⁵³ Butcher and Ponting provide the most up to date discussion of the fineness and content of *denarii* over the course of the Imperial period (Butcher & Ponting 2014: 157–462).

Silver *denarii* were minted in Iberia and elsewhere during the Republican period (Harl 1996: 38–72). The topic of Spanish silver *denarii* is one that has received considerable scholarly debate, particularly about the date of issue of these Iberian coins and the purpose for which they were used (Knapp 1977: 1). These coins are of the same weight and design as Roman *denarii* but bear inscriptions in the Iberian language naming towns such as Bolskan (Oscā), Iltirta (Ilerda) and Kelsa (Celsa). Such coins were even nicknamed *argentum oscense* because of their similarity to Oscan inscriptions (Livy 34.10). They may have been minted by Iberian towns in massive quantities as a way to pay tribute to Roman officials. Before that, however, scholars have suggested that they were minted by certain Iberian towns to pay Celtiberian mercenaries in their struggle against Rome. Iberian *denarii*, rather than Roman coins, appear to have been the prime silver coin through the 1st century BCE. They are found in great quantities in hoards throughout the Iberian Peninsula, though sometimes in mixed hoards of Roman and Iberian silver coins (Harl 1996: 63-66; Chaves Tristán 1996; Knapp 1977: 1-18; Crawford 1969).

By the time of Augustus' reign both *aurei* and *denarii* were minted in Lugdunum (Gaul). This continued to be the primary mint until 63/4 CE when imperial coins started to be minted exclusively in Rome. In recent archaeometallurgical studies of silver *denarii*, Butcher and Ponting confirm that the trace element signatures of these coins were consistent with Spanish silver in the early years of the Roman Empire, and thus southern Spain continued to supply metal even after the alterations in minting practice and location. However, by the reigns of Caligula (37-41 CE) and Claudius (41-54 CE),

the primary source of silver began to shift increasingly to the Massif Central of Gaul close to Lugdunum (Butcher & Ponting 2014: 687–689; Ponting 2009).

It is not clear precisely how metal ores were transported from the mines to the mints. Indeed, various systems of land and sea transport, as well as some combination of military supervision and/or state contractors were probably employed for this purpose (Butcher & Ponting 2014: 33–34). This will be an important topic for future studies that better connect all aspects of the *chaîne opératoire*, and more concretely link contexts of extraction with those of production and use of coins (and indeed other objects). For now, however, the process remains frustratingly opaque. Regardless, it is logical that a source of silver mined closer to the primary mint would have been used increasingly for the sake of convenience, alongside recycling and the continued long-distance import of metals. Though silver extraction in southern Iberia continued, this might account partially for the decline of silver mining in southeast Iberia in the 1st century BCE and in the Sierra Morena in the 1st century CE.

Copper-Based Coinage

As discussed in Chapter 5, the Iberian Pyrite Belt and the Sierra Morena provided large quantities of copper for Roman coinage,¹⁵⁴ among other products, especially during the 1st and 2nd centuries CE. Copper¹⁵⁵ and lead isotope analysis of Roman imperial copper-based coins from the mints at Rome under Augustus and Tiberius has been

¹⁵⁴ Cyprus was the major supplier of copper in the Eastern Mediterranean, while other sources such as Sardinia, Tuscany, Wadi Faynan (Jordan), also played relatively large roles in overall copper production in the Roman Mediterranean.

¹⁵⁵ Copper has traditionally been considered more difficult than is lead (and by extension, silver, since lead and silver are often found together) to definitively trace to a specific provenance using isotopic studies, owing to the smaller number of objects and geological zones that have been sampled. This is now changing as a result of recent successful studies and an expanding database, however (Klein et al. 2007; Klein et al. 2009; Klein et al. 2010).

especially telling of some of these patterns. Both *as* and *quadrans* denominations show that from the period between 16 BCE and 43 CE, these copper-based coins were made primarily of mixed ores from southern Spain and Sardinia, and occasionally from Tuscany. Significantly, coins from the period between 34 and 37 CE were made exclusively from copper ores mined at Riotinto (Klein et al. 2004: 478–479). Further, between the time of Nero (54–68 CE) through at least 160 CE and possibly as late as 250 CE, copper ores from the Sierra Morena and the Iberian Pyrite belt were often mixed for the production of copper-based coinage. This likely happened at the mint in Rome, where copper ingots were shipped to be melted down for coinage (Klein et al. 2010: 55), especially since ores were normally refined and smelted close to the mines. Despite the availability of copper in various places throughout the empire, especially Wadi Faynan (Jordan) and Cyprus in the Eastern Mediterranean, the Riotinto mines—and others in southwest and south-central Iberia—had clearly assumed a place of foremost importance to imperial minting practices during the early imperial period.

Interestingly, while gold and silver ores are rarely encountered on shipwrecks,¹⁵⁶ copper ingots have more often been found on shipwrecks in the western Mediterranean. In a recent study, 112 copper ingots were analyzed that had been recovered over the years from shipwrecks off the coast of Languedoc-Rousillon (southern France), Marseille (southern France), Cádiz (southwest Spain), and from the strait of Bonifacio between Corsica and Sardinia. These ingots, despite some differences in form and in epigraphic markings, displayed “a remarkable homogeneity in both their chemical and isotopic

¹⁵⁶ To my knowledge, no silver ingots have been encountered that can be traced to southeast Spain (Trincherini et al. 2009: 127). Domergue has suggested that gold was normally transported overland, which was a longer, but safer mode of transportation. This would explain the absence of gold ingots on shipwrecks (Domergue 2010: 114).

composition” that is consistent with southern Spain, rather than Sardinia, southern Gaul, or Cyprus¹⁵⁷ (Klein et al. 2007: 214). Specifically, most ingots probably came from the Iberian Pyrite Belt and the Ossa Morena in the easternmost part of the Sierra Morena mountain range, while some could not be assigned to a specific mining district but could be associated with southern Iberia in general (Klein et al. 2007: 218–219). These finds of copper ingots confirm what is clear from the analyses of imperial coinage: southern Iberia was a key source of copper in the early Roman imperial period.

Lead in Shipbuilding, Water Management, and Urban Projects

While the mines of southeast and south-central Iberia provided large quantities of silver for the minting of *denarii* and the creation of luxury objects, the rich deposits of argentiferous galena in these places also provided the opportunity for extracting massive amounts of lead.¹⁵⁸ Lead was used for many purposes in the Roman world, and was especially important for both shipbuilding and urban building projects, which were vital to Mediterranean wide-trade and the development of cities—two essential factors in imperial economic growth and stability. As such, lead was distributed throughout the Mediterranean via maritime trade networks, detectable today through the remains of shipwrecks.

While ships carried lead ingots as cargo, much of the equipment on board and used in the construction of ships themselves was made of lead. For instance, hulls were lined with lead sheathing, especially from the late Republic to the early imperial period.

¹⁵⁷ Cyprus was also a major supplier of copper in antiquity, but it none of these ingots found in the western Mediterranean were found to contain isotopic signatures consistent with Cypriot copper. This is not surprising, as such ingots would be much more likely to be found in eastern Mediterranean contexts.

¹⁵⁸ Britain, Germany, and the Balkans also supplied lead after the conquest of each of these regions, but southern Spain was the first and most prolific source for this ore (Trincherini et al. 2009: 123).

Other equipment used on board included lead anchors, fishing weights, bilge pumps, cooking equipment, and containers (Dütting & Hoss 2014; Kapitan 1984; Oleson 2008; Rosen & Galili 2007). Lead was a desirable metal for seafaring because it was resistant to corrosion, malleable to work for repairs onboard, and fairly plentiful (Tylecote 1977). In a study of late Republican and early imperial Roman ships found off the coast of Israel, Rosen and Galili suggest that the elevated use of lead onboard exposed sailors to higher quantities than were encountered in normal urban life. As such, seafaring traders might have had a more elevated risk of lead poisoning than the general population (Rosen & Galili 2007: 303–304).

In urban building projects, lead was necessary for pipes that supplied running water to public baths, fountains, and private houses (Trincherini et al. 2009: 123; Leveau 2008: 660). Lead could be melted down and recycled for new uses, which is known to have happened in Pompeii, for instance. There, 20 samples of pipes from the Augustan period were analyzed using lead isotope analysis. As a result of either continual maintenance or an overhaul of the system during the Augustan period in this particular urban context, the pipes were found to be made of a recycled mix of lead from sources in southern Spain, Sardinia, Greece, and Tuscany (Boni et al. 2000).

While tracing the lead in objects and infrastructure is not always clear-cut as a result of recycling and reuse of ore coming from disparate geographic locations, lead ingots from southern Iberia provide more direct evidence for the empire-wide distribution of Iberian lead as well as the trade routes through which it was shipped. Lead ingots originating from southern Spain have been found on shipwrecks throughout the western

Mediterranean and as far east as Gavdos island (Greece),¹⁵⁹ Magdalensberg, and off the coast of Tunisia (Figure 8.2; Trincherini et al. 2009: 141).¹⁶⁰ For instance, a wreck off the island of Mal di Ventre (western Sardinia) from the mid 1st century BCE contained 1500 ingots weighing 45 tons. Many of these are now on display in Cabras, Sardinia.

Further, the stamps on ingots from both Cartagena/Mazarrón and the Sierra Morena also give an indication of who was involved in their commodification (Domergue 1998). For instance, of the ingots that are clearly identifiable with southeast Iberia, at least 23 names have been recorded, representing 42 different combinations (or “brands” as Trincherini and colleagues refer to them) on approximately 970 ingots (2009: 131). As I discussed in Chapter 7, many of these names can be traced through onomastic studies to Campania and other parts of Italy (Stefanile 2015; Stefanile 2013). Families—not just ingots, then, were circulating between Italy and the southern Iberian Peninsula because of their involvement with the commodification of lead.

Subsidiary Products

Coins and lead were not the only products from Iberia that became important on the Mediterranean-wide market. Though it would be impossible to trace all of the other metal products and their distribution throughout the Roman Empire, two studies of

¹⁵⁹ Trincherini and colleagues suggest that the ingots from the 1st century Gavdos wreck were not part of a larger cargo, but instead carried on board for use in occasional repairs (Trincherini et al. 2009: 144), so it is perhaps an overstatement to suggest that lead from southern Spain regularly reached the Eastern Mediterranean.

¹⁶⁰ See Gale Brown’s thesis for a general survey on lead ingots in the ancient Mediterranean through the 4th century CE (2011). Ancient lead ingots have caused some recent ethical arguments about the protection and value of ancient cultural heritage. The material has been found to be useful in dark matter detection experiments as a shielding material, which is an inherently destructive activity. Perez-Alvaro and Gonzalez-Zalba have recently argued that the use of ancient lead ingots for modern science does not contravene the 2001 UNESCO Convention on the Protection of the Underwater Cultural Heritage (2015: 56).

pigments created from cinnabar and as a byproduct of silver processing reveal some of the unexpected uses of subsidiary products of mining far from Hispania. Subsidiary and waste products from silver smelting were used to create red pigment that was used in Italy and in Egypt. When silver is smelted, a molten lead is added as a solvent to separate the pure silver from waste material. In this process, a foamy litharge is formed, which can be removed and used for other purposes (Walton & Trentleman 2009: 847). I described in Chapter 6 the ways that *spuma argenti*—the ancient name for this kind of subsidiary product—was commodified, possibly as a household industry in addition to other mining activities at La Loba in the Sierra Morena (see page 250).¹⁶¹

In one investigation, lead isotope analysis was performed on cinnabar used in wall paintings in Roman villas in various locations in Italy including Verona, Vicenza, Padova, Pordenone, and Trieste. The results indicated that most of the cinnabar used to create red pigment matched signatures from Riotinto as well as Cabo de Garta and Mazarrón, both in southeast Iberia (Mazzocchin et al. 2008: 692). The social and material connections between Italy and Iberia as a result of maritime trade have already been well established and this particular trade connection is not unusual. Another study of red pigments, however, shows a more surprising connection with Egypt.

Samples of red pigment from the funerary shrouds of seven Roman-era mummies dating between 31 BCE through the 1st century CE were analyzed using lead isotope analysis. The results were compared to lead and lead rich slag from a variety of locations, including Riotinto, the Red Sea, and Laurion. Even though the Red Sea was the geographically closest location to Egypt of the possible sources, the lead isotope values

¹⁶¹ The use of this litharge was not confined to the Roman period, but known also from Greece at Laurion (Rehren et al. 1999).

were found to most closely match those from Riotinto. Further, slight discrepancies were observed of the lead isotope ratios analyzed as compared with the lead-rich slag generated by mining and metal refinement operations at Riotinto. Ultimately, these were attributed to the use of lead from southeast Spain in the process of silver cupellation at Riotinto (Walton & Trentleman 2009: 845–860). These results suggest not only that red pigments used in Roman Egypt were imported from the opposite end of the Roman Empire in southwest Iberia, but also that pigment production was only possible as a result of the regional trade connections between mining districts in southeast and southwest Iberia. Here, it is abundantly clear that long-distance, Mediterranean-wide trade of many metal products and byproducts was only possible as a result of earlier trade and interaction at the regional and local levels. Further, the distribution and use of materials cannot always be explained by economic rationality, but was transformed (or distorted, even) as a result of imperial directives. In that sense, the imperial, regional, and local economies were interconnected in ways that are impossible to disentangle.

Discussion: Multi-Directional Connectivity, Community Building, and Visions of Empire

This chapter has served to demonstrate the various ways that communities built empire and empire transformed communities in the context of mining economies. It is clear that local, regional, and imperial economies surrounding mining were fundamentally intertwined, and that they reciprocally impacted one another in ways that are possible to trace through the archaeological and epigraphic record. The demand for metal spurred by Mediterranean-wide needs for coins, pipes, ship equipment, tableware tools, jewelry, pigments, and other metals and their subsidiary products, prompted an

increase in the scale of mining in southern Iberia. This increased scale not only transformed landscapes through industrial activity, but also created and reinforced communities of people involved in the many economic activities surrounding mining.

At the local level, large-scale mining created a demand for equipment such as baskets, sandals, specialized clothing, helmets, ropes, handheld picks, chains, wooden infrastructure, and other products that could have been filled through household and workshop production within mining settlements. At the local and perhaps regional level, the creation of more complex equipment, especially Hellenistic water lifting devices also required cooperation across specializations and industries. It necessitated collaboration between loggers, carpenters, blacksmiths, and those with engineering skills and an understanding of the mechanics of construction for such complex devices. Here, it is important to bring up the issue of labor specialization and seasonal work. Even outside of the mining industry, regional economies must have been stimulated by everyday activities of mining communities and those involved in the specialized work surrounding mining that they could not fulfill themselves, such as agricultural products, wine, and olive oil. It is clear that these demands were filled by supply networks from far off places such as Italy and North Africa, and increasingly by regional production in the agriculturally rich areas of Baetica and southern Lusitania.

While some of the work surrounding mining—especially smelting, surveying, and the construction of complex mechanical devices—required specialized training and skillsets, other aspects of work could be accomplished by the same people on a seasonal or periodic basis. For instance, labor could be shared between industries (underground mining and tool production, for instance) and across scales of economic activity (seasonal

work in agricultural fields farther from industrial areas alongside underground mining labor, for instance). Therefore, sharing of labor and temporal variation in productive, economic activities could have stimulated economic and social connections that contributed to even stronger social bonds in mining communities on a local level, and across mining communities in the whole of southern Iberia.

All of these local and regional connections happened only because of the increased scale of mining and the incorporation of mining landscapes into Roman structural and institutional frameworks. One major question we must ask, however, is: were local communities aware of the role of their work in the construction of the imperial economy, and indeed in the construction of empire? As Lori Khatchadourian has recently written: “things appear increasingly inseparable from matters of politics” (2016). She has skillfully demonstrated the impacts of things in the construction of the Persian Empire, and the ways that material connections—even in the absence of direct social connections—can bind an empire together.

Perhaps the way that people in mining communities experienced empire, at least in their daily lives, was grounded in the ways that empire changed their relationship (and access) to metals and other material products. Trade networks both stimulated and restricted by the Roman economy brought in material goods to mining districts that were necessary for everyday life. Beyond this, as communities actively participated in the creation of industrial mining landscapes through the extraction of ore, they saw these metals commodified into ingots and into coins that were stamped with inscriptions, images and symbols associated with Roman economic institutions (and by extension with

Roman power). These coins, in turn, circulated not just in Iberia, but throughout the Mediterranean.

Ripollès has argued that local production of coinages struck to finance the 2nd Punic War was “the factor that contributed in a decisive way to the familiarization of coins and their use by the indigenous population” (2012: 7). The use of coinage was most widespread on the Mediterranean coast and up the Guadalquivir river valley, the places that received the most consistent and prolonged engagement with traders and colonizers, the Greeks and Romans in the northeast and the Phoenicians, Carthaginians, and Romans in the south. The indigenous communities who were most frequently coming into contact with foreign traders and foreign goods, as well as exporting products of their own manufacture, experienced and participated in monetized economies much faster than more isolated areas of the peninsula. For instance, coinage did not come into widespread usage among castro culture populations in northwest Iberia until Roman conquest (see page 153). Many of the mining districts in southern Iberia, of course, were located in just these areas of early monetization, which is no coincidence. I argued in Chapter 2 that the patterns of colonization in southern Iberia in the 1st millennium can be partially explained by a desire of Phoenicians and Carthaginians to access the rich metal resources, among other products.

Even though mining communities were not necessarily geographically close to urban centers and markets, their participation in the extraction of metals for monetization must have brought them into close contact with those who were involved in the production and use of coins. During the Republican period, while coins were still struck in the provinces, the commodification of metals through their transformation into ingots

as well as through their minting into coins was not so far removed from contexts of metal extraction. Further, mining communities used coinage from early on, as is demonstrated by the prevalence of coins in settlements such as La Loba (Chaves Tristán & Otero Morán 2002). In other places, local communities must have at least partially aware of their role in the monetization of the Roman economy.

The experience of empire in mining communities was one drastically different from the experience of empire in cities or agricultural landscapes, and communities may not have fully understood the far-reaching material and economic connections surrounding mining. However, the intimate connection between the mining industry and the Roman imperial economy must have conditioned the formation of communities at the local level, and their perception of their role in the creation of empire.

Conclusions

In this chapter, I considered the role of mining in Hispania in the wider Roman imperial economy. I also discussed the reciprocal effects that this entanglement between Iberian mining and the Roman imperial economy had on local and regional economies surrounding the mining districts of southern Iberia. While mining was practiced prior to Roman conquest in the region, the increased scale of mining activity brought about connections between local, regional, and imperial economies in transformative and unexpected ways. I discussed the many ways in which local and regional economies were stimulated by the mining industry, including the different types of subsidiary production that sustained mining operations and fed local populations in mining districts. In turn, these often small-scale economic activities made large scale mining possible, and therefore helped to sustain the imperial economy. By contrast, I also discussed the many

ways that being incorporated into the wider Roman administrative system, with its many institutions and regulations, constrained and restricted the local and regional economies surrounding mining. I discussed, for instance, the exchange of ingots, lamps, and coins within the closed economies in mining districts. Being incorporated into the Roman Empire, then, brought about material connections between places such as Cathago Nova and Riotinto that previously would not have been possible or probable. But it also restricted the mechanisms for economic interactions of those involved with mining to a closed, though porous, group.

Alongside the other thematic settings of landscape, settlements and households, technology and labor that were the focus of the previous three chapters, this analysis on economies served to show how the everyday interactions of people involved in mining contributed to the formation of mining communities in southern Iberia, and reinforced social connections between people involved in the practice of mining on a continual basis. As in these other, often-overlapping thematic settings, the economic interactions that took place in mining districts stimulated social and material ties among people that lead to the formation and maintenance of mining communities, to connections between those communities in various parts of southern Iberia, and to direct material ties between mining communities and the wider Roman Empire.



Figure 8.1 Augustan *aureus* struck in Spain in 19/18 BCE (Copyright American Numismatic Society).

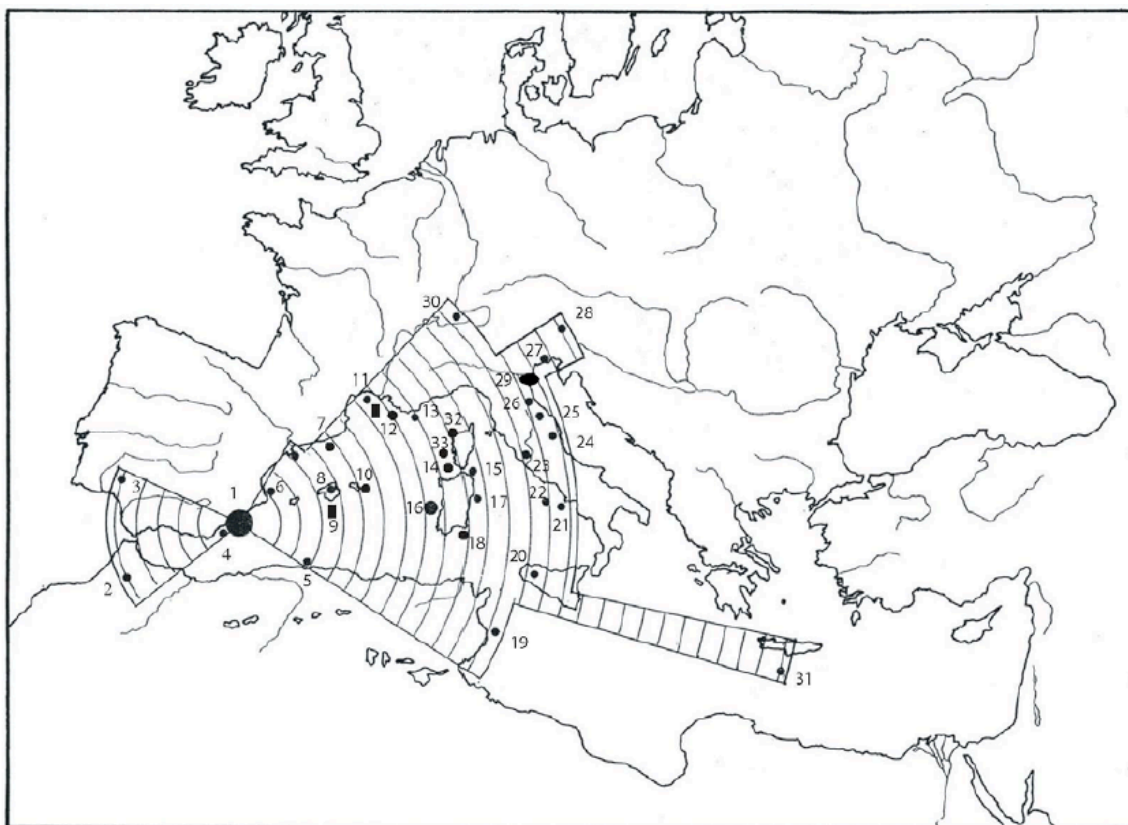


Figure 8.2 Distribution of lead ingots from Cartagena/Mazarrón in the wider Mediterranean (Figure 5 in Trincherini et al. 2009: 141)

CHAPTER 9

CONCLUSIONS: MINING, COMMUNITY, AND EMPIRE

Mining and Empire: Constructing Communities and Experiencing Empire in Roman Iberia

The aim of this dissertation was to interrogate the relationship between mining and empire in the Iberian Peninsula, and to investigate the small-scale impacts of Roman mining on local communities who lived and worked in the metal-rich landscapes there. A desire to access metals has long been cited as a driving factor in Rome's decision to annex the Iberian Peninsula beginning in the late 3rd century BCE, and the large-scale of mining during the centuries that followed is well known among classical archaeologists who study extractive industries. However, few have attempted to investigate how top-down governance and large-scale mining impacted local communities, or indeed the reciprocal impacts that local communities had on the development of the mining industry and the wider Roman economy. My dissertation fills this gap through an investigation of the four largest mining districts in the Iberian Peninsula: the gold mines in the northwest; the lead and silver mines in the southeast at Cartagena/Mazarrón; the lead, silver, and copper mines in the Sierra Morena mountain range of south-central Iberia; and the copper and silver mines in southwest Iberia in the Iberian Pyrite Belt.

This project was divided into two major parts. The first, "Social Approaches to Iberia's Industrial Past," situated existing scholarship on mining, community, and empire within my new socially-oriented, multi-scalar framework. I argued that mining communities should be studied through an examination of the interactions and everyday

practices in which they engaged in the context of four thematic settings: landscapes, settlements and households, labor and technology, and economies. I then presented a detailed analysis of the transformation of castro communities into mining communities at the UNESCO World Heritage site of Las Médulas. I argued that the absence of large-scale gold mining and only infrequent foreign/colonial entanglements in the region prior to Roman conquest created a situation in which many aspects of indigenous life were transformed, and even destroyed, as local people were incorporated into the Roman mining industry at Las Médulas. Yet, even in a place so clearly altered by Roman imperial administration, local continuities can be seen in architectural practice, consumption patterns, and even in the languages and labors surrounding the hydraulic gold mining technologies employed in the region.

The second half of this dissertation, “Mining Communities and Industrial Landscapes in Southern Iberia,” is a substantive and comparative analysis of the three major mining regions of southern Iberia through the thematic settings outline above. I argued that, as a result of the history of previous colonial encounters in the region, specifically Phoenician and Carthaginian colonial trading and settlement, there was already a strong connection between political economies and mining across the region before Roman conquest. However, Roman conquest brought about a rapid and exponential increase in the scale of mining to supply the growing Mediterranean-wide demand for metal products and the widespread use of Roman coinage. This increase in scale necessitated the transformation of the mining industry in some ways that were innovative, but in other ways that were in keeping with local tradition. Locally situated practices and knowledge of the landscapes associated with mining could be a source of

power for local people despite unequal power relationships that arose as a result of Roman social and administrative practice in the provinces. Through discussions of interactions that took place in landscapes (Chapter 5), settlements and households (Chapter 6), labor and technologies (Chapter 7), and economies (Chapter 8), I revealed how the everyday interactions of diverse groups of people in mining landscapes contributed to the formation and maintenance of mining communities across southern Iberia. These communities could be composed of people of different origins, statuses, ages, and social statuses who were linked through the social and material connections that arose from their involvement in the Roman mining industry. In the negotiation of everyday life in mining districts, locally situated practice shaped modes of interaction and ways of life as much (if not more) than Roman governance. Further, the long connection between mining, imperialism, and colonial interaction strongly impacted the speed with which the mining industry grew and the connections between mining communities, industrial landscapes, and imperial economies. This analysis of mining communities and industrial landscapes, then, illuminates the lived experience of empire of a group of people who, while rarely discussed in scholarship, played a significant role in the success of the Roman imperial economy and in the creation of empire.

Building Bridges: Broader Contributions of the Dissertation

This dissertation is based not on a new field project or unpublished dataset, but on the careful revision and compilation of disparate bodies of scholarship that have been brought together to form a nuanced discussion of mining, communities, and empire in Roman Iberia. While aspects of these topics have been studied under the auspices of classical archaeology on both sides of the Atlantic, anthropology, history, and

environmental science, among other disciplines, I have brought disparate datasets and scholarly arguments into conversation throughout this project. My goal was to bridge these academic and linguistic divides, enabling the rich data from the Iberian Peninsula to be brought to bear on broader discussions about the localized and diverse responses to Roman imperialism in the provinces, and about the relationship between mining and empire in world history.

The provinces of the Roman west, with the obvious exception of Roman Britain, have not been examined enough in Anglophone traditions of Roman archaeology. Owing to the long history of the American and British schools in Rome and various countries in the eastern Mediterranean, the geographical focal points of many institutions in the United States, Canada, and United Kingdom have decidedly central and eastern Mediterranean leanings. By contrast, most of the archaeological work in both Spain and Roman Iberia in general—and on Roman mining in particular—has been carried out under the auspices of those living and working in these countries. There are long and rich local and regional scholarly traditions on the archaeology of Roman mining in the Iberian Peninsula, but this work is seldom read or widely cited in Anglophone discussions of Roman imperialism, the Roman economy, or even Roman mining itself. It should be.

This dissertation then, has relied heavily on the previous (and plentiful) archaeological work done on gold mining in northwest Iberia, and on lead, silver, and copper mining in southern Spain and Portugal. Without these publications, it would have been impossible to write this broad regional comparison of mining regions in the Iberian Peninsula, and despite my best efforts I am sure that my bibliography is lacking even still. Nevertheless, my hope is that this dissertation encourages increased communication

between archaeologists and historians in Spain, Portugal, and in Anglophone traditions, and shows the importance of rethinking existing datasets within new theoretical frameworks. Such work will lead to more diverse and well-grounded discussions about the Roman provinces in general, and contribute to scholarship on Roman imperialism and ancient economies, among other diverse topics.

Next, although anthropological studies that intersect with the topics of mining, community, and empire abound, evidence from the classical world is rarely considered in these debates. The division between classical archaeology and anthropological archaeology has always struck me as artificial, constructed by and imbedded into our own academic institutions in a way that hinders scholarship on both sides of this divide, including work on mining communities and industrial landscapes. The volume *Social Approaches to an Industrial Past: the Archaeology and Anthropology of Mining* (Knapp et al. 1998) had a tremendous impact on my early thinking on this project, and, from the beginning, I lamented the absence of any case study from the Roman Empire in what is otherwise a varied and fairly comprehensive work. Mining in the Roman Empire, while fascinating in its own right, was also demonstrably important to mining in world history. In the classical period, levels of pollution attributable to mining reached unprecedented heights that were not matched again until the industrial Revolution. As I discussed in Chapter 1, much of this pollution can even be traced to mining in southern Iberia under Roman domination. Further, many of the technologies of mining that were employed on a large-scale and widespread basis are those that have continued to be used into contemporary times. It seems no coincidence that many of the techniques and practices first elaborated in in the Iberian Peninsula in Roman and indeed pre-Roman times, were

carried across the Atlantic for use in the mines of Spanish colonial Latin America. This long-term history, and the close association of mining and empire centered on the Iberian Peninsula in the ancient and contemporary past is one that should be explored further.

Thus, this dissertation represents my best effort to bring this fascinating and indeed relevant evidence from Roman Iberia into conversation with wider debates in anthropology and history surrounding mining in other times and places. One of my major goals in doing so was to create a mutual language with which to discuss mining communities and industrial landscapes across temporal or regional specializations. It is for these reasons that I included, in Chapter 3, a theoretically grounded method for understanding mining communities from a multi-scalar perspective, as well as theoretical discussions at the beginning of each thematic chapter. Mining communities, I argued, can be best understood through an analysis of interactions between people, things, and landscapes at different scales through four thematic settings. Namely, the interactions of daily life that contribute to the formation of mining communities—and mining communities *anywhere*—take place in the settings of landscapes, settlements and households, labor organization and technological practice, and economies. It is my contention that, when discussed through these thematic categories, the distinct aspects of mining communities that are situated both in place and in practice become clear. I hope that the theoretical and methodological framework laid out here, then, can serve as a mutual language for discussion of mining communities among like-minded scholars in the future. I hope that this detailed examination of Roman Iberia can serve as a rich example of mining and empire that will be of interest to those working both within and outside of the discipline of Roman archaeology.

New Directions, Future Research

There is ample room for expansion of this research in several directions, both big and small. First of all, the themes of human suffering and landscape degradation appear frequently in literature on mining, both the in the ancient literature and in contemporary archaeological studies. Diodorus (*History* 5.38; trans. J. Humphrey, J. Oelson, and A. Sherwood) wrote of miners,

Many of them die as a result of the inordinate hardships, for they have no remission or rest from their work, but use up their lives in misfortune, compelled by the blows of their overseers to endure the harsh situation...Indeed, on account of the magnitude of the suffering, death to them is preferable to life.

In some respects, this project has been my reaction against these themes and my effort to produce a more varied picture of the many ways that being a part of a mining community could impact everyday life. Not all of these were negative, as mining could be a source of upward mobility among certain social classes, and becoming a member of a mining community can incite feelings of solidarity and connection to place.

Nevertheless, one major line of research that should be explored in the future is the impact of mining on human health and local environmental ecosystems. For instance, a careful study of the human remains including, paleopathology, DNA, stable isotopes could reveal a great deal about the origins, compositions, and health of mining communities. (Aside from health, this would contribute greatly to discussions of migration and mining, which have been based primarily on epigraphic evidence). While well-preserved osteological from the mining districts of Roman Iberia remains are few and far between, a future study might examine those that do survive in concert with assemblages from other mining districts from the Roman Empire. This could produce a varied picture of the health, diversity, and lived experience of miners in the Roman

provincial territories. Similarly, more localized work on the environmental impacts of Roman mining that attempts to parse the impact of Roman mining alongside prehistoric and contemporary mining activity could contribute much to our understanding of industrial landscapes and how they were experienced in the past. Ongoing work at Wadi Faynan (Jordan) can serve as a model for this kind of research agenda.

Outside of this more specific work, it will be important in the future to conduct more integrated analyses of economic activities within the Iberian Peninsula. In this dissertation, I have already discussed potential material and social connections between industries such as mining and fish salting, as well as the relationship between mining and subsidiary industries, and the ways that agricultural production and other industries sometimes expanded as mining declined in southern Iberia. While many of these connections are already well known, more integrated regional studies that encompass various kinds of industrial and agricultural production could shed light on economic connectivity within Hispania, and the various social impacts that economic and material connections had on local populations who lived in rural, industrial, and urban environments.

Further, this dissertation has begun to explore how the connection between empire and mining incited movement of materials and migration of people within Roman Iberia, but also between Iberia and Italy. Future work that traces patterns of movement and migration could shed light on regional connections between southern Iberia and North Africa, as well as between southern Iberia and other parts of the Roman west, including the islands such as the Balearics, Sardinia, and Corsica. Integration of material evidence from ship cargoes, epigraphic and osteological evidence for the movement of people

involved in mining administration and labor, as well as archaeological evidence for mining itself at various locales will continue to reveal interesting and unusual patterns of connectivity between provinces of Roman Empire in the west (and east, lest we forget the pigments in Egypt!), as well as between Rome and Hispania in particular.

While new topics of investigation stemming from this research seem limitless, this dissertation marks a waypoint in my ongoing effort to disentangle the complex relationship of imperialism, resource extraction, and the formation of communities in this corner of the Roman Empire. And so, as José Saramago, concluded in his guide to Portugal that accompanied me on many of my own research travels for this project: “You have to go back to the footsteps already taken, to go over them again or add fresh ones alongside them. You have to start the journey anew. Always. The traveller sets out once more” (1990: 443).

APPENDICES: EPIGRAPHIC AND TEXTUAL SOURCES

Appendix I: Bierzo Edict

Bierzo Edict

Date: 15 BCE

Material: Bronze

Provenience: Bierzo, Castilla y León, Spain (chance find in 1999)

Current Location: Museo de León (Castilla y León, Spain)

Transcription (after Alföldy 2000):

- Imp(erator) Caesar Divi fil(ius) Aug(ustus) trib(unicia) pot(estate)*
VIII{I} et pro co(n)s(ule) dicit:
Castellanos Paemeiobrigenses ex
gente Susarrorum desciscentibus
5 *ceteris permansisse in officio cog-*
novi ex omnibus legatis meis, qui
Transdurianae provinciae prae-
fuerunt. Itaque eos universos im-
munitate perpetua dono; quosq(ue)
10 *agros et quibus finibus possede-*
runt Lucio Sestio Quirinale leg(ato)
meo eam provinciam optinente{m},
eos agros sine controversia possi-
dere iubeo.
15 *Castellanis Paemeiobrigensibus ex*
gente Susarrorum, quibus ante ea
immunitatem omnium rerum dede-
ram, eorum loco restituo castellanos
Aiiobrigiaecinos ex gente Gigurro-
20 *rum volente ipsa civitate; eosque*
castellanos Aiiobrigiaecinos om-
ni munere fungi iubeo cum
Susarris.
Actum Narbone Martio
25 *XVI et XV K(alendas) Martias M(arco) Druso Li-*
bone, Lucio Calpurnio Pisone
co(n)s(ulibus).

Translation (after Mattingly & Orejas 2009: 129–130):

The emperor Caesar Augustus, son of the Divine Julius Caesar, in the exercise of the tribune power for the eighth time as proconsul states:

I have learned from all my legates that are at the front of the Transduriana province that, when the others abandoned us, the Paemeiobrigian villagers (*castellani*) of the Sussaro community (*civitas*) have continued to comply with their obligations. Thus, I grant them perpetual immunity; and order that they shall hold without controversy all the fields and with the same limits they possessed while my legate Lucius Sesto Quirinal was in charge of that province.

With regard to the Paemeiobrigian villagers of the Susarro community to whom immunity had already been granted in all its terms, in its place I restore to the Aliobrigian villagers of the Gigurro community in accordance with the will of this same community; and I order that the Aliobrigian villagers comply with their obligations towards the Sussaro.

Dictated in Narbonne on the 14th and 15th of February during the consulate of Marcus Drusus Libonus and Lucius Calpurnius Piso (15 BCE).

Appendix II: Pliny the Elder on Gold Mining

Historia Naturalis 33.21:

Aurum invenitur in nostro orbe, ut omittamus Indicum a formicis aut apud Scythas grypis erutum, tribus modis: fluminum ramentis, ut in Tago Hispaniae, Pado Italiae, Hebros Thraciae, Pactolo Asiae, Gange Indiae, nec ullum absolutius aurum est, ut cursu ipso attrituque perpolitum. alio modo puteorum scrobibus effoditur aut in ruina montium quaeritur; utraque ratio dicatur.

Aurum qui quaerunt, ante omnia segullum tollunt; ita vocatur indicium. alveus hic est harenae, quae lavatur, atque ex eo, quod resedit, coniectura capitur. invenitur aliquando in summa tellure protinus rara felicitate, ut nuper in Delmatia principatu Neronis singulis diebus etiam quinquagenas libras fundens. cum ita inventum est in summo caespite, talutium vocant, si et aurosa tellus subest. cetero montes Hispaniarum, aridi sterilesque et in quibus nihil aliud gignatur, huic bono fertiles esse coguntur.

Quod puteis foditur, canalicium vocant, alii canaliense, marmoris glareae inhaerens, non illo modo, quo in oriente sappiro atque Thebaico aliisque in gemmis scintillat, sed micans amplexu marmoris. vagantur hi venarum canales per latera puteorum et huc illuc, inde nomine invento, tellusque ligneis columnis suspenditur. quod effossum est, tunditur, lavatur, uritur, molitur in farinam; farinam a pila scudem vocant; argentum, quod exit a fornace, sudorem. quae e camino iactatur spurcitia in omni metallo scoria appellatur. haec in auro tunditur iterumque coquitur. catini fiunt ex tasconio; hoc est terra alba similis argillae, neque enim alia flatum ignemque et ardentem materiam tolerat.

Tertia ratio opera vicerit Gigantum. cuniculis per magna spatia actis cavantur montes lucernarum ad lumina; eadem mensura vigiliarum est, multisque mensibus non cernitur dies.

Arrugias id genus vocant. siduntque rimae subito et opprimunt operatos, ut iam minus temerarium videatur e profundo maris petere margaritas atque purpuras. tanto nocentiores fecimus terras! relinquuntur itaque fornices crebri montibus sustinendis. occursant in utroque genere silices; hos igne et aceto rumpunt, saepius vero, quoniam id cuniculos vapore et fumo strangulat, caedunt fractariis clavas libras ferri habentibus egeruntque umeris noctibus ac diebus per tenebras proximis tradentes; lucem novissimi cernunt. si longior videtur silex, latus sequitur fossor ambitque. et tamen in silice facilius existimatur opera; est namque terra ex quodam argillae genere glareae mixta—gangadium vocant—prope inexpugnabilis. cuneis eam ferreis adgrediuntur et isdem malleis nihilque durius putant, nisi quod inter omnia auri fames durissima est. peracto opere cervices fornicum ab ultimo caedunt. dat signum rima, eamque solus intellegit in cacumine eius montis vigil. hic voce, nutu evocari iubet operas pariterque ipse devolat. mons fractus cadit ab sese longe fragore qui concipi humana mente non possit, aequae et flatu incredibili.

spectant victores ruinam naturae. nec tamen adhuc aurum est nec scire esse, cum foderent, tantaque ad pericula et inpendia satis causae fuit sperare quod cuperent.

Alius par labor ac vel maioris inpendii: flumina ad lavandam hanc ruinam iugis montium obiter duxere a centesimo plerumque lapide; corrugos vocant, a conrivatione credo. mille et hic labores: praeceps esse libramentum oportet, ut ruat verius quam fluat; itaque altissimis partibus ducitur. convalles et intervalla substructis canalibus iunguntur. alibi rupes inviae caeduntur sedemque trabibus cavatis praebere coguntur. qui caedit, funibus pendet, ut procul intuenti species ne ferarum quidem, sed alitum fiat. pendentes maiore ex parte librant et lineas itineri praeducunt, quaque insistentis vestigiis hominis locus non est, amnes trahuntur ab homine. vitium lavandi est, si fluens amnis lutum inportet; id genus terrae urium vocant. ergo per silices calculosve ducunt et urium evitant. ad capita deiectus in superciliis montium piscinae cavantur ducenos pedes in quasque partes et in altitudinem denos. emissaria in iis quina pedum quadratorum ternum fere relinquuntur, ut repleto stagno excussis opturamentis erumpat torrens tanta vi ut saxa provolvat. alius etiamnum in plano labor. fossae, per quas profluat, cavantur—agogas vocant—; hae sternuntur gradatim ulice. frutex est roris marini similis, asper aurumque retinens. latera cluduntur tabulis, ac per praerupta suspenduntur canales. ita profluens terra in mare labitur ruptusque mons diluitur, ac longe terras in mare his de causis iam promovit Hispania.

in priore genere quae exhauriuntur inmenso labore, ne occupent puteos, in hoc riganur. aurum arrugia quaesitum non coquitur, sed statim suum est. inveniuntur ita massae, nec non in puteis, et denas excedentes libras; palagas, alii palacurnas, iidem quod minutum est balucem vocant. ulex siccatur, uritur, et cinis eius lavatur substrato caespite herboso, ut sidat aurum. vicena milia pondo ad hunc modum annis singulis Asturiam atque Callaeciam et Lusitaniam praestare quidam prodiderunt, ita ut plurimum Asturia gignat. neque in alia terrarum parte tot saeculis perseverat haec fertilitas. Italiae parci vetere interdicto patrum diximus; alioqui nulla fecundior metallorum quoque erat tellus. extat lex censoria Victumularum⁴ aurifodinae in Vercellensi agro, qua cavebatur, ne plus quinque milia hominum in opere publicani haberent.

Translation (after Rackham 1952):

Gold in our part of the world—not to speak of the Indian gold obtained from ants or the gold dug up by griffins in Scythia—is obtained in three ways: in the detritus of rivers, for instance in the Tagus in Spain, the Po in Italy, the Maritza in Thrace, the Sarabat in Asia Minor and the Ganges in India; and there is no gold that is in a more perfect state, as it is thoroughly polished by the mere friction of the current. Another method is by sinking shafts; or it is sought for in the fallen debris of mountains. Each of these methods must be described.

People seeking for gold begin by getting up *segullum*—that is the name for earth that indicates the presence of gold. This is a pocket of sand, which is washed, and

from the sediment left an estimate of the vein is made. Sometimes by a rare piece of luck a pocket is found immediately, on the surface of the earth, as occurred recently in Dalmatia when Nero was emperor, one yielding fifty pounds weight of gold a day. Gold found in this way in the surface crust is called *talutium* if there is also auriferous earth underneath. The otherwise dry, barren mountains of the Spanish provinces which produce nothing else whatever are forced into fertility in regard to this commodity.

Gold dug up from shafts is called ‘channeled’ or ‘trenched’ gold; it is found sticking to the grit of marble, not in the way in which it gleams in the lapis lazuli of the East and the stone of Thebes and in other precious stones, but sparkling in the folds of the marble. These channels of veins wander to and fro along the sides of the shafts, which gives the gold its name; and the earth is held up by wooden props. The substance dug out is crushed, washed, fired, and ground to a soft powder. The powder from the mortar is called the ‘*scudes*’ and the silver that comes out from the furnace the ‘sweat;’ the dirt thrown out of the smelting-furnace in the case of every metal is called ‘scoria,’ slag. In the case of gold the scoria is pounded and fired a second time; the crucibles for this are made of *tasconium*, which is a white earth resembling clay. No other earth can stand the blast of air, the fire, or the intensely hot material.

The third method will have outdone the achievements of the Giants. By means of galleries driven for long distances the mountains are mined by the light of lamps—the spells of work are also measured by lamps, and the miners do not see daylight for many months. The name for this class of mines is *arrugiae*; also cracks give way suddenly and crush the men who have been at work, so that it actually seems less venturesome to try to get pearls and purple-fishes out of the depths of the sea; so much more dangerous have we made the earth! Consequently arches are left at frequent intervals to support the weight of the mountain above. In both kinds of mining masses of flint are encountered, which are burst asunder by means of fire and vinegar, though more often, as this method makes the tunnels suffocating through heat and smoke, they are broken to pieces with crushing-machines carrying 150 pounds of iron, and the men carry the stuff out on their shoulders, working night and day, each man passing them on to the next man in the dark, while only those at the end of the line see daylight. If the bed of flint seems too long, the miner follows the side of it and goes round it. And yet flight is considered to involve comparatively easy work, as there is a kind of earth consisting of a sort of potter’s clay mixed with gravel, called *gangadia*, which is almost impossible to overcome. They attack it with iron wedges and the hammer-machines mentioned above; and it is thought to be the hardest thing that exists, except greed for gold, which is the most stubborn of all things.

When the work is completely finished, beginning with the last, they cut through, at the top, the supports of the arched roofs. A crack gives warning of a crash, and the only person who notices is the sentinel on a pinnacle of the mountain. He by shout and gesture gives the order for the workmen to be called out and himself at

the same moment flies down from his pinnacle. The fractured mountain falls asunder in a wide gap, with a crash which it is impossible for human imagination to conceive, and likewise with an incredibly violent blast of air. The miners gaze as conquerors upon the collapse of nature. And nevertheless even now there is no gold so far, nor did they positively know there was any when they began to dig; the mere hope of obtaining their coveted object was a sufficient inducement for encountering such great dangers and expenses.

Another equally laborious task involving even greater expense is the incidental operation of previously bringing streams along mountain-heights frequently at a distance of 100 miles for the purpose of washing away the debris of this collapse; the channels made for this purpose are called *corrugi*, a term derived I believe from *conrivatio*, a uniting of streams of water. This also involves a thousand tasks; the dip of the fall must be steep, to cause a rush rather than a flow of water, and consequently it is brought from very high altitudes. Gorges and crevasses are bridged by aqueducts carried on masonry; at other places impassable rocks are hewn away and compelled to provide a position for hollowed troughs of timber. The workman hewing the rock hangs suspended with ropes, so that spectators viewing the operations from a distance seem to see not so much a swarm of strange animals as a flight of birds. In the majority of cases they hang suspended in this way while taking the levels and marking out the lines for the route, and rivers are led by man's agency to run where there is no place for a man to plant his footsteps. It spoils the operation of washing if the current of the stream carries mud along with it; an earthy sediment of this kind is called *urium*. Consequently they guide the flow over flint stones and pebbles, and avoid *urium*. At the head of the waterfall on the brow of the mountains reservoirs are excavated measuring 200 feet each way and 10 feet deep. In these there are left five sluices with apertures measuring about a yard each way, in order that when the reservoir is full the stopping-barriers may be struck away and the torrent may burst out with such violence as to sweep forward the broken rock. There is also yet another task to perform on the level ground. Trenches are excavated for the water to flow through—the Greek name for them means 'leads;' and these, which descent by steps, are floored with gorse—this is a plant resembling rosemary, which is rough and holds back the gold. The sides are closed in with planks, and the channels are carried on arches over steep pitches. Thus the earth carried along in the stream slides down into the sea and the shattered mountain is washed away; and by this time the land of Spain owing to these causes has encroached a long way into the sea. The material drawn out at such enormous labor in the former kind of mining so as not to fill up the shafts is in this latter process washed out. The gold obtained by means of an *arrugia* does not have to be melted, but is pure gold straight away. In this process nuggets are found and also in the shafts, even weighing more than 10 pounds. There are called *palagae* or else *palacurnae*, and also the gold in very small grains *baluce*. The gorse is dried and burnt and its ash is washed on a bed of grassy turf so that the gold is deposited on it. According to some accounts Asturia and Gallaecia and Lusitania produce in this way 20,000 pounds of gold a year, Asturia supplying the largest amount. Nor has there been in any other part of the

world such a continuous production of gold for so many centuries. We have stated that by an old prohibiting degree of the senate Italy is protected from exploitation; otherwise no country would have been more productive in metals, as well as in crops. There is extant a ruling of the censors relating to the gold mines of Victumulae in the territory of Vercellae which prohibited the farmers of public revenues from having more than 5000 men engaged in the work.

Appendix III: Vipasca Tablets

A. Vipasca I: *Lex Metalli Vipascensis*

Vipasca I (Vip. A): *Lex Metalli Vipascensis*

Date: 2nd century CE

Material: copper alloy

Provenience: slag heaps at Vipasca (Aljustrel, Portugal)

Current Location: Museo Geológico (Lisbon, Portugal)

Transcription (after Domergue 1983):

[1] *Centesimae argentariae stipulationis. Conductor ea[rum venditionum quae per auctio]nem intra fines metalli Vipascensis fient, exceptis iis, quas procu(rator) metallorum iu[ssu imp(eratoris) faciet, centesimam a vendito]/re accipito. Conductor ex pretio puteorum, quos proc(urator) metallorum vendet, cen[tesimam ab emptore accipito]. / Si instituta auctione universaliter omnia addicta fuerint, nihilo minus venditor ce[ntesimam conductori socio acto]/rive eius praestare debeto. Conductor socio actorive eius, si volet stipulari au[t pignus capere liceto. Conductor]/ socius actorve eius <eius> quoque summae, quae excepta in auctione erit, centesimam exigo. [Qui res sub praecone / habuerit, si eas non addixerit et intra dies decem, quam sub praecone fuerint, de condici[one vendiderit, nihilo minus con]ductor socio actorive eius centesimam d(are) d(ebeto). Quod ex hoc capite legis conduct[ori socio actorive eius debebitur,] / nisi in triduo proximo, quom debere coeptum erit, datum solutum satisve factum erit, du[plum d(are) d(ebeto)]. /*

[2] *Scripturae praeconii. Que praeconium conduxerit, praeconem intra fines praebe[to. Conductor ab eo qui venditionem] / (denariorum) C (centum) minoremve fecerit, centesimas duas, ab eo qui maiorem i (denariorum) C (centum) fecerit, centesimam exig[ito. Qui mancipia sub praecone venum] dederit, si quinque minoremve numerum vendiderit, capitularium in singula capita [i (denariorum) ..., si maiorem numerum vendi]derit, in singula capita i (denarius) III (tres) conductorio socio actorive eius dare debeto. Si quas [res proc(urator) metallorum nomine] fisci ven/det locabitve, iis rebus conductor socius actorve eius praeconem praestare debeto. Q[ui inventari]um cuiusque rei vendum / dae nomine proposuerit, conductor socio actorive eius i (denarius) I (unum) d(are) d(ebeto). Puteorum, quos proc(urator) metallorum vendiderit, em/ptor centesimam d(are) d(ebeto). Quod si in triduo non dederit, duplum d(are) d(ebeto). Conductor socio actorive eius pignus cap<re> liceto. / Qui mulos mulas asinos asinas caballos equas sub praecone vendiderit in k(apita) sing(ula) i (denarius) III (tres) d(are) d(ebeto). Qui mancipia aliamve quam re[m sub] / praeconem subiecerit et intra dies XXX (triginta) de condicione vendiderit, conductor socio actorive eius [idem d(are) d(ebeto)]. /*

[3] *Balinei fruendi. Conductor balinei sociusve eius omnia sua impensa balineum, [quod ita conductum habe]bit in / pr(idie) k(alendas) Iul(ias) primas omnibus diebus calfacere et praestare debeto a prima luce in horam septim[am diei mulieribus] et ab hora octava / in horam secundam noctis viris arbitrato proc(uratoris) qui metallis praeerit. Aquam in [aenis usque at] summam ranam hypo/caustis et in labrum tam mulieribus quam viris profluentem recte praestare debeto. Conductor a viris sing(ulis) / aeris semisses et a mulieribus singulis aeris asses exigito. Excipiuntur liberti et servi [Caes(aris) qui proc(uratori)] in officiis erunt vel / commoda percipient, item inpuberes et milites. Conductor socius actorve eius [balineum et instrument]ta omnia quae / ei adsignata erunt integra conductione peracta reddere debeto nisi si qua vetustate c[orrupta erunt]. Aena quibus / utetur lavare tergere unguereque adipe e recenti tricensima quaque die recte debeto. [Si vis maior per aliquod tempus inpedi] / erit, quo minus lavare recte possit, eius temporis pro rata pensionem conductor reputare deb[eto]. Praeter] haec et siquid / aliud eiusdem balinei exercendi causa fecerit, reputare nihil debebit. Conductor ve[n]dere ligna] nisi ex recisamini/bus ramorum quae ostili ideona non erunt ne liceto. Si adversus hoc quid fecerit, in singul[as venditiones HS (sestercios)] centenos (nummos) fisco d(are) d(ebeto). / Si id balineum recte praebitum non erit, tum proc(uratori) metallorum multam conductori quo[ti]ens recte praebitum non erit usque / ad HS (sestercios) CC (ducentos) dicere liceto. Lignum conductor repositum onni tempore habeto, quod diebus...[satis sit]. /*

[4] *Sutrinum. Qui calciamentorum quid loramentorumve, quae sutores tractare so[lent, vendiderit clavomve cali]ga/rem fixerit venditaveritve sive quid aliud, quod sutores vendere debent, vendidis[se intra fines convictus erit, is] / conductori socio actorive eius duplum d(are) d(ebeto). Conductor clavom ex lege ferrariar[um vendito. Conductor soci]o / actorive eius pignus capere liceto. Reficere calciamenta nulli licebit nisi cu[m] sua dominive quis curaverit refece]rite/ve. Conductor omne genus calciamentorum praestare debeto: ni ita fecer[it, unicuique ubi volet ementi]us / esto.*

[5] *Tonstrinum. Conductor frui debeto ita, ne alius in v[ico metalli Vipascensis inve] / territoris eius tonstrinum quaestus causa faciat. Qui ita tonstrinum fecerit, in sin[gluos ferramentorum usus I (denarius)...] / conductori socio actorive eius d(are) d(ebeto) et ea ferramenta commissa conductori sunt. [Excipiuntur servi] qui / dominos aut conservos suos curaverint. Circitoribus, quos conductor [non miserit, tondendi ius ne es]to. Conductor socio actorive eius pignoris captio esto. Qui pignus capientem prohibuerit, [in singular prohi]bitiones i (denarius) V (quinque) d(are) / debeto. Conductor unum pluresve artifices idoneos in portionem recipito. /*

[6] *Tabernarum fulloniarum. Vestimenta rudia vel recurata nemini m[ercede polire nisi qui conductor so]cius actorive eius locaverit permiseritve liceto. Qui convictus fuerit adversus ea qui[d] fecisse, in singulas la[cinias] / i (denarius) III*

(tres) conductori socio actorive eius d(are) d(ebeto). Pignus conductori socio actoriv[e eius capere liceto.] /

[7] *Scripturae scaurarium et testarium. Qui in finibus met[alli Vipascensis...scau]ri/as argentarias aerarias pulveremve ex scaureis rutramina ad mesuram pondusve pugare...[re expe/dire frangere cernere lavare volet quive lapicaedinis opus quoquo modo facien[dum suscipiet, quos ad id] faciendum / servos mercenariosque mittent, in triduo proximo profiteantur et solvan[t I (denarius)...conductor quo]que mense / intra pr(idie) k(alendas) quasque: ni ita fecerint, duplum d(are) d(ebeto). Qui ex alis locis ubertumbis ae[raria argentariave ru]tramina in / fines metallorum inferet, in p(ondo) C(centum) i (denarium) I (unum) conductori socio actorive eius d(are) d(ebeto). Qu[od ex hoc capite] legis condu/ctori socio actorive eius debetur neque ea die, qua deberi coeptum erit, solu[tum satisve factum erit], d(uplum) d(are) d(ebeto). / Conductor socio actorive eius pignus capere liceto et quod eis sacuriaepu[rgatum...expeditum frac]tum cretum lavatumque erit quive lapides lausiae expeditae in lapicaedi[nis erunt, commissae ei sunt, nisi quid]/quid debitum erit conductori socio actorive eius solutum erit; ex[cipiuntur servi et liberti] / flatorum argentarium aerarium qui flaturis dominorum patron[orumque operam dant]. /*

[8] *Ludi magistri. Ludi magistros a proc(uratore) metallorum immunes es[se placet]. /*

[9] *Usurpationes puteorum sive pittaciarium. Qui intra fi[nes metalli Vipascensis puteum locum] / qui putei iuris retinendi causa usurpabit occupabitve e lege metallis dicta, b[iduo proximo quod usurpaverit occupa]verit apud conductorem socium actoremve huiusce vectigalis profiteatu/r...]*

Translation (after Edmondson 1987):

1. Of the One Percent Tax on Auction Transactions

The lessee of the tax on sales held at auction within the district of the Vipasca mines shall receive one percent from the seller except on sales which the procurator of the mines holds on the order of the emperor. The lessee shall exact one percent of the price for working shafts which the procurator of the mines sells. If, after the auction has begun, everything is knocked down in one lot, the seller shall, nevertheless, be required to pay one percent to the lessee, or to his partner or agent. The lessee, or his partner or agent, if he wishes, shall be allowed to stipulate or obtain security. The lessee, or his partner or agent, shall exact one percent also of any amount that is received during an auction. If anyone has property for sale through the auctioneer and he does not sell it at auction, but sells it himself by contract within 10 days of placing it with the auctioneer, he shall, nevertheless, be required to give one percent to the lessee, or his partner or agent. If anything owed to the lessee, or his partner or agent, in accordance with this

section of the regulations, is not given, paid, or secured within the next three days after the debt is incurred, he shall have to pay double.

2. Of the Auctioneering Fee

Whoever leases the auctioneering concession shall provide an auctioneer within the mining district. On a sale of 100 *denarii* or less he shall collect a fee of two percent from the seller, on a sale of over 100 *denarii*, one percent. Anyone who sells slaves through the auctioneer shall be required to pay the lessee, or his partner or agent [6?] *denarii* per head if he sells five or less, three *denarii* if he sells more than five. If the procurator of the mines sells or leases any property in the name of the *fiscus*, the lessee, or his partner or agent, shall be required to furnish an auctioneer for the sale of such property. Anyone who posts a list with a view to selling any property whatsoever shall be required to pay one *denarius* to the lessee, or to his partner or agent. The purchaser of shafts sold by the procurator of the mines shall be required to pay one percent. If he does not pay it within three days, he shall have to pay double. The lessee, or his partner or agent, shall have the right to obtain security. Anyone who sells mules, asses, or horses, male or female, through the auctioneer shall be required to pay three *denarii* per head. Anyone who places slaves or any other property for sale through the auctioneer and sells it himself by contract within thirty days shall be required to pay the same to the lessee, or to his partner or agent.

3. On the Maintenance of the Baths

The lessee of the baths or his partner shall, in accordance with the terms of the lease valid until the forthcoming 30th of June, be required to heat the baths and keep them open for use entirely at his own expense every day from daybreak to the seventh hour for women, and from the eighth hour to the second hour in the evening for men, at the discretion of the procurator in charge of the mines. He shall be required to provide a proper supply of running water for the heated rooms, to the bath tub up to the highest level and to the basin, for women and for men. The lessee shall charge men one half an *as* each and women one *as* each. Imperial freedmen and slaves in the service of the procurator or on his payroll are to be admitted free, as are children and soldiers. At the expiry of the lease, the lessee, or his partner or agent, shall be required to return in good condition all the bath equipment consigned to him, except for anything rendered unusable through age. He shall also be required to wash, dry, and coat with fresh grease every 30 days the bronze implements that he uses. If any needed repair prevents the proper operation of the baths, the lessee shall be entitled to prorate the rental for that period. Excepting this, whatever else he may do for the purpose of operating the said baths, he shall be entitled to no reduction in rental. The lessee shall not be allowed to sell wood except for branch trimmings unsuited for fuel. If he does anything in violation of this, he shall have to pay to the *fiscus* 100 sesterces for each sale. If these baths are not properly kept open for use, then the procurator of the mines shall have the right to fine the lessee up to 200 sesterces every time they

are not kept open properly. The lessee shall at all times have on hand a supply of wood sufficient for...days.

4. Of the shoemaking trade

Anyone who makes any of the shoes or thongs with shoemakers customarily handle, or who drives or sells shoemaker's nails, or who is convicted of selling within the mining district anything else which shoemakers are entitled to sell shall have to pay double to the lessee, or to his partner or agent. The lessee shall sell nails in accordance with the regulations of the iron mines. The lessee, or his partner or agent, shall have the right to obtain security. No one will be allowed to repair shoes, except to mend or repair his own or his master's. The lessee shall be required to offer all types of shoes for sale; if he does not, everyone shall have a legal right to purchase wherever he wishes.

5. Of the barbering trade

The lessee shall be entitled to operate with the assurance that no one else in the village of the Vipasca mines or within the mining district thereof shall practice barbering for a profit. Anyone who does so practice barbering shall have to pay to the lessee, or his partner or agent, ...*denarii* for each use of razors, and the said razors shall be forfeited to the lessee. Slaves attending to their masters or their fellow slaves are excepted. Itinerant barbers not sent out by the lessee shall not have the right to practice barbering. The lessee, or his partner or agent, shall have the right to obtain security. Anyone who hinders his obtaining security shall have to pay five *denarii* for each such act of hindrance. The lessee shall engage one or more skilled workers in proportion [to the demand for them].

6. Of the fuller's shops

No one to whom he lessee, or his partner or agent, has not leased or granted the right shall be allowed to do work on new or used clothing for pay. Anyone convicted of any violation of this shall have to pay the lessee, or his partner or agent, three *denarii* for each garment. The lessee, or his partner or agent, shall have the right to obtain security.

7. Of the fee for exploiting slag heaps and rock deposits

Anyone who wishes in the district of the mines of Vipasca...to clean, process, break up, sift, or wash copper or silver slag or slag dust scooped out by measure or weight, or who undertakes to execute work of any kind in the quarries, shall within the next three days declare what slaves and hired laborers he will send to do this, and shall pay the lessee...each month on or before the last day of the month. If he does no do so, he shall have to pay double. Anyone who brings into the mining district scoopings of copper or silver from ore dumps in other places shall have to pay one *denarius* per 100 pounds to the lessee, or to his partner or

agent. If anything is owed to the lessee, or to his partner or agent, in accordance with this section of the regulations, and is not paid or secured on the day on which the obligation is incurred, he shall have to pay double. The lessee, or his partner or agent, shall have the right to obtain security, and any of the said slag that is cleaned, processed, broken up, sifted, or washed and any stone blocks that are dressed in the quarries, shall be forfeited to the lessee, or his partner or agent, if whatever is owed to him is not paid. Slaves and freedmen of silver and copper smelters working in the smelting-plants of their masters or patrons are excepted.

8. Schoolteachers

Schoolteachers shall be exempt from taxes at the hands of the procurators of the mines.

9. Claims to workings

Anyone who, in accordance with the regulations issued for the mines, stakes a claim to or occupies a shaft or the site of a shaft within the district of the mines of Vipasca with a view to maintaining a legal right shall within the next two days after such claim or occupancy declare to the lessee of the revenue, or his partner or agent...

B. Vipasca II: *Lex Metallis Dicta*

Vipasca II (Vip. B) = *FIRA* I, 104

Date: 2nd century CE

Material: Copper Alloy

Provenience: slag heaps at Vipasca (Aljustrel, Portugal)

Current Location: Museo Geológico (Lisbon, Portugal)

Transcription (after d'Encarnação 2012 [1984]):

[...] *VLPIO AELIANO suo salutem* /

[1] *[Qui puteum aerarium occupaverit, priusquam venam coxerit, pretium partis dimidia ad fiscum pertinentis secundum legem imp(eratoris) Hadriani] / Aug(usti) praesens numerato. Qui ita non fecerit et convictus [sic] erit prius coxisse venam quam pretium sicut <su> / supra scriptum est solvisse, pars occupatoris commissa esto et puteum universum proc(urator) metallorum / vendito. Is, qui probaverit ante colonum venam coxisse quam partis dimidia ad fiscum pertinem/tis numerasse, partem quartam accipito.*

[2] *Putei argentarii ex forma exerceri debent, quae / hac lege continentur; quorum pretia secundum liberalitatem sacratissimi Imp(eratoris) Hadriani Aug(usti) obser/vabuntur, ita ut ad eum pertineat proprietas partis quae ad fiscum pertinebit, qui primus pretium puteo fecerit/ et sestertia quattuor milia nummum fisco intulerit.*

[3] *Qui ex numero puteorum quinque unum / ad venam perduxerit, in ceteris sicut supra scriptum est opus sine intermissione facito. Ni ita fecerit, alii / occupandi potestas esto.*

[4] *Qui post dies XXV (quinque et viginti) praeparationi impensarum datis opus quidem / statim facere coeperit, diebus autem continuis decem postea in opere cessaverit, alii occupandi / [i]us esto.*

[5] *Puteum a fisco venditum continuis sex mensibus intermissum alii occupandi.*

[6] *[Occupat]ori puteorum socios quos volet habere liceto, ita ut pro ea parte qua quis socios erit impensas / conferat. Qui ita non fecerit, rationem impensarum factarem a se / continuo triduo in foro frequentissimo loco propositam habeto et per praeconem denunciato / sociis, ut pro sua quisque portione impensas conferat. Qui ita non contulerit quive quid dolo malo fecerit quominus conferat quove quem quove ex sociis fallat, is eius putei partem ne / habeto eaque pars socii sociorumve qui impensas fecerit esto. /*

[7] *[Ve]l ii coloni qui impensam fecerint in eo puteo, in quo plures socii fuerint, repetendi a sociis quod / bona fide erogatum esse apparuerit ius esto.*

[8] *Colonis inter se eas quoque partes puteorum quas / a fisco emerint et pretium solverint vendere quanti quis potuerit liceto. Qui venderam suam partem / quive emere volet, apud proc(uratem) qui metallis praeerit professionem dato. Aliter emere aut vendere ne / liceto. Ei qui debitor fisci erit donare partem suam ne liceto.*

[9] *Venas quae ad puteos prolatae / iacebunt ab ortu solis in occasum ii quorum erunt in officinas vehere debebunt. Qui post occa/sum solvis vel noctu venas a puteis sustulisse coniunctus erit. HS (sestertios) mille nummus fisco inferre debeto. /*

[10] *[Ve]nae furem, si servos [sic] erit procurator flagellis caedito et ea condicione vendito, ut in perpetuis / vinculis sit neve in ullis metallis territorisve metallorum moretur; pretium servi ad dominum / pertineto. Liberum procurator confiscato [sic] et finibus metallorum in perpetuum prohibeto. /*

[11] *[P]utei omnes diligenter fulti destinatique sunt, proque pruti materia colonus cuiusque putei no/vam et idoneam subicito.*

[12] *Pilas aut fulturas firmamenti causa relictas attingere aut / violare dolove malo quid facere, quominus eae pilae fulturaeve perviae sint, ne liceto. /*

[13] *[Q]ui puteum vitasse, labefactasse, decapitasse aliutque quid dolo malo fecisse, quominus is puteus / firmus sit, convictus erit, si servos [sic] erit, flagellis arbitrato proc(urator) caesus, ea condicione a domi/no veneat, net in ullis metallis moretur; liberi bona proc(urator) in fiscum cogito et finibus ei metal/lorum in perpetuum interdicito.*

[14] *Qui puteos aerarios aget a cuniculo qui aquam metallis / subducet, recedito et non minus quam quinos denos pedes utroque latere relinquito. /*

[15] *[Cu]niculum violare ne liceto. Proc(urato), explorandi novi metalli causa, ternagum a cuniculo agere / permittito, ita ut ternagus non plures latitudinis et altitudinis quam quaternos pedes habeat. /*

[16] *[V]enam intra quinos denos pedes ex utroque latere a cuniculo quaerere caedereve ne liceto. /*

[17] *[Q]ui aliter quit in ternagis fecisse convictus erit, servos [sic], flagellis artibratu proc(uratoris) caesus, ea condi/cione [a] domino veniet, ne in ullis metallis moretur; liberi bona proc(urator) in fiscum cogito et fini/bus ei metallorum in perpetuum interdicito.*

[18] *Qui puteos argentarios [aget] a cuniculo qui / aqua metallis subducet, recedito et non minus quam sexagenos pedes utroque latere relin/quito et eos*

puteos, quos occupaverit adsignatosve acceperit, in opere, uti determinati erunt, / habeto nec ultra procedito neve egbolas colligito neve ternagos ita agito extra fines putei adsignati [occupative, ut cuniculus violetur].

Translation (text and added headings (not in original Latin text) after Edmondson 1987):

PREAMBLE

...to his dear Ulpus Aelianus, greetings.

PAYMENT FOR SMELTING OF [COPPER?] ORE

1. In accordance with the will of the liberal and most sacred emperor Hadrian Augustus, he shall make immediate payment. If anyone does not do so and is convicted of having smelted ore before paying the price as specified above, his share as occupier shall be confiscated and the entire shaft shall be sold by the procurator of the mines. Anyone who proves that the tenant (*colonus*) has smelted ore before paying the prices of the half shares belonging to the *fiscus* shall receive one quarter (of this sum).

THE LEASING OF SILVER WORKINGS

2. Silver shafts must be worked in accordance with the details contained in these regulations. Prices for them will be kept in accordance with the liberality of the most sacred Emperor Hadrian Augustus, whereby the ownership of the share belonging to the *fiscus* belongs to the first person to offer the price for the working and pay down to the *fiscus* the sum of 4,000 sesterces.

REGULATIONS TO ENSURE PRODUCTION IN SILVER WORKINGS

3. If anyone strikes ore in one out of five shafts, he shall, as stated above, carry out the work in the others without interruption. If he does not do so, another shall have the legal right to take possession.
4. If anyone after the 25-day period granted for raising working capital actually begins regular operations, but then stops operations for 10 consecutive days, another shall have the right to take possession.
5. If a shaft sold by the *fiscus* lies idle for six consecutive months, another shall have the legal right to take possession on condition that when the ore is extracted therefrom, one half shall be, according to the customary practice, reserved for the *fiscus*.

THE RIGHT TO FORM ASSOCIATIONS (*SOCIETATES*) IN SILVER WORKINGS

6. The occupier of shafts shall have the right to have any partners (*socii*) he wishes on the condition that each partner contribute his proportionate share of the expenses. If anyone does not do so, then the one who covers the expenses shall have an account of the expenses covered by himself posted on three consecutive days in the most frequented place in the forum, and shall demand of his partners through the public crier that each contribute his proportionate share of the expenses. If anyone does not contribute or does anything with malice aforethought to avoid contributing or to deceive one or more of this partners, he shall not have his share of the shaft, and that share shall belong to the partner or partners who cover the expenses.
7. Tenants who cover expenses in such shafts in which there are several partners shall have a legal right to recover from their partners anything that is shown to have been expended in good faith.
8. Tenants shall also have the right to sell among themselves, at as high a price as they can, shares of mineshafts purchased from the *fiscus* and paid for. Anyone who wishes to sell or buy a share shall submit a declaration to the procurator who is in charge of the mines; otherwise he shall not be allowed to buy or sell. Anyone who is a debtor to the *fiscus* shall not be allowed to give away his share.

SMELTING AND STEALING OF ORE

9. Ore extracted and lying near the shafts must be conveyed to the smelters by those to whom it belongs between the hours of sunrise and sunset. Anyone convicted of having removed ore from the shafts after sunset or by night shall have to pay to the *fiscus* the sum of 1,000 sesterces.
10. A stealer of ore, if he is a slave, shall be whipped by the procurator and sold on this condition, that he shall be kept perpetually in chains and not tarry in any mine or mining district; the price of the slave shall belong to the owner. If the thief is a free man, the procurator shall confiscate his property and bar him forever from the mining district.

THE SAFETY OF MINING SHAFTS: THE MAINTENANCE OF PROPS

11. All shafts shall be carefully propped and reinforced, and the tenant of each working shall provide new and suitable replacements for rotten materials.
12. It shall be forbidden to touch or damage pillars or props left for reinforcement, or to do anything with malice aforethought to render the said pillars or props unsafe.
13. If anyone is convicted of having injured, weakened, or damaged a shaft, or of having done anything with malice aforethought to render such shafts unsafe, if he

is a slave, he shall be whipped at the discretion of the procurator and sold by his master on this condition, that he shall not tarry in any mine [or mining district]; if he is a free man, the procurator shall confiscate his property and bar him forever from the mining district.

PROSPECTING AND THE MAINTENANCE OF DRAINAGE DITCHES IN COPPER WORKINGS

14. Anyone who operates copper shafts shall avoid the ditch (*cuniculum*) that drains the water from the mines and leave a space of not less than 15 feet on either side.
15. It shall be forbidden to damage the ditch. The procurator shall permit the driving of a drift (*ternagus*) from the ditch for the purpose of discovering new mineral, on the condition that the drift be not more than four feet in width and depth.
16. It shall be forbidden to loot for or extract ore within 15 feet on either side of the ditch.
17. If anyone is convicted of having done anything contrary to the regulations in the drifts, if he is a slave, he shall be whipped at the discretion of the procurator and sold by his master on this condition, that he shall not tarry in any mine [or mining district]; if he is a free man the procurator shall confiscate his property and bar him forever from the mining district.

PROSPECTING AND THE MAINTENANCE OF DRAINAGE DITCHES IN SILVER WORKINGS

18. Anyone who operates silver shafts shall avoid the ditch that drains the water from the mines and shall leave a space of not less than 60 feet on either side. He shall exploit those shafts occupied by him or allotted to him within the boundaries prescribed, and shall not advance beyond them nor collect leavings (*egbolae*) nor drive drifts outside the limits of the shafts allotted...

Appendix IV: Diodorus Siculus on Italian Immigration and Underground Labor

Diodorus Siculus, *History*, 5.36-38:

Ὑστερον δὲ πολλοῖς χρόνοις οἱ μὲν Ἰβηρες μαθόντες τὰ περὶ τὸν ἄργυρον ιδιώματα κατεσκεύασαν ἀξιόλογα μέταλλα· διόπερ ἄργυρον κάλλιστον καὶ σχεδόν τι πλεῖστον κατασκευάζοντες μεγάλας ἐλάμβανον προσόδους. ὁ δὲ τρόπος τῆς μεταλλείας καὶ τῶν ἔργων τοιοῦτός τις ἐστὶ παρὰ τοῖς Ἰβηρσιν. ὄντων χαλκοῦ καὶ χρυσοῦ καὶ ἀργύρου μετάλλων θαυμαστῶν, οἱ μὲν ἐργαζόμενοι τὰ χαλκουργεῖα τὸ τέταρτον μέρος χαλκοῦ καθαροῦ ἐκ τῆς ὀρυττομένης γῆς λαμβάνουσι, τῶν δ' ἀργυρευόντων τινὲς ιδιωτῶν ἐν τρισὶν ἡμέραις Εὐβοϊκὸν ἐξαίρουσι τάλαντον· πᾶσα γὰρ ἡ βῶλός ἐστι ψήγματος συμπεπηγότης καὶ ἀπολάμποντος μεστή. διὸ καὶ θαυμάσαι τις ἂν τὴν τε τῆς χώρας φύσιν καὶ τὴν φιλοπονίαν τῶν ἐργαζομένων αὐτὴν ἀνθρώπων. τὸ μὲν οὖν πρῶτον οἱ τυχόντες τῶν ιδιωτῶν προσεκαρτέρουν τοῖς μετάλλοις, καὶ μεγάλους ἀπεφέροντο πλούτους διὰ τὴν ἐτοιμότητα καὶ δαψίλειαν τῆς ἀργυρίτιδος γῆς· ὕστερον δὲ τῶν Ῥωμαίων κρατησάντων τῆς Ἰβηρίας, πλῆθος Ἰταλῶν ἐπεπόλασε τοῖς μετάλλοις, καὶ μεγάλους ἀπεφέροντο πλούτους διὰ τὴν φιλοκερδίαν. ὠνούμενοι γὰρ πλῆθος ἀνδραπόδων παραδιδόασιν τοῖς ἐφεστηκόσι ταῖς μεταλλικαῖς ἐργασίαις· οὗτοι δὲ κατὰ πλείονας τόπους ἀνοίξαντες στόμια καὶ κατὰ βάθους ὀρύττοντες τὴν γῆν ἐρευνῶσι τὰς πολυαργύρους καὶ πολυχρύσους πλάκας τῆς γῆς· καταβαίνοντές τε οὐ μόνον εἰς μῆκος, ἀλλὰ καὶ εἰς βάθος παρεκτείνοντες ἐπὶ πολλοὺς σταδίους τὰ ὀρύγματα, καὶ πλαγίας καὶ σκολιὰς διαδύσεις ποικίλως μεταλλουργοῦντες, ἀνάγουσιν ἐκ βυθῶν τὴν τὸ κέρδος αὐτοῖς παρεχομένην βῶλον.

Μεγάλην δ' ἔχει παραλλαγὴν τὰ μέταλλα ταῦτα συγκρινόμενα τοῖς κατὰ τὴν Ἀττικὴν. ἐκεῖνα μὲν γὰρ οἱ μεταλλεύοντες καὶ πρὸς ταῖς ἐργασίαις μεγάλας προΐεμενοι δαπάνας ἃ μὲν ἤλπισαν ἐνίστε λαβεῖν οὐκ ἔλαβον, ἃ δ' εἶχον ἀπέβαλον, ὥστε δοκεῖν αὐτοὺς ὥσπερ αἰνίγματος τρόπον ἀτυχεῖν· οἱ δὲ κατὰ τὴν Σπανίαν μεταλλουργοὶ ταῖς ἐλπίσι¹ μεγάλους σωρεύουσι πλούτους ἐκ τούτων τῶν ἐργασιῶν. τῶν γὰρ πρώτων ἔργων ἐπιτυγχανομένων διὰ τὴν τῆς γῆς εἰς τοῦτο τὸ γένος ἀρετὴν αἰεὶ μᾶλλον εὐρίσκουσι λαμπροτέρας φλέβας, γεμούσας ἀργύρου τε καὶ χρυσοῦ· πᾶσα γὰρ ἡ σύνεγγυς γῆ διαπέπλεκται πολυμερῶς τοῖς ἐλιγμοῖς τῶν ράβδων. ἐνίστε δὲ καὶ κατὰ βάθους ἐμπίπτουσι ποταμοῖς ρέουσιν ὑπὸ τὴν γῆν, ὧν τῆς βίας περιγίνονται διακόπτοντες τὰς ρύσεις αὐτῶν τὰς ἐμπιπτούσας τοῖς ὀρύγμασι πλαγίως. ταῖς γὰρ ἀδιαψεύστοις τοῦ κέρδους προσδοκίαις πιεζόμενοι πρὸς τὸ τέλος ἄγουσι τὰς ἰδίας ἐπιβολάς, καὶ τὸ πάντων παραδοξότατον, ἀπαρύτουσι τὰς ρύσεις τῶν ὑδάτων τοῖς Αἰγυπτιακοῖς λεγομένοις κοχλίαις, οὓς Ἀρχιμήδης ὁ Συρακόσιος εὗρεν, ὅτε παρέβαλεν εἰς Αἴγυπτον· διὰ δὲ τούτων συνεχῶς ἐκ διαδοχῆς παραδιδόντες μέχρι τοῦ στομίου, τὸν τῶν μετάλλων τόπον ἀναζητοῦσιν καὶ κατασκευάζουσιν εὐθετον πρὸς τὴν τῆς ἐργασίας πραγματείαν. φιλοτέχνου δ' ὄντος τοῦ ὀργάνου καθ' ὑπερβολὴν, διὰ τῆς τυχούσης ἐργασίας ἅπλατον ὕδωρ ἀναρριπτεῖται παραδόξως, καὶ πᾶν τὸ ποτάμιον ρεῦμα ραδίως ἐκ βυθοῦ πρὸς τὴν ἐπιφάνειαν ἐκχεῖται. θαυμάσαι δ' ἂν τις εἰκότως τοῦ τεχνίτου τὴν ἐπίνοιαν οὐ μόνον ἐν τούτοις, ἀλλὰ καὶ ἐν ἄλλοις πολλοῖς καὶ μείζοσι, διαβεβοημένοις κατὰ πᾶσαν τὴν οἰκουμένην, περὶ ὧν τὰ κατὰ μέρος ὅταν ἐπὶ τὴν Ἀρχιμήδους ἡλικίαν ἔλθωμεν ἀκριβῶς διεξιμεν.

Οἱ δ' οὖν ταῖς ἐργασίαις τῶν μετάλλων ἐνδιατρίβοντες τοῖς μὲν κυρίοις ἀπίστους τοῖς πλήθεσι προσόδους περιποιοῦσιν, αὐτοὶ δὲ κατὰ γῆς ἐν τοῖς ὀρύγμασι καὶ καθ' ἡμέραν καὶ νύκτα καταξινόμενοι τὰ σώματα, πολλοὶ μὲν ἀποθνήσκουσι διὰ τὴν ὑπερβολὴν τῆς κακοπαθείας· ἄνεσις γὰρ ἢ παῦλα τῶν ἔργων οὐκ ἔστιν αὐτοῖς, ἀλλὰ

τῶν ἐπιστατῶν πληγαῖς ἀναγκαζόντων ὑπομένειν τὴν δεινότητα τῶν κακῶν ἀτυχῶς προῖενται τὸ ζῆν, τινὲς δὲ ταῖς δυνάμεσι τῶν σωμάτων καὶ ταῖς τῶν ψυχῶν καρτερίαις ὑπομένοντες πολυχρόνιον ἔχουσι τὴν ταλαιπωρίαν· αἰρετώτερος γὰρ αὐτοῖς ὁ θάνατός ἐστι τοῦ ζῆν διὰ τὸ μέγεθος τῆς ταλαιπωρίας. πολλῶν δ' ὄντων περὶ τὰς προειρημένας μεταλλείας παραδόξων, οὐχ ἥκιστ' ἂν τις θαυμάσειε διότι τῶν μεταλλουργείων οὐδὲν πρόσφατον ἔχει τὴν ἀρχήν, πάντα δ' ὑπὸ τῆς Καρχηδονίων φιλαργυρίας ἀνέφχθη καθ' ὃν καιρὸν καὶ τῆς Ἰβηρίας ἐπεκράτουν. ἐκ τούτων γὰρ ἔσχον τὴν ἐπὶ πλέον αὔξησιν, μισθούμενοι τοὺς κρατίστους στρατιώτας καὶ διὰ τούτων πολλοὺς καὶ μεγάλους πολέμους διαπολεμήσαντες. καθόλου γὰρ αἱ Καρχηδόνιοι διεπολέμουν οὔτε πολιτικοῖς στρατιώταις οὔτε τοῖς ἀπὸ τῶν συμμάχων ἀθροισμένοις πεποιθότες, ἀλλὰ καὶ Ῥωμαίους καὶ Σικελιώτας καὶ τοὺς κατὰ τὴν Λιβύην οἰκοῦντας εἰς τοὺς¹ μεγίστους ἦγον κινδύνους καταπλουτομαχοῦντες ἅπαντας διὰ τὴν ἐκ τῶν μετάλλων γινομένην εὐπορίαν. δεινοὶ γάρ, ὡς ἔοικεν, ὑπῆρξαν οἱ Φοίνικες ἐκ παλαιῶν χρόνων εἰς τὸ κέρδος εὐρεῖν, οἱ δ' ἀπὸ τῆς Ἰταλίας εἰς τὸ μηδὲν² μηδενὶ τῶν ἄλλων καταλιπεῖν.

Γίνεται δὲ καὶ καττίτερος ἐν πολλοῖς τόποις τῆς Ἰβηρίας, οὐκ ἐξ ἐπιπολῆς εὕρισκόμενος, ὥς ἐν ταῖς ἱστορίαις τινὲς τεθρυλήκασιν, ἀλλ' ὀρυττόμενος καὶ χωνευόμενος ὁμοίως ἀργύρῳ τε καὶ χρυσῷ. ὑπεράνω γὰρ τῆς τῶν Λυσιτανῶν χώρας ἔστι μέταλλα πολλὰ τοῦ καττιτέρου, καὶ κατὰ τὰς προκειμένας τῆς Ἰβηρίας ἐν τῷ ὠκεανῷ νησιῖδας τὰς ἀπὸ τοῦ συμβεβηκότος Καττιτερίδας ὀνομασμένας. πολὺς δὲ καὶ ἐκ τῆς Βρεττανικῆς νήσου διακομίζεται πρὸς τὴν κατ' ἀντικρὺ κειμένην Γαλατίαν, καὶ διὰ τῆς μεσογείου Κελτικῆς ἐφ' ἵππων ὑπὸ τῶν ἐμπόρων ἄγεται παρὰ τε τοὺς Μασσαλιώτας καὶ εἰς τὴν ὀνομαζομένην πόλιν Ναρθῶνα· αὕτη δ' ἐστὶν ἄποικος μὲν Ῥωμαίων, διὰ δὲ τὴν εὐκαιρίαν² μέγιστον ἐμπόριον ἔχουσα τῶν ἐν ἐκείνοις τοῖς τόποις

Translation (after C. H. Oldfather 1933):

[36] But at a much later time the Iberians, having come to know the peculiar qualities possessed by silver, sunk notable mines, and as a consequence, by working the most excellent and, we may say, the most abundant silver to be found, they received great revenues. The manner, then, in which the Iberians mine and work the silver is in part as follows. The mines being marvellous in their deposits of copper and gold and silver, the workers of the copper mines recover from the earth they dig out a fourth part of pure copper, and among the unskilled workers in silver there are some who will take out a Euboic talent in three days; for all the ore is full of solid silver-dust which gleams forth from it. Consequently a man may well be filled with wonder both at the nature of the region and at the diligence displayed by the men who labour there. Now at first unskilled labourers, whoever might come, carried on the working

of the mines, and these men took great wealth away with them, since the silver-bearing earth was convenient at hand and abundant; but at a later time, after the Romans had made themselves masters of Iberia, a multitude of Italians have swarmed to the mines and taken great wealth away with them, such was their greed. For they purchase a multitude of slaves whom they turn over to the overseers of the working of the mines; and these men, opening shafts in a number of places and digging deep into the ground, seek out the seams of earth which are rich in silver and gold; and not only do they go into the ground a great distance, but they also push their diggings many stades in depth and run galleries off at every angle, turning this way and that, in this manner bringing up from the depths the ore which gives them the profit they are seeking.

[37] Great also is the contrast these mines show when they are compared with those of Attica. The men, that is, who work the Attic mines, although they have expended large sums on the undertakings, yet "Now and then, what they hoped to get, they did not get, and what they had, they lost," so that it would appear that they met with misfortune in a kind of riddle; but the exploiters of the mines of Spain, in their hopes, amass great wealth from their undertakings. For their first labours are remunerative, thanks to the excellent quality of the earth for this sort of thing, and they are ever coming upon more splendid veins, rich in both silver and gold; for all the ground in that region is a tangled network of veins which wind in many ways. And now and then, as they go down deep, they come upon flowing subterranean rivers, but they overcome the might of these rivers by diverting the streams which flow in on them by means of channels leading off at an angle. For being urged on as they are by expectations of gain, which indeed do not deceive them, they push each separate undertaking to its conclusion, and what is the most surprising thing of all, they draw out the waters of the streams they encounter by means of what is called by men the Egyptian screw, which was invented by Archimedes of Syracuse at the time of his visit to Egypt; and by the use of such screws they carry the water in successive lifts as far as the entrance, drying up in this way the spot where they are digging and making it well suited to the furtherance of their operations. Since this machine is an exceptionally ingenious device, an enormous amount of water is thrown out, to one's astonishment, by means of a trifling amount of labour, and all the water from such rivers is brought up easily from the depths and poured out on the surface. And a man may well marvel at the inventiveness of the craftsman, in connection not only with this invention but with many other greater ones as well, the fame of which has encompassed the entire inhabited world and of which we shall give a detailed and precise account when we come to the period of Archimedes.

[38] But to continue with the mines, the slaves who are engaged in the working of them produce for their masters revenues in sums defying belief, but they themselves wear out their bodies both by day and by night in the diggings under the earth, dying in large numbers because of the exceptional hardships they endure. For no respite or pause is granted them in their labours, but compelled beneath blows of the overseers to endure the severity of their plight, they throw away their lives in this wretched manner, although certain of them who can endure it, by virtue of their bodily strength

and their persevering souls, suffer such hardships over a long period; indeed death in their eyes is more to be desired than life, because of the magnitude of the hardships they must bear. And although many are the astounding features connected with the mining just described, a man may wonder not the least at the fact that not one of the mines has a recent beginning, but all of them were opened by the covetousness of the Carthaginians at the time when Iberia was among their possessions. It was from these mines, that is, that they drew their continued growth, hiring the ablest mercenaries to be found and winning with their aid many and great wars. For it is in general true that in their wars the Carthaginians never rested their confidence in soldiers from among their own citizens or gathered from their allies, but that when they subjected the Romans and the Sicilians and the inhabitants of Libya to the greatest perils it was by money, thanks to the abundance of it which they derived from their mines, that they conquered them in every instance. For the Phoenicians, it appears, were from ancient times clever men in making discoveries to their gain, and the Italians are equally clever in leaving no gain to anyone else.

Tin also occurs in many regions of Iberia, not found, however, on the surface of the earth, as certain writers continually repeat in their histories, but dug out of the ground and smelted in the same manner as silver and gold. For there are many mines of tin in the country above Lusitania and on the islets which lie off Iberia out in the ocean and are called because of that fact the Cassiterides. And tin is brought in large quantities also from the island of Britain to the opposite Gaul, where it is taken by merchants on horses through the interior of Celtica both to the Massalians and to the city of Narbo, as it is called. This city is a colony of the Romans, and because of its convenient situation it possesses the finest market to be found in those regions.

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AE = *L'Année Épigraphique*

CIL = *Corpus Inscriptionum Latinarum*

CILA = *Corpus de Inscripciones Latinas de Andalucía*

EE = *Ephemeris Epigraphica*

FIRA = *Fontes Iuris Romani Antiqui*

HEp = *Hispania Epigraphica*

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