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Les concepts en sciences de l'Antiquité : mode d'emploi

Chronique 2025

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Les concepts en sciences de l'Antiquité : mode d'emploi
Chronique 2025– Empires: State Control on Natural Resources
in Ancient Economies, I

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I- Introduction: Global Classicists' Turns to Ecology and Imperiology

Anca DAN

1- When, how and why the Classics have become global?

Classics (in the Anglo-American world) and *Altertumswissenschaft/Sciences de l'Antiquité* (including the *Klassische Philologie/Philologie classique* in the German and French traditions) are disciplines that study ancient origins. No matter how scientific the method, however, the lack of consistent evidence makes the reconstruction of the “real origins” of a civilization almost impossible. This is why the Classicists' work is mainly about *ideal origins*—imagined, constructed, and assumed at different moments by different communities.

The notion of “antiquity” (Latin *antiquitas*, corresponding to the Greek ἀρχαιολογία) has long been central to the study of collective identities. Already in

Classical and Hellenistic Greece, historians grappled with how to conceptualize their most distant past. Thucydides offered one of the first critical narratives of Hellenic origins in the aftermath of the Peloponnesian War. In the late 1st-century BCE, Marcus Terentius Varro composed the *Antiquitates rerum humanarum et divinarum* (now lost), which profoundly shaped subsequent Latin historical and philosophical descriptions of Roman society. His contemporary, Livy, produced the first “complete” Roman history: his work “From the foundation of the City”, *Ab Urbe condita*, blended mythology with historically documented events after Hellenistic models. One century later, Flavius Josephus compiled the Jewish biblical and historical tradition into twenty books of Ἰουδαϊκὴ ἀρχαιολογία (*Antiquitates Judaicae*). This story of “Jewish antiquities” had an exceptional success, being considered as the historical foundation of the identity.

Between the late 18th and the 19th centuries, modern nation-states were taking shape. The major European powers transformed themselves into national empires, with colonial projects whose “Classical” origins had to be invented. In this context, the ancient literary genres of *archaiologia/antiquitates*, developed as the antiquarian field of study during the Renaissance, have become academic disciplines. While the Anglo-American *Classics* concentrated on the study of a canon of major texts, the German *Altertumswissenschaft* and French *Sciences de l'Antiquité* advanced a broader and more revolutionary program: the systematic and “scientific” study of all available textual and material evidence—what would today be called an “interdisciplinary” approach.¹

Taken together, *Classics* and *Altertumswissenschaft/Sciences de l'Antiquité* sought to reveal the foundations of modern ethnic identities—and, at times, of nationalism, colonialism, and racism—as well as for the roots of European political regimes, Western philosophy, monotheistic religions, myths, sciences, and the arts.²

¹ See, for example, Harloe 2013; the studies in Lanza, Ugolini 2022. For the scientificity rather than the scientism of the German project, see Krause 2024; with reference to Friedrich August Wolf, the first rhetorician of the concept of *Altertumswissenschaft* (*Darstellung der Alterthumswissenschaft nach Begriff, Umfang, Zweck und Werth*, in 1807) see now Loporcaro 2025.

² For the origins of the notion of “Europe”, see now Sebillotte Cuchet *et al.* 2024; for the “West”, Mac Sweeney 2023. The present day use of archaeology in Israel and Greece, described from a personal perspective, is the object of Greenberg, Hamilakis 2022. The impact of the Classics on the modern Western European cultures is best described in Canfora 1980 and 1989-2004 (for Italy and Germany), Espagne 1997 and 2005 (for the German-French connection), Jorge 2018 (for France); García Jurado 2016 (for Spain), Malamud 2009 and 2019 (for the USA). Lately, see Canfora, Schiano 2024 (for Italy), Roche 2018, Rebenich 2021 and Wiedemann 2024 (for Germany), Funder *et al.* 2019 (for Denmark),

In the early 20th century, as scientific positivism gave way to relativism, the perceived gap between “us” and “our ancestors” grew significantly. Historians shifted from writing educative narratives (*Belles Lettres*) to adopting the perspectives of social scientists – anthropologists, psychologists, ethnographers or, more generally, philosophers. French and Francophone Classicists have been the first to be influenced by these sociological methods, due to the prestige of Claude Lévi-Strauss, Pierre Bourdieu, Michel Foucault, Jacques Derrida, and, on space-related topics, Maurice Merleau-Ponty, Henri Lefebvre, Gilles Deleuze, Paul Ricoeur and Philippe Descola. The impact of the “French theory” has been the final separation between us and the ancient Greeks and Romans, who have finally started to be considered as “others” and studied just like any society scrutinized by a foreign ethnographer.³

In the late 20th and early 21st centuries, after the “spatial turn” (marked, in Mediterranean studies, by the work of Fernand Braudel⁴), Classics have come under the influence of the successive “environmental” and “ecological” turns. The environmental turn, best represented by the influential work of J. Donald Hughes, one of the fathers of “environmental history”,⁵ draws attention to pollution, protection, and sustainability. The ecological turn emphasized the entanglements of humans and nature, including

Teixeira-Bastos, Lichtenberger 2022 (for Portugal and Brazil), the articles edited by Edwards 1999 and by Harloe *et al.* 2018 (for Western cultures); for the impact on the colonized cultures, see, among others, Goff 2013 (British Africa); Blouin, Akrigg 2025 (for the whole world). A panorama of the current academic situation of Classics worldwide has just been edited by Hunt, Bulwer 2025.

³ For the French influence in the writing of ancient history, see our chronicle in *DHA*, 40/1, 2014, p. 239-305 (especially p. 299-305). See also the personal testimonies of Pierre Vidal-Naquet (1985), Jean-Pierre Vernant (2008a and 2008b), Marcel Detienne (2008), François Hartog (in Hartog *et al.* 2016), François Lissarrague *et al.* (2023).

⁴ Besides his *opus magnum* on Philip II's Mediterranean, see also Braudel's less known work, republished in 2025. For his reception after Horden, Purcell 2000, see the studies in Concannon, Mazurek 2016, and in Horden, Purcell 2020. Some of the main representatives of the “spatial turn” in the study of the Greek and Roman texts have been Richard Talbert, Graham Shipley, Pietro Janni, Francesco Prontera, Serena Bianchetti, Hans-Joachim Gehrke, Klaus Geus, Michael Rathmann, Jehan Desanges, Pascal Arnaud, Patrick Counillon, Christian Jacob, Didier Marcotte, Pierre Moret, Francisco José González Ponce, Gonzalo Cruz Andreotti, Daniela Dueck. Recent insights into the “spatial turn” in Classics were presented in our chronicle “Le sacré et ses espaces en Grèce, en Étrurie et dans l'Italie romaine”, *DHA*, 46/1, 2020, especially p. 275-304, and “Cartographeur l'Asie”, *DHA*, 47/1, 2021, especially p. 300-323.

⁵ Cf. Hughes 1975, 1983, 2005, 2009², 2014², 2016². Besides authoring numerous articles on various aspects of the historical environments of different ancient cultures, Hughes also served as one of the editors of the journal *Environmental History*.

modes of thinking about the environment.⁶ This change gave rise to new trends in the history of spatial representations, marking a shift from “geocriticism” to “ecocriticism”, that is, from the study of the geographical texts and maps in their cultural tradition to that of the natural and anthropic milieu in a broader, historical context.⁷ Despite some concerns with environmental determinism in the interpretation of the major historical events (such as the fall of ancient civilizations),⁸ the importance of the ecological approach is growing in both the study of ancient literatures, as well as in geo-bio-archaeology and climatology.⁹ The evidence about paleoenvironments and paleoclimates seems now strong enough to allow suggestions of past solutions for contemporary quests of “resilience”.¹⁰

Following the evolution of processual and post-processual archaeology, Classical studies benefit from collaborations with almost all natural and social sciences. Even if the humanistic ideal of a universal culture is now out of fashion and the “total history” remains a utopic ideal, many historians get training in these scientific disciplines. Interdisciplinarity is not an ephemeral fashion but a *conditio sine qua non* for the reconstruction of the ancient pasts. This deserves emphasis now more than in the 19th or 20th century, for at least three reasons:

- The widening gap between the humanities and the sciences. This divide is greater today than the discrepancies between history and philosophy, or between history, archaeology, and the social sciences in the 20th century.

⁶ After the pioneering books of environmental history dealing with the Classical world by J. D. Hughes (mentioned *supra*), Fedeli 1990, Panessa 1991, and Sallares 1991, see Thommen 2012, Egerton 2012, p. 1-15; Voisin 2014; further bibliography can be found in Bonnanno, Bonnet 2018. The most important disciplinary approaches in contemporary Classical environmental studies are illustrated in Redman 1999, Walsh 2014, Haldon *et al.* 2018, in the articles collected by Harris 2013 and in the bibliographical review of Weiberg, Finné 2022. For the Jewish contexts, see Simkins 1994, Belser 2015; for ancient China, the articles in Miller *et al.* 2014.

⁷ For environmental approaches of ancient texts, see the studies in Siebert 1996; Mauduit, Luccioni 1998; Mauduit 2006; Clément 2011; Futo Kennedy, Jones-Lewis 2016, Schliephake 2017; Chiai, Cordovana 2017, and the highly influential book of Harper 2017.

⁸ Multiple controversial details in Harper 2017 are discussed by Haldon *et al.* 2018a; cf. Th. P. Newfield in *BMCR* 2019.10.21, online <https://bmc.brynmawr.edu/2019/2019.10.21/>; Bresson 2020; Leveau 2021. More generally, Sessa 2019.

⁹ For the methodology of paleo-climate reconstruction, see for example McCormick 2019; White *et al.* 2022; Manning 2025.

¹⁰ See for example Haldon *et al.* 2018b and 2024; Izdebski *et al.* 2022.

Cross-disciplinary training in political, economic, and environmental studies, combined with digital skills, should become standard, as proven by the papers included in this chronicle, below.

- New cutting-edge scientific discoveries. Breakthroughs such as isotopes and DNA analysis, which has enabled the study of paleoclimates and ancient genetics, or the use of generative AI to recover ancient texts (*e. g.*, the Herculaneum papyri), provide unprecedented evidence for reconstructing the past.¹¹ In the future, lost languages could be reconstructed, lost sites could be found, and new interpretations will be possible even for well-known texts. Such advances offer new insights not only for historians but also for natural scientists, who can use quantitative or qualitative information from archaeology and history in their models of past and future environments and climates.
- The future impact of artificial intelligence. Recent advances in data mining and large language models are sometimes seen as a threat to the humanities. They will certainly reshape academia, as society's need for translators and assistants diminishes. But the study of Classics—like the study of any language and culture—should never have been reduced to memorizing grammar or compiling facts, tasks delegated to enslaved laborers by the Ancients themselves, and now to free AI systems. Now, they offer an opportunity to return to the essence of Classics and pursue inquiry on the fundamentals of the human mind, emotions, values, and self-awareness. Furthermore, by their capacity to treat big data and predict models, these generative systems will increase our textual and archaeological evidence, but also accelerate and improve the study of details.

These changes come simultaneously with attempts at the “globalization” of Classics. Already in the second part of the 20th century, more and more Classicists looked at the Greco-Roman connections far beyond the Mediterranean and the Black Sea, from Scandinavia to the Sahara and from India to Siberia. The French excavation of the Hellenistic city at Ai Khanoum remains a symbol of this process of rediscovering Hellenic culture, as far as Afghanistan.¹² The next step is to encourage the study of

¹¹ Two recent examples of impressive developments based on the large language models (LLM) are the reconstruction of Greek and Roman inscriptions by Ithaca and Aeneas (developed by Google DeepMind and freely available at <https://predictingthepast.com/>), and the composition of Latin texts by LatinIA (developed at the Haute École Pédagogique Vaud, Switzerland and freely available at <https://latin-ia.hepl.ch/>).

¹² For this definition of “global Classics” referring to the networks of the Greco-Roman world, see Bromberg 2021. For Alexander's and then the Seleucid expansion in Central Asia, see the paper of Claude Rapin in our chronicle of *DHA*, 2021, p. 324-365. Recently, the French School in Athens resumed

other languages and texts that served as “classical” models in civilizations that had no direct connection, but which can be compared with the Greco-Roman world.¹³ This extension of Classics on a global scale aligns well with their origin as academic field, with the needs of today’s environmental studies and with the openness of the Greek anthropocentric thinking. In fact, even if the ancient writers did not tell their history in “global” terms, because human history written down in texts became genuinely global only from the 16th century, they perceived their world (the Greek *oikoumene*, the Roman *orbis terrarum*) as being “open”, because surrounded by *terrae incognitae* and the Ocean that nobody crossed.

2- World empires in a Classicist’s perspective

One of the most fertile areas of Classical scholarship in today’s globalized context is the study of empires. As one can see from the scholarship about the supposed environmental and climatic determinism of the destiny of the Bronze Age cultures, of Rome, or of Maya, the global ecological and economic crises, with the collective fears they generate, provoke a wide interest in the fall of empires and civilizations.¹⁴ The danger is to adopt a simplistic approach and to imagine that the exhaustion of natural resources, climate change or epidemics are direct causes for the end of a world. To avoid this trap, it is necessary to have an in-depth understanding of how empires work, how they exploit resources and manage risks. Such moderate approaches of complex situations have been adopted recently in sustainability and resilience studies—such as those dealing with ancient China¹⁵ and with the steppe of the Mongolian empire.¹⁶ Therefore, environmental studies need “imperiology,” the new academic field that has

the publication of the *Mémoires de la délégation archéologique française en Afghanistan* (MDAFA) with the volumes of Bousdroukis 2025.

¹³ For the origins of this approach in the last 200 years of Classical studies, see Assmann 2018. For the fruitful comparison between the Greco-Roman world and ancient China, see, as examples, the papers in Scheidel 2015, and our chronicle co-edited with Huang Yang, in *DHA*, 48/1, 2022, p. 407-450, and *DHA*, 50/1, 2024, p. 309-410.

¹⁴ This trend started in the 1970s (cf. the bibliography in Yoshino 2005), but successful essays were especially Linden 2006, Fagan 2008. For the fall of the Mycenaean civilizations, see Finné *et al.* 2017; cf. Cline 2021². For Rome, see Harper 2017 with the controversies quoted above. For the Maya, Seligson 2023.

¹⁵ See, for example, Cheung *et al.* 2019; Zhang *et al.* 2021.

¹⁶ Struck *et al.* 2022.

emerged from the historical comparisons of Western and Eastern empires in the post-colonial era and which will certainly grow in the context of tensions among China's global economic ambitions via the "Silk Roads," Russia's neo-Eurasianism, and the "America First" policies of MAGA populists.¹⁷

In the last part of the 20th century, after the fall of the Italian, French, and British empires, while facing the Marxist-Leninist accusations against the capitalists' imperialism, some historians formulated serious doubts about the "imperialism" of the ancient empires, and in particular about the motivations of Rome's hegemonic expansion.¹⁸ The collapse of the Soviet Union and the conclusion of the Cold War even raised the hope of an "end of history."¹⁹ That hope, however, quickly faded as the failure of global democratic pacification gave rise to "illiberal democracies." These regimes divide the world into spheres of influence, dominated by powerful nation-states that assert their superiority over weaker neighbors, often denying them political individuality. While such contemporary states rarely recognize themselves as "empires" or "imperialistic," their political ideologies remain indebted to theories formulated in past centuries by historians and philosophers who studied ancient empires. Classicists can explain the role played by their discipline in these new ideologies, which are the result of a compromise between how different civilizations assumed their imperial past and how they deal with the political, economic as well as cultural colonialism of the West.

Two points in this regard require further attention. Although Europe has been the spreader of the imperial model, the first empires were invented in Western Asia; moreover, the most durable empires were outside Europe—if we cumulate the dynasties on the Chinese territory into a civilizational empire which has lasted more than 2100, or the Egyptian dynasties over 2600 years. Furthermore, Europe's imperial history does not begin in Antiquity, even if Rome provided not only the Latin term *imperium* but also the paradigms of Western and Eastern (Byzantine), Germanic and Hispanic (Catholic), and Tsarist (Orthodox) empires.²⁰ Since all these European

¹⁷ The term "imperiology" was imposed by the Japanese political scientist specialist of Russia, Kimitaka Matsuzato, in seminal books such as Matsuzato 2010.

¹⁸ Cf. e. g. Badian 1967; Veyne 1975; *contra* Musti 1978; Harris 1979; Hermon 1984. For the other ancient empires, see in the same period the papers in Garnsey, Whittaker 1982.

¹⁹ Fukuyama 1992.

²⁰ For understanding the etymology of "empire", one must distinguish *imperium* from related Latin terms such as *potestas* (general power), *maiestas* (the dignity of the people and then of the emperor) and

empires provided evidence which served for the identification of the socio-political, economic and cultural characteristics of an empire, the Roman empire itself appears as the fundamental reference in “imperiology”. Rome itself, however, was not a European empire, neither geographically nor historically.²¹ Starting with the Punic Wars, Rome expanded along the shores of the “Internal Sea”—our Mediterranean and Black Seas—extending across the three parts of the ancient *oikoumene*: Europe, Asia, and Africa. Following the fall of Alexandria, the last of the Hellenistic capitals to resist Roman power, Rome could claim universal dominion. Roman poets contemporary with the battle of Actium celebrated this achievement: Virgil mentioned an “empire without end” (*imperium sine fine*),²² while Ovid declared that the “space of the city of Rome is the same as that of the world”²³. This vision of universal power became a leitmotif of Augustus and his successors, imitators of Alexander the Great, the Macedonian king who claimed to have walked in the footsteps of Dionysus and Heracles to the ends of the Earth. It is this claim of universality that marks, in my opinion, the birth of the empire.

From this perspective, “empires” can be defined as polities that claimed, or aspired to claim universal power—beyond ethnic, geographic, or natural boundaries. This means that statehoods based on federalism or conquest outside the borders of a city-state, an *ethnos*, a kingdom or a national-state, which did not claim global or cosmic power, cannot be considered as “empires” *stricto sensu*. The definition is useful for the categorization of the Near Eastern, Egyptian, Achaemenid, Macedonian, Roman, Parthian, Sassanian, Chinese, Kushan or Indian ancient empires, which inscribed themselves into a series of empires and recognized their debts one towards the previous empire.²⁴ But it leaves aside several powers usually qualified as “empires”—such as the Athenian thalassocracy which monopolized the First Delian League, during the 2nd half of the 5th century BCE, called “ἀρχή” by Thucydides himself²⁵. Another consequence

auctoritas (the capacity to make things grow). *Imperium* meant: 1. the military or political command itself; 2. the authority to issue such a command; 3. the power through which sovereignty was effective; 4. the spatial extension of the power, inside and beyond the City.

²¹ See Sebillotte *et al.* 2024.

²² *Aeneid*, I, 275-279.

²³ *Fasti*, II, 683-684.

²⁴ See, for example, the papers in Morris, Scheidel 2009; Cresci, Gazzano 2018; Gehler, Rollinger 2014; Rollinger *et al.* 2020; Gehler, Rollinger 2022; Gehler *et al.* 2022. For a general synthesis, Richardot 2003.

²⁵ *History of the Peloponnesian War*, I, 96-97.

of this definition is that imperial undertakings are far more difficult to trace in oral cultures, from which we did not preserve written documents with the universal claims of their chiefs. Even if some masters of the steppe could have imagined their territory as boundless, it is difficult to accept the idea of Scythian or Sarmatian and even Hunnic empires (before Attila).²⁶ As a consequence, it is important to remember that ancient states are far more diverse and that the categorization as “empires” is only a heuristic tool of the modern researcher, who builds his/her historical narrative on the Roman notion and on the Medieval and Early Modern theoretical patterns of *imperium*.

In fact, the historiographic definition and the study of “empire” are mainly Western European creations and draw on realities inherited from the Holy Roman Empire (a matrix for modern federalism), which stood in contrast to the French “national” model of centralized law and administration. The Medieval formula *rex imperator in regno suo*—king and emperor within his own realm, without recognizing the superior power of the Holy Roman Emperor and of the Pope—was the Sicilian, French, Spanish and then the English monarch’s answer to the dichotomy between kingdom and empire, that is, between the “national” and the “universal” models of statehood.²⁷ With Napoleon Bonaparte, who came back to Augustus’ model of power, building on the traces of the Roman Germanic empire, the concept took on a new, explicitly universalist dimension, seeking to spread the ideals of the French Revolution—and with them, the political sovereignty of the nation—across the world. “National empires” and “universalism” are products of 19th-century Europe, combined—in the case of British India—with the ancient Asiatic imperial tradition.

During and immediately after the First World War, the collapse of the last multinational dynastic empires, of the Tsars, the Habsburg and the Ottomans, paved the way for the ideological confrontation between ultranationalist empires—epitomized by the Nazi slogan *Ein Reich, ein Volk, ein Führer*—and the Soviet Union, which rejected the very label of “empire” while constructing its propaganda around the struggle against imperialism.

Despite the postwar condemnation of fascism and extensive work on “collective memory”, fascist and even “ultrafascist” interwar thinkers are nowadays once again attracting interest. Carl Schmitt and Julius Evola, for instance, grounded their theories of empire in Roman history and in the European opposition between state

²⁶ Pace Beckwith 2023, who describes a “Scythian” empire, analogues to the Chinese one.

²⁷ Bossuat 1961; Carbasse 2017, p. 73-74.

power and ecclesiastical authority. Their influence is acknowledged today by “New Right” reactionary movements, which use numerous references to Classics. In France, Alain de Benoist’s *L’Empire intérieur* (1995) reintroduced Indo-European studies to nationalist and traditionalist audiences nostalgic for Aryan supremacy. Academic debates over the far-right sympathies of influential scholars such as Georges Dumézil and Mircea Eliade have since captured the broader public attention. Across today’s political spectrum, figures as diverse as Steve Bannon, Donald Trump’s former campaign strategist, and Alexander Dugin, the Russian ultranationalist and architect of neo-Eurasianism often dubbed “Putin’s brain,” invoke the notion of Western decline, echoing Oswald Spengler’s *Untergang des Abendlandes* (1918-1922). For many, the proposed solution lies in a “return to tradition,” a theme inspired by René Guénon, whose perennialist philosophy posited the survival of a primordial truth in ancient India. This far-right traditionalism is grounded in religion, and occasionally embellished with motifs from Classical mythology, such as Dugin’s invocation of Hyperborea as the original homeland of human civilization (in the footsteps of Herman Wirth).²⁸ Leaders of this movement, belonging to a current called by Max Weber “Caesarism”, share features of authoritarianism and populism with major figures of the Classical world.²⁹

The ecological views of these “New Rights” range from the rejection of the “return to nature”, in the continuation of Julius Evola (1961), to the development of an “identitarian ecology”, based on “bioregionalism”, that is, on the belief in an intimate connection between a people and a specific place, which should not be contaminated by the Other.³⁰ Classicists can play an important part in the dismantling of these non-scientific theories, by explaining their factual errors, by the geo-bio-archaeological reconstruction of paleolandscapes, the study of migrations and the explanation of the interdependency between humans and nature.

3- Archaeological and historical examples of studying ancient imperial environments

This chronicle brings together two examples of how “global Classics” deal with the study of ancient empires, their management of natural resources (soil and subsoil) and their environmental impact. The two papers are complementary not only in terms

²⁸ Douguine 2023.

²⁹ Schwentzel 2017; Doan 2019. For this “wrong” reception of Antiquity in the 20th century, see Traina 2023.

³⁰ Cf. Antonacci 2024.

of the geographical and chronological scope they address—from Archaic Greek and Italic settlements in the Western Mediterranean, through the Roman Empire and its networks, to Han China—but also in their methodology of research and writing. One examines the development of cultivated landscapes in agrarian societies over the long term, with a particular focus on the diachronic transfer of cultural practices. The other compares two roughly contemporary empires—Rome and Han China—that developed independent strategies for the exploitation of metal resources.

Rodolfo Brancato's study of land surveying in Southern Italy and Sicily (from which the following article on Catina in Augustan times is only a part) requires modern non-invasive or micro-invasive techniques of geo-bio-archaeological survey, such as remote sensing, geophysics, geomorphology, paleobotanics (including palynology and dendrochronology), and finally archaeological excavations, which complete the information gathered from ancient maps and texts. In the long run, this research provides not only new historical data (who made the land division, how and why fields and cultures changed over time, and what are the demographic, economic and political consequences of each land distribution). It also pushes the scientific limits of our dating techniques and encourages the use of artificial intelligence for mining the big data obtained from all the sources, allowing us to determine the limits of ancient plots. This type of research will not only bring new insights into ancient economies, demography and paleolandscapes. It may change our perception of heritage: should we preserve the traces of imperial land surveying like any other archaeological artefact? Is an economic tradition as important as any other cultural tradition?

Ching-Yuan Wu's paper is a further development of his project of comparing the Qin-Han and Roman Mediterranean iron industry, after having modelled their respective systems of extraction, manufacturing, and trade. The use of archaeological, epigraphic and historical sources specific to each of the two areas requires new methodological developments in modelling of each series of historical data, for a solid reconstruction of the specific context and a good understanding of both the Roman and the Han administrative policies. In conclusion, Wu's paper offers not only a new, more complete review of the available information about the Chinese state-control, which determined an apparently more robust productivity of steel, in comparison with the Roman technological versatility. It also shows the limits of comparativism: the method is useful because it inspires new questions in traditional historical schools, but its results remain limited by the dangers of extrapolation, especially when dealing with ancient fragmentary evidence.

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II- The Agrarian Landscape from the Republic to the Empire: The Changing Settlement System of Catina as a Case Study

Rodolfo BRANCATO

The territory of Catania (CT) constitutes one of the case studies of the PRIN 2022 PNRR research project ASH. Archaeological Investigation of Soil Heritage: the Case of Andosols. An Integrated and Open IT Approach to Investigate a Crucial Agricultural Resource in Central-Southern Italy (Latium, Campania, Calabria and Sicily) through Archaeology, Pedology, Archaeobotany and Remote Sensing (acronym: ASH; project code: P2022NNE72).

Introduction

Numerous historiographical contributions have explored the development of the agrarian economy in eastern Sicily from the period of the civil wars to the Julio-Claudian age, particularly in light of the increasing volume of archaeological evidence now available for the island, the first *Provincia*.³¹ Known by Cicero³² as the “grain basket” of the Mediterranean, Sicily played a central role due to its agricultural production both after the mid-to late Republican age and in the Augustan era, when land was allocated to veterans in newly established colonies.³³ In the island, with the exception of the 5th century BCE divided *chora* of Kamarina,³⁴ agrarian systems are not archaeologically verified; the hypothesised Roman centuriations of *Lilybaeum* (Marsala) and Sofiana (Mazzarino) have been respectively refuted through the archival research on agrarian cadastral systems.³⁵ The transformation of Sicily during the Hellenistic period has been studied through the lens of its urban contexts.³⁶ However, since the 4th century BCE the island experienced complex economic and social transformations of the rural landscapes, as surface archaeology has revealed.³⁷ The Roman impact on

³¹ Giardina 1988-1989; cf. Manganaro 1988; Campagna 2003; Prag 2009a-b. On the economy of Roman Sicily, a still fundamental reference is Mazza 1980-1981; cf. Belvedere, Bergemann 2018, with further bibliography.

³² *In Verrem*, II, 3.

³³ Wilson 1990.

³⁴ Brancato 2022a, with bibliography.

³⁵ Frentress, Kennet, Valenti 1986, cf. Mosca 2018.

³⁶ Pfuntner 2019; cf. de Ligt 2019.

³⁷ Burgio 2017, with bibliography.

the rural landscapes became evident long after the conquest, during the early Imperial period.³⁸ This is particularly true in the Augustan colonies, where the arrival of settlers was followed by land allocations, sometimes achieved through territorial expansion.³⁹ Yet, no topographical data show if these allocations determined a reorganisation of the agrarian landscapes: the *Liber coloniarum* only refers to a *viritim* land allocation with wooden boundary markers in the territories of Palermo and Segesta during the age of Vespasianus.⁴⁰ The Roman organisation of the rural landscape took into account existing agrarian structures, as evidenced by the roads already in use, which formed the framework upon which the Roman system was maintained.⁴¹ In eastern Sicily, this scenario directly reflects the Roman intent to preserve the *status quo*.⁴² In cases where survey data are available, such as in the Catania Plain⁴³ and Termini Imerese,⁴⁴ GIS spatial analyses have demonstrated that farms of comparable status are located in similar plots. However, maybe the Roman *limitatio* here did not follow an orthogonal system, and its exact topography remains elusive:⁴⁵ indeed, traditional studies have often overemphasised orthogonal centuriation as a product of Roman military imperialism and economic planning, overlooking the diversity, complexity and long durée of rural systems across the Mediterranean.⁴⁶ This paper aims to address this topic by analysing the topographical evolution of settlement patterns in the territory of Catina/Catania (Eastern Sicily),⁴⁷ focusing on two areas where Republican and early Imperial age data

³⁸ Belvedere 2012.

³⁹ Salmeri 2004.

⁴⁰ *Liber Coloniarum*, Panormus (C 167.17 = L 211.13); Segesta (C 167.24 = L 211.21), cf. Campbell 2000, p. 167.

⁴¹ Uggeri 2004.

⁴² For the economy of Eastern Sicily under Hieron II, see Walthall 2024, with bibliography.

⁴³ Brancato 2020a.

⁴⁴ Belvedere 2018.

⁴⁵ For the definition of *centuriatio* in the context of *limitatio*, see Castagnoli 1958, with bibliography.

⁴⁶ Pelgrom 2018, with bibliography.

⁴⁷ This contribution discusses the results of GIS-based digitisation and archaeological field survey projects concerning the ancient topography of Catania and its hinterland (Albanese Procelli *et al.* 2007; Brancato 2019a; 2020a; 2021; 2024). The Etnean area offers an excellent foundation for analysis, thanks to the long-term archaeological research conducted by E. Tortorici (1990-2019) in both the urban and suburban contexts of Catania, as well as in its hinterland (the municipalities of Castel di Iudica, Ramacca, and Palagonia) and along the Ionian-Etnean coast, now part of the territory of Acireale (Sirena 2012; Tortorici 2016; Brancato, Tortorici 2021).

are available: the alluvial plain to the southwest of the city and the northern region stretching between Mount Etna and the Ionian Sea, where the site of *Acium* was located⁴⁸ (fig. 1).

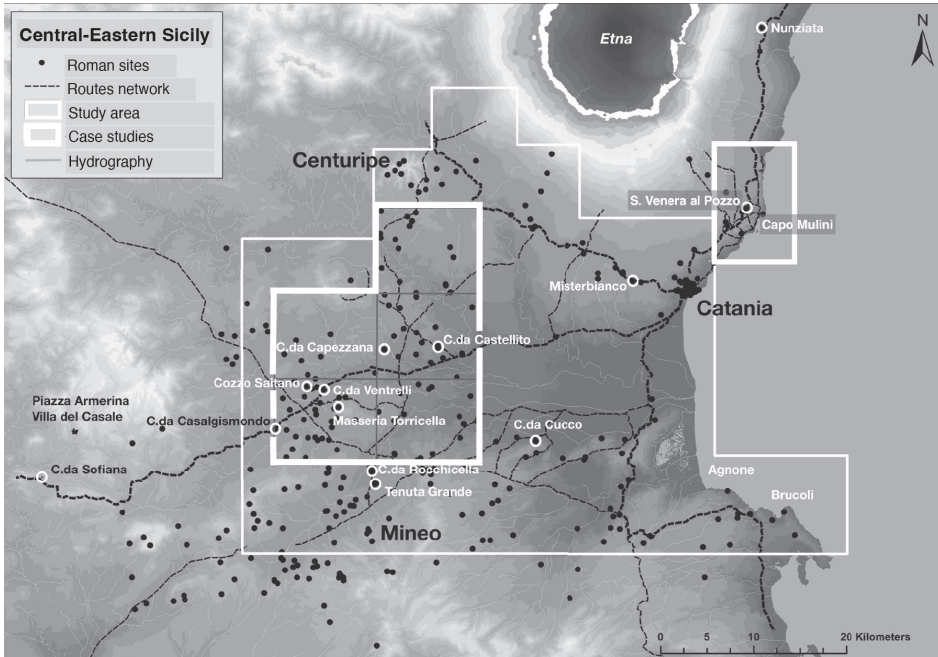


Figure 1: Sicily. The territory of *Catina*-Catania, showing the main Roman sites, the hypothesised road networks, and the selected areas discussed in the text: A) the western margins of the Plain of Catania; B) the hinterland of *Acium*-Acireale.

Credits/fonts: Rodolfo Brancato.

In 212 BCE, following the Roman conquest of Syracuse, Catania regained its territorial autonomy, accompanied by a marked economic and mercantile revival. Within the framework of *Provincia Sicilia*,⁴⁹ and based on the scant information preserved in the literary sources, the city was initially counted among the *civitates decumanae*, with its territory incorporated into the *ager publicus Populi Romani*.⁵⁰ This

⁴⁸ The site of *Acium* is traditionally associated with the archaeological area of Santa Venera al Pozzo (Acireale, Catania: *BTCGI* III, p. 15-22, with bibliography and ancient sources); for the identification of A. in the area of Capo Mulini harbour, see Brancato, Tortorici 2021 and Wilson 2024, p. 831.

⁴⁹ Tortorici 2016, p. 284-285.

⁵⁰ Pinzone 2003.

legal arrangement likely enabled the *locatio censoria* of lands to Roman citizens, resulting in an influx of Italic entrepreneurs engaged in agricultural exploitation, facilitated by the growing prominence of a slave-based production system.⁵¹ Spatial analysis of the available data for Catania's extra-urban area reveals the scale of transformation in the settlement structure between the late 3rd century BCE and the 1st century CE, while recognising both the persistence of certain agrarian features inherited from the Greek period and the emergence of significant discontinuities. These transformations appear to have been driven by the increasing integration of Roman elements into Sikeliot society and economy. By the 1st century BCE, Catania seemed to enjoy considerable prosperity, largely due to its flourishing port activities and the productivity of its rural hinterland. This prosperity was fostered by a dialectical relationship between local traditions and Roman cultural and economic values.⁵² Cicero, on multiple occasions, describes the citizens of Catania as *locupletissimi* and *amicissimi* of the Romans, and refers to their chief magistrate (*proagoros*) as highly esteemed in the capital⁵³ (fig. 2). Elite residential buildings (*domus*) occupied the summit of Montevergine: the city's residential quarter developed during the Late Republican period, expanding further north, although this area was later obliterated by funerary use in the early Imperial period (fig. 3).⁵⁴ However, this period of economic and social prosperity was abruptly interrupted during the seven years (43-36 BCE) when much of Sicily became the base for Sextus Pompey's maritime kingdom, as *praefectus classis et orae maritimae* during his conflict with the *triumviri*.⁵⁵ Catania's loyalty to Sextus Pompey is well attested, notably through silver denarii depicting him as Neptune, accompanied by the two *pii fratres* of Catania.⁵⁶ The end of the civil wars brought significant changes for the Sicilian cities, particularly in the Etnean city, both in urban form and in the organisation of its territory. E. Tortorici (2016) has recently proposed a diachronic analysis of the city's urban features, linking its general layout to Augustus's decision to grant Catania colonial status in 21 BCE, including the substantial settlement of loyal veteran

⁵¹ Cf. Pais 1888; Manganaro 1980; Frascetti 1981; Pinzone 1999; Pinzone 2000, p. 850-852; Molè Ventura 2008, p. 42-43.

⁵² Molè Ventura 2008, p. 41.

⁵³ Tortorici 2016, p. 287-288.

⁵⁴ Tortorici 2016, p. 69, site 54.

⁵⁵ Pensabene 1991; Stone 1983, 2002.

⁵⁶ Tortorici 2021, p. 238-239; cf. Zanker 1987.

soldiers.⁵⁷ Previously, G. Manganaro (1996) had explored this issue and hypothesised a significant expansion of Catania's territory to meet the demand for cultivable land. The settlement of veterans as colonists created challenges in identifying land parcels to allocate. Expansion to the north was not possible, as the foundation of a Roman colony at Tauromenion in 36 BCE had already led to the confiscation of land and the expulsion of the local population,⁵⁸ possibly impacting Catania's territory.⁵⁹

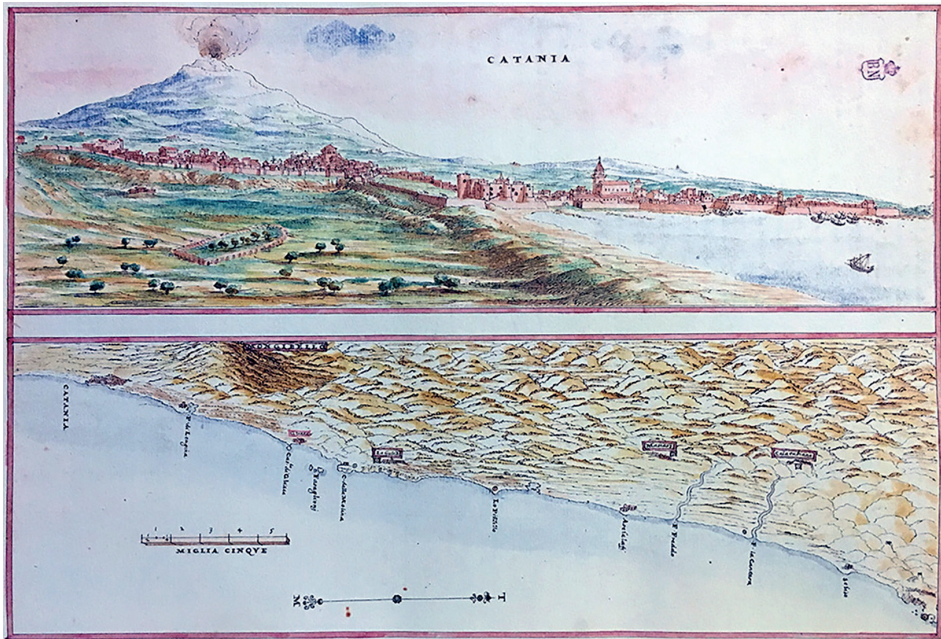


Figure 2: Catania as depicted in a drawing by T. Spannocchi (1543-1606), showing a view of the early modern city enclosed within the medieval walls, and the ruins of an extra-urban Roman building (the stadium).

Credits/fonts: drawing by T. Spannocchi (1543-1606), Biblioteca Nacional de España, ms 788, *Marine nel Regno di Sicilia*, facsimile reproduction edited by R. Trovato, Catania, 1993.

⁵⁷ Tortorici 2016, p. 287-292; cf. Molè Ventura 1996, p. 184-185; Molè Ventura 2008, p. 44-45, n. 125.

⁵⁸ Diodorus, XVI, 7, 1.

⁵⁹ Manganaro 1996, p. 53.

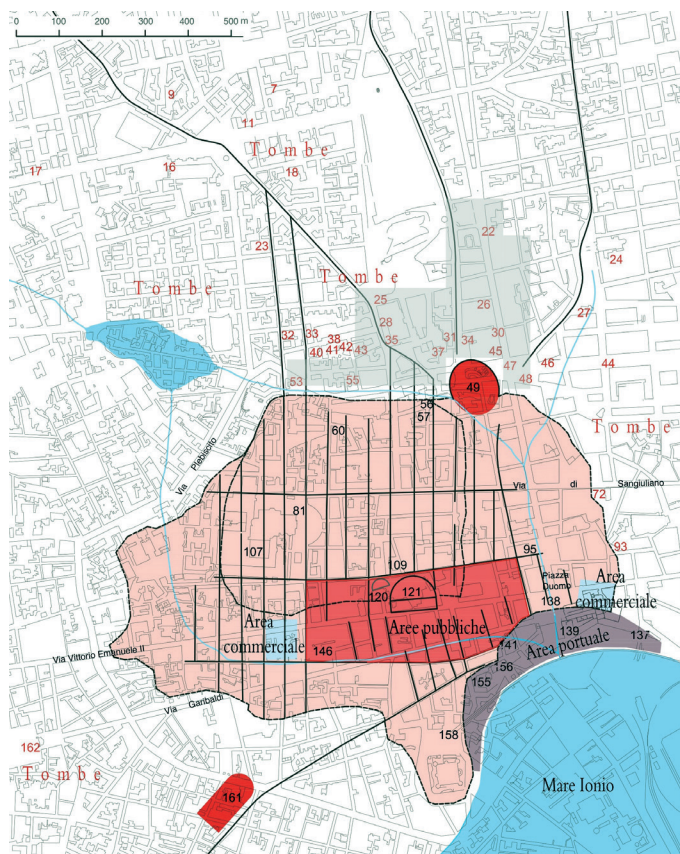


Figure 3: Sicily. Archaeological map of Catania in the Imperial period. The area of expansion during the Late Republican period is shown in transparent grey.

Credits/fonts: reworked after E. Tortorici, *Catania antica. La carta archeologica*, Roma, 2016.

Therefore, if such an expansion did take place, it likely occurred at the expense of territories in the western and southern slopes of the Catania Plain,⁶⁰ historically contested areas between Centuripe and Leontini (fig. 1). The Simeto River no longer marked the boundary between Catina and the *ager Leontinus*, as Strabo indicates that the river flowed through the *chora Katanaia*.⁶¹ Moreover, the territory of Catina may have extended into the Erei region, as ancient sources suggest that the lands of the two

⁶⁰ Brancato 2020a, p. 62-63, 65.

⁶¹ Strabo, VI, 2, 4 C 272.

cities named Hybla were part of its territory.⁶² The allocation of land parcels to the colony of Catina likely involved uncultivated or abandoned lands, possibly corresponding to the *eremia*—the term repeatedly used by Strabo in reference to certain parts of Sicily,⁶³ a phenomenon linked to the decline in agricultural productivity caused by the civil wars.⁶⁴ The Augustan reorganisation of Sicily laid the foundations for future economic and landownership patterns. It is well established that private senatorial interests on the island increased, as senators were granted the privilege of accessing Sicily without prior authorization.⁶⁵ Indeed, senatorial landownership in Sicily was actively encouraged by Octavian following his victory over Sextus Pompey, through the distribution of confiscated lands, most notably to his son-in-law Agrippa.⁶⁶

Data from the the western edges of Catania Plain and the *Akis-Acium* hinterland

Investigations carried out in the western portion of the Plain of Catania, and the number of sites with evidence dating to the Republican period (*villae*, *vici*, and farms), indicate a substantial continuity in the rural settlement pattern established during the Hieronian era. The total number of occupied units compared to the previous phase shows a marked increase (24 topographic units; **fig. 4**). Common features among the areas (11) exhibiting continuity from the earlier phase include the density and quality of surface finds—indicators of the substantial size of occupation already in the Hieronian period—as well as their proximity to watercourses and communication routes. Many of the newly attested sites are situated at lower elevations than those occupied in earlier centuries and are clearly associated with terrestrial or fluvial routes.

⁶² Pausanias, V, 23, 6: “One [Hybla] was called Gereatis, and the other, as it truly was, was known as ‘the Greater’. They still retain these names, but lie within the chōra of Katanaia: one has entirely declined (*erēmos*), the other, Gereatis, is a village of the Katanaioi, to whom belongs a sanctuary of the goddess Hyblaia, venerated by the Siceliotis”. Cf. Manganaro 1996, p. 54-55; Tempio 2014.

⁶³ Manganaro 1996, p. 55.

⁶⁴ Gabba 1982-1983, p. 522; Uggeri 2004, p. 25.

⁶⁵ Tacitus, *Annales*, XII, 23; Cassius Dio, LII, 42, 6.

⁶⁶ Gabba 1982-1983, p. 523; on Agrippa, see Roddaz 1984; on the estates still held by Sextus Pompey in Sicily in 14 CE (for which he was referred to as *Rex Siciliae*), see Caliri 2007, p. 28-29.

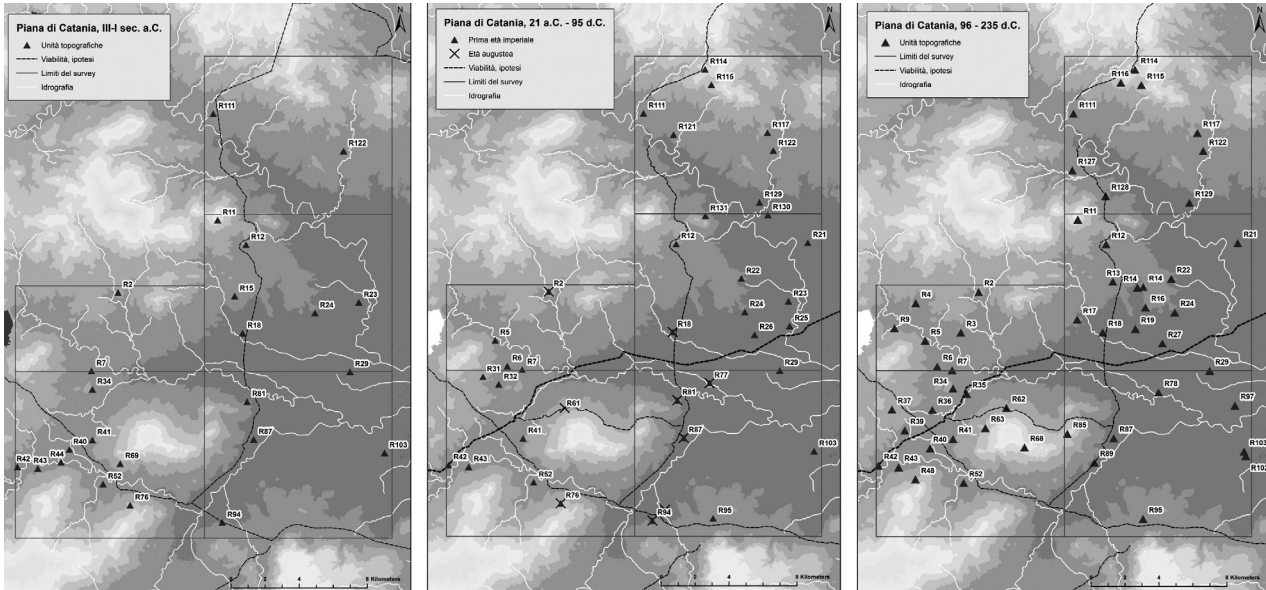


Figure 4: eastern Sicily (Ramacca, Catania). Diachronic distribution of Roman-period sites between the Dittaino and Gornalunga river basins.

Credits/fonts: Rodolfo Brancato.

Based on specific characteristics—such as the size of the scatter, and the quality and density of artefacts—some of these assemblages may be interpreted as stable rural settlements linked to the exploitation of local environmental resources. Evidence of this type is closely related to the hydrographic network, particularly along the Margi—Caltagirone, Monaci, Gornalunga, Dittaino and Simeto Rivers valleys. The data also suggest an increase in the number of occupations between the late Republican and early Imperial periods. During the 1st century CE, the number of occupied areas rose from twenty-four to thirty-five. Of extraordinary interest is the number of sites with continued settlement (18), possibly indicative of a persistent system of landownership formed during the previous phase. Equally significant is the number of new settlements (17). Artefacts datable to the Augustan age have been recorded at least seven sites, notably including thin-walled pottery and early forms of Italic terra sigillata. A shared characteristic among these sites is their low elevation and close proximity to major terrestrial and fluvial routes. The most significant archaeological evidence consists of large quantities of fine tableware (Arretine ware, South Gaulish and late Italic terra sigillata): the presence of such imports in inland, non-urban contexts suggests the wide commercial distribution of these luxury goods throughout the Mediterranean and points to the existence of a wealthy clientele settled permanently in the Sicilian countryside.⁶⁷

Furthermore, in the study area, the highest concentrations of Italic terra sigillata were consistently associated with other indicators of wealth, such as glass and metal artefacts. In general, 1st century CE tableware is frequently found alongside common and cooking wares, roof tiles, and transport amphorae used for imported goods: Dressel 7-11 (fish sauce from Spain), Dressel 2-4 (from the central Italian coast), and Agora M 254 (from North Africa).⁶⁸ The sites attributed to the early Imperial period, based on the size of the topographic unit and the quality of surface materials, may correspond to elite residences established along the banks of the Gornalunga and Dittaino rivers (fig. 5). These watercourses may have served not only as a source of irrigation for

⁶⁷ On the distribution and characteristics of Italic sigillata in Sicily, see Malfitana 2006a; 2006b; 2011, with bibliography.

⁶⁸ The assemblage recovered through field survey is corroborated and enriched by the sample of underwater finds along the coastline: underwater surveys conducted by E. Tortorici (2006) have revealed the presence of Dressel 21-22 amphorae (from Campania), Dressel 6A (from the Adriatic coasts), Dressel 43 (from Crete), Schöne-Mau XV (Southern France), Dressel 2-4 and Dressel 7-11. Cf. Tortorici 2015; Brancato, Tortorici 2021.

agriculture and livestock but also, possibly, as a cost-effective route for transporting agricultural products to the coast. The emergence of large estate complexes (*latifundia*) appears to be suggested in the Dittaino basin by evidence from the localities of Castellito (UT R34), Capezzano (UT R17), and Raso (UT R18) (fig. 5A). In contrast to the Gornalunga area, the Dittaino region seems to exhibit, already from the 1st century BCE, a stabilisation in the number of new settlements and the emergence of dominant centres, such as the site likely occupying the summit of a low hill (106 m asl) east of the Dittaino, in Castellito district (Ramacca).⁶⁹ One of the few Roman contexts excavated in the extra-urban area of Catania,⁷⁰ the investigated sector at Castellito consists of a large quadrangular building measuring 36 × 44 m (fig. 5B). The structures, oriented northeast-southwest, relate to 24 rooms arranged around a peristyle of 19.8 × 19 m, equivalent to 52.25 × 54.45 Roman feet, *i. e.* metrological unit used throughout the complex. The layout follows a rigidly symmetrical plan (fig. 6). Two main construction phases (2nd-3rd centuries and 4th century CE), suggested by masonry techniques (*opus caementicium*) and visible stratigraphic relationships (fig. 6, rooms 2-4), may have been preceded by an earlier phase, hinted at by reused large limestone blocks and Hellenistic pottery.⁷¹ The dating of the earliest phase remains to be verified stratigraphically. However, the building's layout finds comparisons with Sicilian rural villas constructed during the early Imperial period, such as the first phase of the villa at Patti Marina and Phase V of the villa at San Biagio in Terme Vigliatore.⁷² Notably, the site yielded a considerable number of late Republican and Augustan finds during intensive and systematic fieldwalking (fig. 7).⁷³ Among other sites datable to the 1st century CE is the one near contrada Ventrelli, at the foot of Cozzo Saitano (UT R33). In the 1960s, the funerary inscription of Abdalas⁷⁴ was discovered here, *magister ovium* in the service of Domitia Longina.⁷⁵ This marble plaque may mark one of the boundaries of the *saltus*

⁶⁹ On the villa of Castellito di Ramacca, see Spigo 1982-1983; Albanese Procelli, Procelli 1988-1989, p. 7-22; Patanè 1997-1998, p. 200-201.

⁷⁰ Albanese, Procelli 1988-1989, p. 17; cf. Brancato 2020a, p. 292-298.

⁷¹ Cf. Brancato *et al.* 2022.

⁷² Cf. Toscano Raffa 2020 and Tigano 2008, with bibliography.

⁷³ Albanese Procelli, Procelli 1988-1989, p. 7-12.

⁷⁴ EDR 079873 = *ISicily* 0628: *D(is) M(anibus) S(acrum) / Abdalas Domitiae Domitiani / magister magnus ovium / qui bene vixit in officio ann(os) LXXX.*

⁷⁵ As pointed out by S. Salmeri (1984, with bibliography), Abdalas is a theophoric name of Semitic origin. It is attested, for instance, in the Nabataean area in two Greek inscriptions of Imperial date (Umm

belonging to the wife of Domitian,⁷⁶ accessible from Catania through a route that may already have led towards Piazza Armerina at that time.⁷⁷ While the full extent and boundaries of Domitia's estate cannot be determined, it is reasonable to consider that upon her death, the property passed into the *fiscus* , as was the case with another of her holdings, the *horti* in the *Ager Vaticanus* at Rome.⁷⁸ Finally, the reference to a *magister ovium* in the service of Domitia Longina confirms the importance of livestock farming, especially sheep-rearing, in Imperial Sicily.⁷⁹ After the end of the island's central role in supplying grain to Rome, livestock husbandry—although practised already in the Republican period—assumed an increasingly prominent role.⁸⁰

el-Jemal and It-Taiybeh), both localities situated near the caravan city of Bostra and along the *limes* of the province of Syria, where between 60 and 63 CE the imperial legate was none other than Cn. Domitius Corbulo, father of Domitia Longina (Suetonius, *Domitianus* , I, 3; Cassius Dio, LXVI, 3, 4).

⁷⁶ Strabo, VI, 2, 4. Salmeri 1984, p. 18: an inscription from Taormina naming Domitia Longina as the dedicatee is the other secure piece of evidence for her ties to Sicily (cf. Manganaro 1964).

⁷⁷ Cf. Brancato 2019b; Sfacteria 2018.

⁷⁸ Salmeri 1984, p. 20.

⁷⁹ Wilson 1990, p. 193-194; Portale 2005, p. 53-54; cf. Brancato 2021.

⁸⁰ Salmeri 1984, p. 22, notes that the addressee of one of Horace's odes (*Carmina* , II, 16), *Pompeius Grosphus* was likely a descendant of *Grosphus Centuripinus* , a wealthy landowner and victim of Verres' extortion (Cicero, *In Verrem* , II, III, 56). Horace describes *Grosphus* as the owner of vast flocks and herds of sheep, cattle, and horses in Sicily. It is therefore plausible that, within the fifty years separating Verres' governorship and Horace's ode, *Grosphi* acquired the Roman citizenship and shifted from grain cultivation to the more lucrative pastoral economy. Merchant lead seals bearing the name Γρόσφος, surrounding a monogram Ε(βυλιδαζ)—likely related to the wool trade—have been found on the margins of the Plain of Catania (Manganaro 1992, p. 459-464; Patané 2002, p. 132; Patané 2014, p. 104-105). Stamped lead tiles attributable to the GROSFI have been discovered at the villa excavated at Contrada Franchetto (Castel di Iudica, Catania) (Bonacini, Turco 2015, cat. 91, pl. VI; Patané 2021, p. 265) and at Casaligismondo Sottano (Aidone, Enna), a settlement active in the 1st-2nd centuries CE located along the Catania-Agrigento road (Bonanno 2014, p. 83-84; Brancato 2020, p. 115-116; Bonanno 2021a, p. 244-245; Bonanno 2021b, p. 481-482; Barresi, Patané 2024, p. 599-600). Evidence for wool production in Roman Sicily is provided by Cicero (*In Verrem* , II, IV, 58; II, V, 16-20), Strabo (VI, 2, 7), and the *Expositio totius mundi* (LXV), confirming the enduring importance of sheep-farming throughout the imperial period; cf. Calderone 1984, p. 20; Brancato 2019b, n. 72.

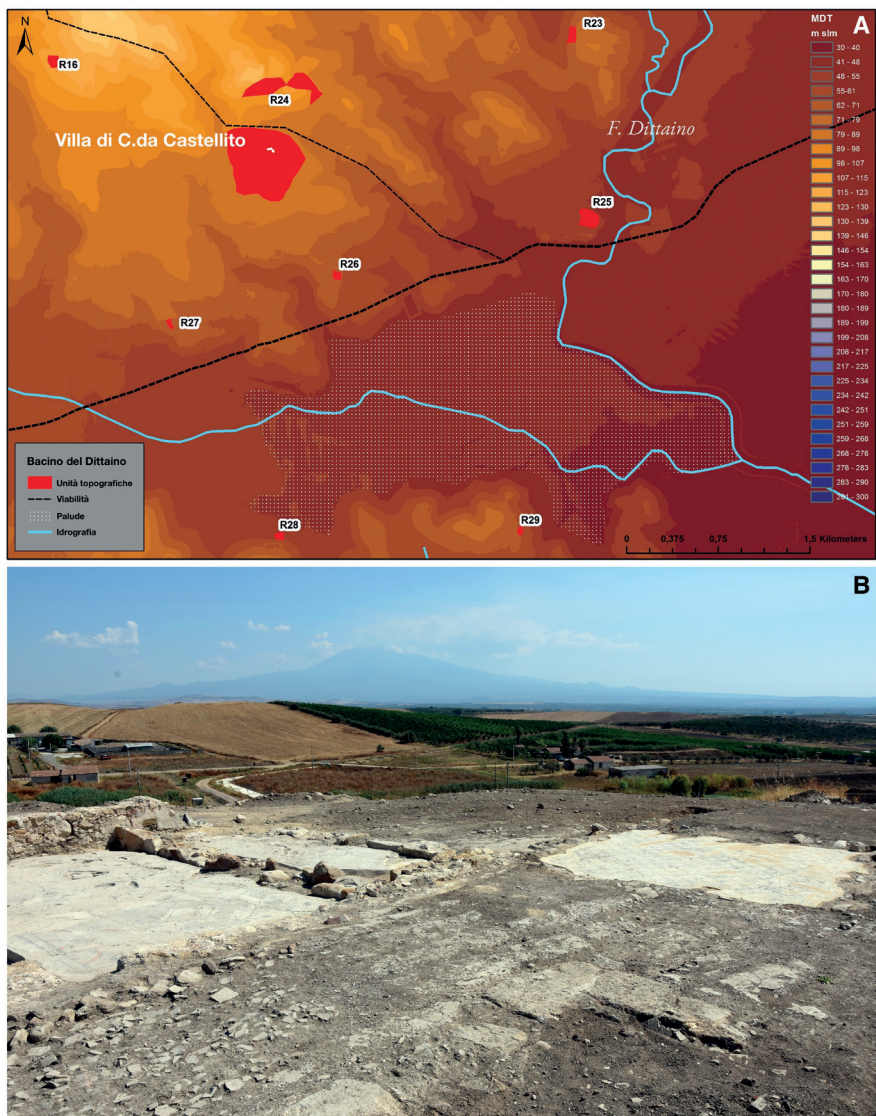


Figure 5: contrada Castellito (Ramacca, Catania). A) distribution of the main Roman sites within the Dittaino valley, based on a digital terrain model (2 x 2 m resolution) by the Regione Siciliana; B) view of the structures of the Roman villa, with Mount Etna in the background (July 2019).

Credits/fonts: Rodolfo Brancato.

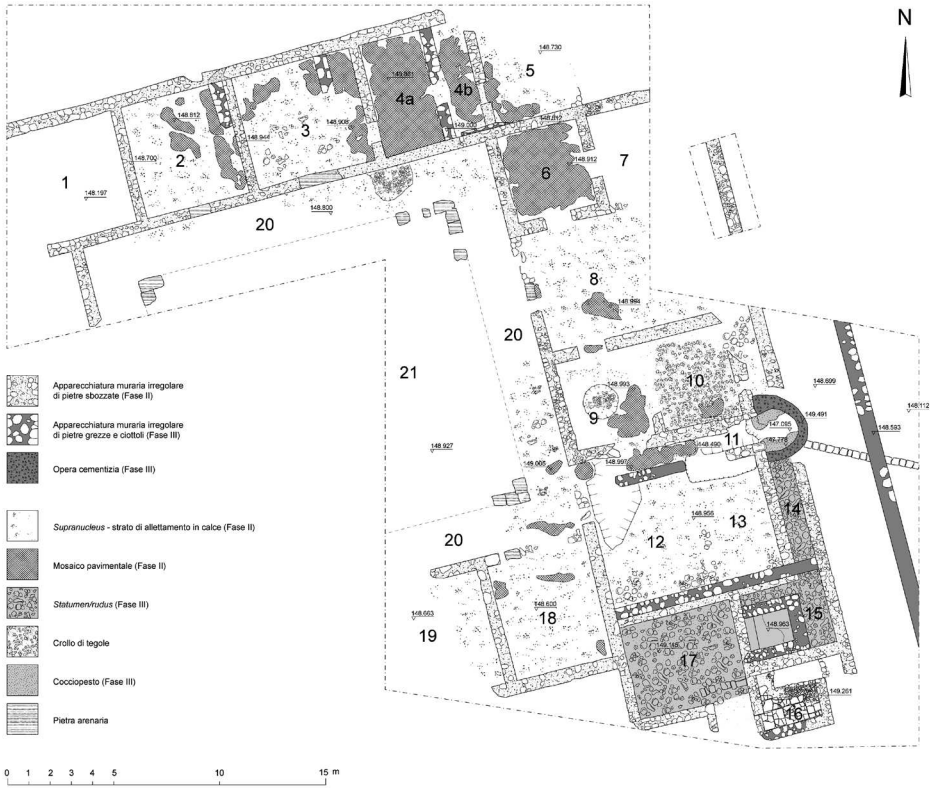


Figure 6: contrada Castellito (Ramacca, Catania). Planimetric survey of the archaeological site. Credits/fonts: Rodolfo Brancato.

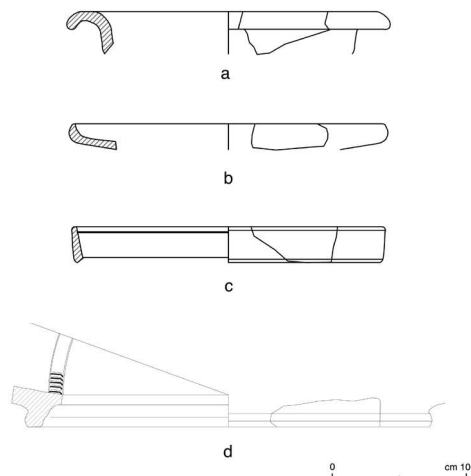


Figure 7: contrada Castellito (Ramacca, Catania). Republican—and Augustan—period pottery sherds from the field survey: (a) rim fragment of a black-gloss ware cup, form Morel 1261; first half of the 2nd century BC; (b) rim fragment of a shallow black-gloss ware patera (Campana B) with vertical rim, form Morel 2250; first half of the 2nd century BC; (c) outward-sloping rim fragment in Italic Terra Sigillata, Conspectus 20, dated to Augustan-Flavian age (d) base fragment with ring foot, fully glazed, from a large dish; base diam. 30 cm; wall nearly straight, sloping outward; Conspectus 1, 40–10 BCE.

Credits/fonts: Rodolfo Brancato.



Figure 8: Sicily. Aerial view of the Ionian-Etnean coast, the urban area and the alluvial plain; in the background, Mount Etna (3 357 m asl).

Credits/fonts: Wikimedia Commons, photo Mauro Cacciola, CC BY 2.0.

In the territory north of Catania, the area spanning from the western fertile slopes of Etna Volcano and the Ionian sea, the settlement system of Hellenistic origin appears to undergo a general crisis (fig. 8). This trend emerges both from the results of the systematic surveys of the territory and from the stratigraphic excavations conducted at the main sites with phases attributable to the early and middle Hellenistic period, namely the areas of Montedoro-Casalrosato and Santa Venera (fig. 9). The site of Montedoro-Casalrosato is a Hellenistic settlement established over an earlier Archaic phase, gradually declined: evidence of occupation continues at least until the mid-2nd century BCE, as indicated by the material culture (common pottery and fragmentary terracotta figurines).⁸¹ In the votive deposit investigated near the settlement and associated with the cult of a nearby spring⁸²—active during the Hellenistic period (from the 4th century BCE)⁸³—the latest offerings are covered by a thick layer of lapilli (10-50 cm) attributed to the volcanic eruption of 122 BCE.⁸⁴

Figure 9: Ionian-Etnean area (Acireale, Catania). Distribution of Roman-period sites.

1. Tombs, Viale Cristoforo Colombo; 2. Necropolis, San Cosmo; 3. Tombs, Viale Ionio; 4. Scatter area, Contrada Cervo; 5. Scatter area, Piazza Indirizzo; 6. Tombs, Corso Savoia; 7. Scatter area; Structures, Contrada Cubisia I; 8. Scatter area; Structures, Contrada Cubisia II; 9. Structures, Chiesa della Pietà; 10. Structures, Via dell'Asilo; 11. Scatter area, Contrada Giglio; 12. Structures; Scatter area; Tomb; Inscription; Coins, Tondo di Casalotto; 13. Shipwreck; Scatter area, Capo Mulini N; 14. Scatter area, Timpa di Acquegrandi; 15. Necropolis, Acì San Filippo N; 16. Necropolis, Via Zio Martino; 17. Scatter area, Valverde/Maugeri; 18. Structures; Scatter area, Contrada Isola; 19. Structures; Scatter area, Santa Venera al Pozzo; 20. Scatter area; Structures, Località Belfiore; 21. Scatter area, Gazzena N; 22. Structures, Contrada Reitana I; 23. Scatter area; Structures, Contrada Reitana II; 24. Tomb; Scatter area, Madonna di Valverde; 25. Structures, Gazzena S; 26. Tombs; Scatter area, Gazzena; 27. Structures; Scatter area, Reitana; 28. Scatter area, Santa Venera/Reitana; 29. Scatter area, Contrada Gazzena; 30. Scatter area; Necropolis, Capo Mulini; 31. Scatter area, Contrada Lecco; 32. Structures, Capomulini-Via Nissoria; 33. Structures; Scatter area; Necropolis, Capomulini-Tempio; 34. Necropolis; Scatter area, Fontana/Casal Rosato; 35. Necropolis, Via di Carminello I; 36. Necropolis, Via di Carminello II; 37. Scatter area, Capo Mulini-Baia; 38. Scatter area; Necropolis, Nizeti; 39. Necropolis, Chiesa della Porta; 40. Structures; Scatter area; Necropolis, Contrada Gelsò; 41. Scatter area, Capomulini S; 42. Necropolis, Chiesa di Santa Maria La Nova; 43. Structures; Scatter area, Acitrezza; 44-45. Scatter area, Monte D'Oro; 46. Structures; Scatter area, Casalrosato; 47. Scatter area, Crocefisso Nizzeti; 48. Scatter area; Rock site, Crocefisso Nizzeti; 49. Scatter area, Campo sportivo; 50. Scatter area, Ficarazzi N; 51. Necropolis, Crocefisso Nizzeti; 52. Scatter area, Contrada Olivo S. Mauro; 53. Necropolis; Scatter area, Hotel Eden Riviera; 54. Structures, Via Dietro; 55. Structures; Scatter area, Monte Fano; 56. Structures, Bastioncello; 57. Structures, S. Maria La Provvidenza; 58. Structures; Scatter area, Monte Vampolieri; 59. Scatter area, Baia di Acitrezza; 60. Structures; Scatter area, Isola Lachea; 61. Structures, Località Cretoni; 62. Structures (unspecified); 63. Structures, Lido del Castello; 64. Cave; Scatter area; 65. Scatter area, Ex Stazione; 66. Scatter area; Structures, Via Re Martino; 67. Scatter area; Necropolis, Scuola Elementare; 68. Scatter area; Structures, Piazza Castello; 69. Scatter area, Via A. Barbagallo; 70. Necropolis, SS 115/Via Battisti; 71. Cave; Scatter area, Grotta Micio Conti; 72. Scatter area, Lido dei Ciclopri; 73-74. Scatter area, Acicastello-seabed.

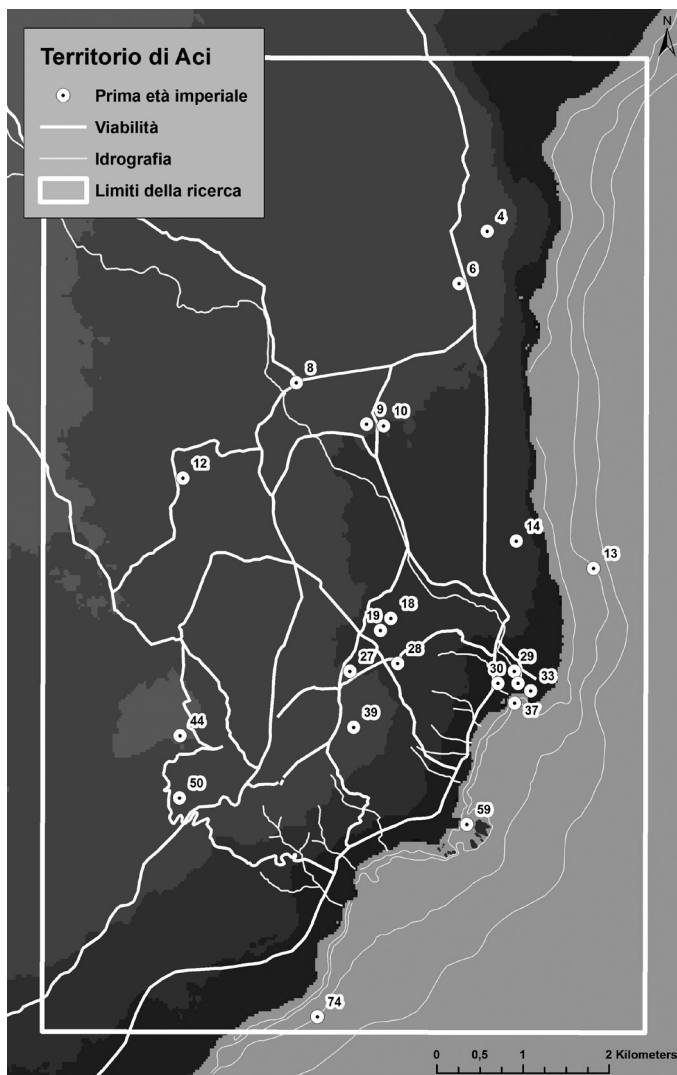
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⁸¹ Privitera 2005, p. 88-89.

⁸² Brancato, Tortorici 2021, p. 202.

⁸³ Grasso 2009.

⁸⁴ Coltelli, Del Carlo, Vezzoli 1998.



Significant changes also occurred in the area of Santa Venera al Pozzo, near Acireale (fig. 10). Here, the so-called *Casa del Pitthos*, an installation active from the 4th century BCE, was abandoned in the early decades of the 3rd century BCE; however, sporadic Republican-era Roman coins suggest continued activity in the area.



Figure 10: archaeological area of S. Venera al Pozzo (Acireale, Catania). Aerial view of the site.

Credits/fonts: Ministero della Cultura, Catalogo dei Beni Culturali [<https://catalogo.beniculturali.it/detail/ArchaeologicalProperty/1900382205#lg=1&slide=2>].

Between the 2nd and 1st centuries BCE, a notable revival in settlement is documented in the territory, taking on forms of considerable monumentality. Among the key pieces of evidence from this phase is the so-called “Building 1”, excavated in the north-eastern corner of the archaeological area of Santa Venera al Pozzo.⁸⁵ This is a complex structure comprising approximately thirty-seven rooms arranged around an open central courtyard, occupying a total surface area of around 1.700 square metres (fig. 11). Probably constructed after 280 BCE on earlier Hellenistic remains and remaining in use for several centuries, the building—judging from construction techniques, layout, and material finds—was primarily productive in nature, most likely connected to agricultural processing and storage of goods such as wine or oil.

⁸⁵ Branciforti 2006, p. 94-97; Malfitana *et al.* 2018, p. 334; cf. Mazzaglia 2019, p. 127-128.

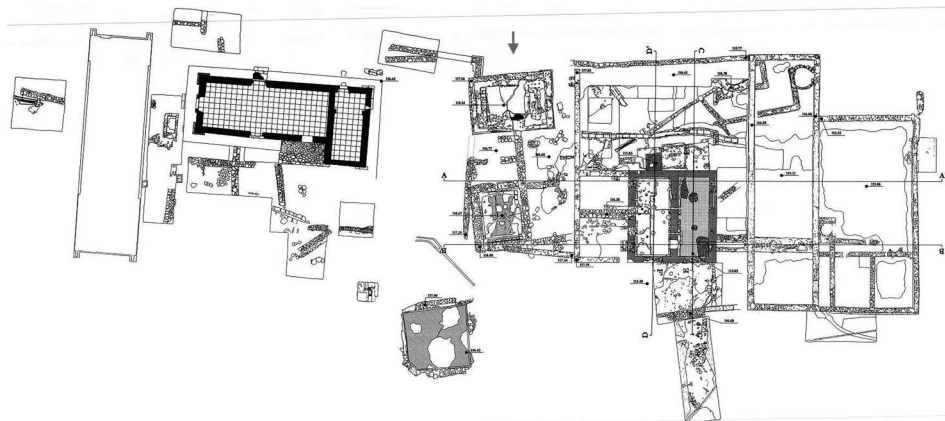


Figure 11: archaeological area of S. Venera al Pozzo (Acireale). Plan of the archaeological site; the grey arrow in the middle indicates the location of the temple.

Credits/fonts: drawing Ministero della Cultura, Catalogo dei Beni Culturali [https://www.sigecweb.beniculturali.it/images/fullsize/ICCD1064413/ICCD15079444_DRA%20Terme%204.jpg].

A short distance away, about 160 metres to the south and near a still-active sulphurous spring, excavations in the 1980s uncovered the remains of a podium temple, likewise built during the Republican period (fig. 11).⁸⁶ The rectangular base, measuring 9.70 m (east–west) by 6.70 m (north–south), is composed of mortar and rubble of varying sizes. In the south–eastern corner, a surviving section of *opus isodomum* in lava stone preserves two blocks still in situ; the others, removed over the centuries, have left clearly visible impressions along the east and south sides. As already noted by U. Spigo, the monument can be identified as the podium of a small temple (*sacellum*), datable to the late Republican period (second half of the 1st century BCE) and probably dedicated to a healing deity, given the proximity of the thermal spring. The discovery in 1825 by L. Vigo of a high-relief sculpture depicting the head of a togate male figure and, more significantly, a female figure identified as Minerva,⁸⁷ led R. J. Wilson to suggest that the sanctuary and the nearby spring were dedicated to this goddess.⁸⁸ The decision to build a sanctuary near the sulphurous spring should be understood not only as an effort to monumentalise the Italic-style cult of locations marked by striking expressions of secondary volcanic activity, but also perhaps as an attempt to reclaim an unhealthy, uninhabitable environment. Notably, in Republican

⁸⁶ Spigo 1980-1981, p. 787-788.

⁸⁷ Vigo 1836, p. 48.

⁸⁸ Wilson 1990, p. 291.

Sicily, such temple monuments are rare—not only in terms of their architectural form but also in their extra-urban context, for which very few comparisons exist.⁸⁹

The contemporaneous construction of the sanctuary and a rural villa likely part of a larger residential and productive complex marks a key stage in the development of the site at Santa Venera. The organisation of the area evidently included water management for the stream that crosses the site from west to east, and the regulation of the spring itself, through channel construction and land reclamation, which culminated in the building of the temple and the initial phase of the associated bath complex.⁹⁰

In the surrounding territory, between the Augustan age and the early Imperial period, there is evidence for a homogeneous expansion of settlement: nineteen sites (*villas*, *vici* and farms) can be dated to this phase (fig. 12).

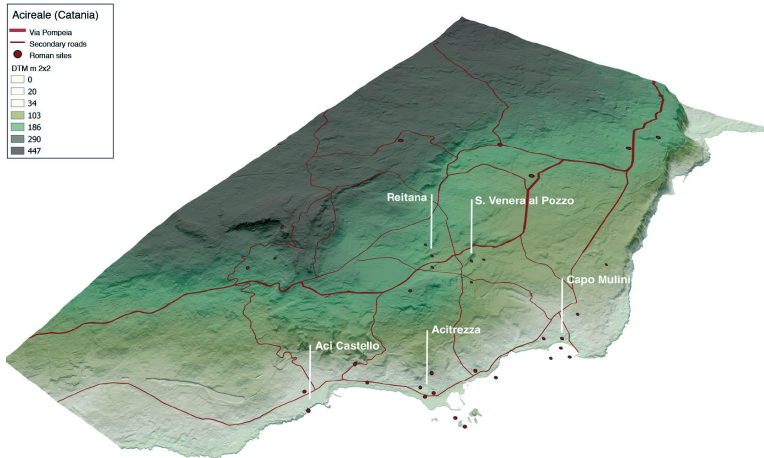


Figure 12: territory of Acireale. Roman-period settlements and roads (main and secondary) between S. Venera al Pozzo (UT 18) and the port of Capo Mullini, Acium (UT 32), on a DTM (m 2 × 2 resolution).

Credits/fonts: Rodolfo Brancato.

⁸⁹ Among the known Hellenistic temples in Sicily, only two are clearly located in extra-urban contexts: the Asklepieion at Agrigento, built within a newly established sanctuary in the 4th century BCE, and the so-called Herakleion at S. Marco d'Alunzio, situated along a route leading into the settlement (cf. Fuduli 2015, p. 309). The environmental setting of the Agrigento sanctuary is particularly noteworthy. Koldewey and Puchstein (1899, p. 183-184) linked the site to a possible sacred spring or well, though no such feature has been found. Marconi, in the early 20th century, noted the unhealthy, clay-rich soil and a permanent water table, which may have motivated the cult's location in an area also inhabited in prehistoric times (De Miro 2003; cf. Fuduli 2015, p. 310).

⁹⁰ Branciforti 2006.

During the Augustan period, another *podium* temple was erected in the bay of Capo Mulini,⁹¹ about 2.8 km from Santa Venera al Pozzo, in a prominent position overlooking the harbour (fig. 13). As is well known, examples of Etrusco-Italic temple architecture are rare in Sicily prior to the Augustan age, to which at least one construction phase of the Capo Mulini temple can be attributed.



Figure 13: Capo Mulini (Acireale, Catania). Aerial view of the bay with the location of the temple.

Credits/fonts: after R. Brancato, E. Tortorici, *Carta archeologica delle Aci*, Roma, 2021.

Originally dated between the 2nd and 1st centuries BCE by G. Libertini and interpreted as a sanctuary dedicated to “una qualche divinità marina,”⁹² the structure was later linked by F. Coarelli to Augustus’s victory in one of the naval battles against Sextus Pompey in 36 BCE (fig. 14-15).⁹³ Recent studies by E. Tortorici have identified at least two building phases at the site. The earlier phase (11.75 × 8.90 m, podium

⁹¹ Tortorici 2021.

⁹² Libertini 1952.

⁹³ Coarelli 1981; cf. Bejor 1983; Belvedere 1988. F. Coarelli’s (1981) hypothesis was later refuted by C. Molè Ventura (2000, p. 207) on the basis of Appianus (*Bellum Civile*, V, 112) to whom the reader is referred for a comprehensive review of the debate. R. Wilson’s early proposal (1990, p. 105 and n. 304;

height 2.40-2.50 m) follows the Etrusco-Italic type, with four columns on the façade and a central staircase (fig. 16A).⁹⁴ A later phase is represented by an additional concrete structure built onto the southern façade—corresponding to the temple front—which extended the pronaos and added a monumental stairway. This later intervention aimed to enhance the visual impact of the temple; in this phase (17.80 × 8.90 m, podium height 2.40-2.50 m), the structure would have remained tetrastyle on a high podium but featured a wider pronaos and two columns aligned with the cella walls (fig. 16B). The Capo Mulini temple, together with that at Santa Venera al Pozzo, should be seen as part of the broader tradition of Hellenistic-inspired sacred architecture on the island (fig. 17).⁹⁵



Figure 14: Capo Mulini (Acireale, Catania). Aerial view of the Roman temple.

Credits/fonts: after E. Tortorici, "Il tempio di Capo Mulini: scavo, tecnica di costruzione, cronologia, attribuzione", in R. Brancato, E. Tortorici (dir.), *Carta archeologica delle Aci*, Roma, 2021, p. 227-240.

p. 297 and n. 92) to date the temple to the early Imperial period and to attribute its construction to private rather than state initiative has recently been reconsidered by the author himself (Wilson 2024, p. 833).

⁹⁴ Tortorici 2021, p. 106-114, 227-240.

⁹⁵ Wilson 1990, p. 105-106; Portale 2005, p. 40-59. For the temple at S. Venera al Pozzo, see Spigo 1980-1981, p. 787-788; for the temple at Capo Mulini, see Tortorici 2021; Libertini 1952. However, in the Republican period, the distinctive features of Hellenistic temple architecture appear to have been retained (cf. Fuduli 2015, p. 324). For a broader discussion of the archaeological issues relating to Hellenistic-Roman Sicily, see Portale 2005.

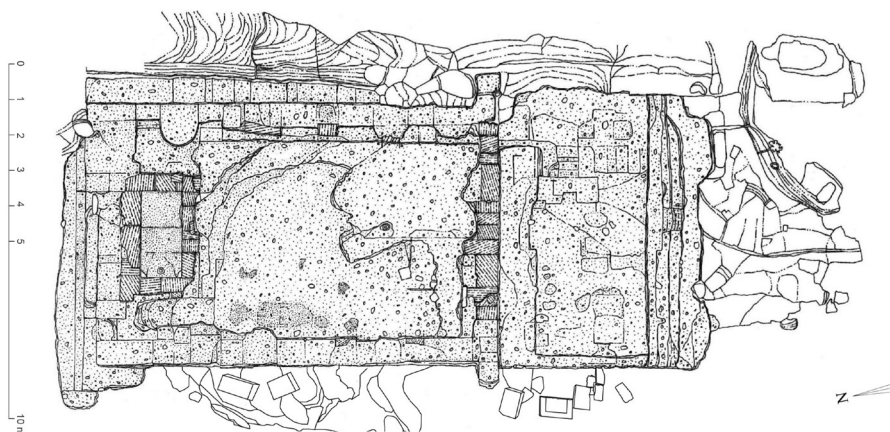


Figure 15: Capo Mulini (Acireale, Catania). Plan of the Roman temple.

Credits/fonts: after E. Tortorici, "Il tempio di Capo Mulini: scavo, tecnica di costruzione, cronologia, attribuzione", in R. Brancato, E. Tortorici (dir.), *Carta archeologica delle Aci*, Roma, 2021, p. 227-240.

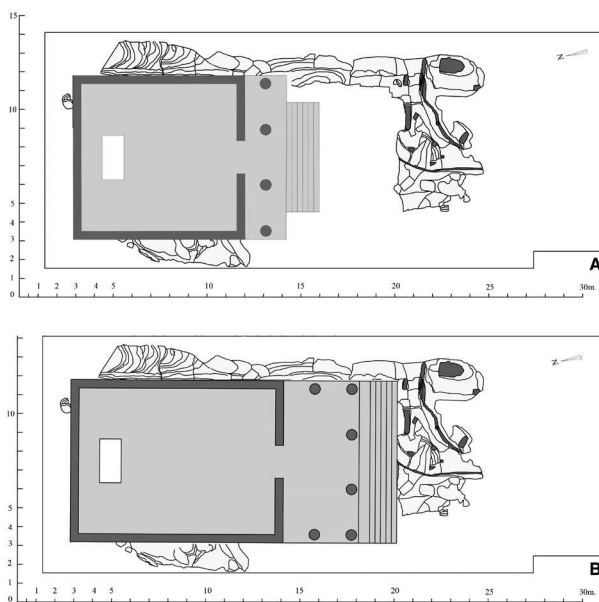


Figure 16: Temple of Capo Mulini, Republican phase (A) and Augustan phase (B).

Credits/fonts: elaboration of Rodolfo Brancato after E. Tortorici, "Il tempio di Capo Mulini: scavo, tecnica di costruzione, cronologia, attribuzione", in R. Brancato, E. Tortorici (dir.), *Carta archeologica delle Aci*, Roma, 2021, p. 227-240.

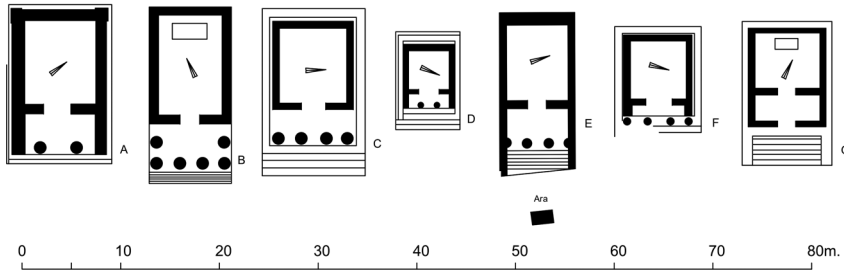


Figure 17: plans of temples *on podia* in Sicily: A) Iseum of Taormina; B) Temple of Capo Mulini; C) So-called Arco di Marcello at Catania; D) Temple of S. Venera al Pozzo; E) Agora temple of Monte Iato; F) So-called Oratory of Phalaris at Agrigento; G) Iseum of Agrigento.

Credits/fonts: after E. Tortorici, "Il tempio di Capo Mulini: scavo, tecnica di costruzione, cronologia, attribuzione", in R. Brancato, E. Tortorici (dir.), *Carta archeologica delle Aci*, Roma, 2021, p. 227-240.

While monumental sanctuaries were being constructed near the port and along the main inland routes, the rural hinterland witnessed the establishment of new settlements in previously unoccupied areas. The most noteworthy case is the site investigated by G. Libertini in the early 20th century at Tondo Casalotto district near Aci Sant'Antonio.⁹⁶

Among the discoveries, a large 1st century villa *rustica* stands out, especially the remains of a vast rectangular room (41.50 × 14 m, with walls 0.60 m thick), whose long sides run north-south along the natural slope of the terrain.⁹⁷ The space, only partially excavated, was probably used in its final phase as a storage area for the villa's produce, as originally suggested by Libertini (fig. 18).⁹⁸

Another aristocratic residence may be associated with finds reported by L. Vigo in contrada Anzalone–Isola (Acireale).⁹⁹ Though the building itself has not been identified, its luxurious character is suggested by the extensive use of mosaic decoration in the rooms (13 in total), which together occupied an area exceeding 50 metres per side.¹⁰⁰ It remains unclear whether these remains, identifiable as part of a bath complex, belonged to a public structure or to the *balneum* of a wealthy private estate.

⁹⁶ Libertini 1922.

⁹⁷ Mazzaglia 2019, p. 117-119.

⁹⁸ Brancato, Tortorici 2021, site 12.

⁹⁹ Vigo 1878, p. 78-80.

¹⁰⁰ Brancato, Tortorici 2021, site 18, fig. 3.18.

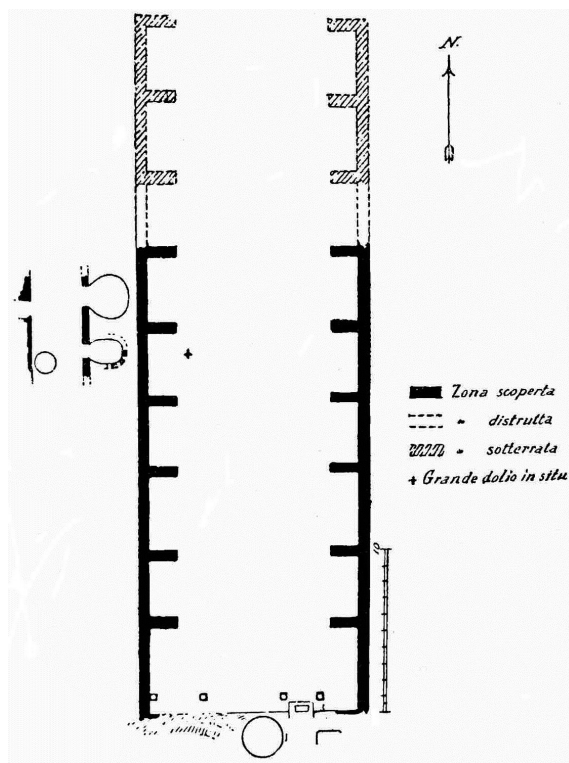


Figure 18: contrada Casalotto (Acireale). Plan of the sector of the rural villa used for storage.

Credits/fonts: after G. Libertini, "Scoperte a Casalotto", *Notizie degli Scavi di Antichità*, 10, 1922, p. 491-499.

Discussion

As elsewhere in eastern Sicily, in Catania the years following the Roman conquest witnessed a contraction of the urban centre.¹⁰¹ The crisis, which may have threatened to affect the surrounding countryside in the long term, was swiftly mitigated by a series of decisive interventions by Rome.¹⁰² Indeed, although fragmentary, the available data for the extra-urban territory appear to indicate a reduction in the number of occupied sites between the Hieronian and Augustan periods (late 3rd to 1st century BCE), while also

¹⁰¹ Strabo, VI, 2, 5; 2, 6 C 27. On urban decline in Republican Sicily, see Pfuntner 2019, p. 22-61, with bibliography; cf. de Ligt 2019.

¹⁰² Polybius, VIII, 4-7; cf. Prag 2011.

suggesting the overall resilience of the landscape structure established in the Etnean territory during the early Hellenistic age.¹⁰³

The rural character that, between the 2nd and 1st centuries BCE, came to define the settlement forms in the alluvial plain, alongside the productive and commercial focus of the area north of Catania, must reflect the functional organisation of the *suburbium*¹⁰⁴ as outlined from the earliest stages of Roman control.¹⁰⁵

The absence of urban development in these areas may be interpreted in light of two typical factors in the formation of the Roman rural landscape: the emergence of large landed estates based on slave-operated production,¹⁰⁶ and the expansion of areas devoted to livestock and pastoralism.¹⁰⁷ As is well known, during the 2nd century BCE, Roman senators and equites benefited greatly from the cereal-producing vocation of Sicily, among other advantages derived from Rome's expansionist phase.¹⁰⁸ While the island's traditional role as a grain-producing *provincia* persisted, it was gradually complemented by other economic activities common in Italy. Among these, livestock farming, particularly on *ager publicus*, proved especially profitable.¹⁰⁹

The livestock economy, due to its structural requirements, necessitated ownership of large estates and their extensive exploitation. This created a self-reinforcing cycle: large tracts of hilly and mountainous terrain gained economic value only if devoted to large-scale pastoralism, which in turn required initial capital investment to acquire

¹⁰³ Bejor 1986; cf. Wilson 1990; Portale 2005; Bejor 2007.

¹⁰⁴ The suburban space of the Roman city generally lacked fixed boundaries, being defined instead by the area in which urban inhabitants pursued their economic and commercial interests. In this perspective, the *suburbium* was conceived more as a temporal than a physical distance—roughly equivalent to a day's journey, as Cicero notes (*Philippicae*, XII, 24). Based on legal texts indicating a maximum reach of 10 + 10 miles (ca 15 + 15 km), estimates place the *suburbium* between 1 and 10 miles from the city, with a typical range of 1.5 to 5 km depending on the size of the urban centre (Grilli 2000, p. 45-47, n. 28, with bibliography).

¹⁰⁵ Cf. Salmeri 1992; Soraci 2011, with bibliography.

¹⁰⁶ Coarelli 1981; Mazza 1981; cf. Bejor 1986.

¹⁰⁷ Calderone 1960, p. 21-22, "Ai proprietari siciliani si offriva la possibilità di un più redditizio sfruttamento del terreno: pascolo su grandi estensioni ed economia pastorizia": the author acknowledges a decline in cereal production, yet emphasises that the exploitation of land for vineyards, olive groves, and orchards generated a significant flow of exports (p. 23). The hypothesis of a policy aimed at restoring small-scale landownership, attributed to the actions of Rupilius, consul alongside Popilius Laenas, was later proposed by G. Mangano (1988).

¹⁰⁸ Soraci 1988, p. 10-11.

¹⁰⁹ Brancato 2021, p. 151-152. On the *ager publicus*, see Pinzone 2003.

livestock and slave labour.¹¹⁰ This mechanism marginalised smaller rural farms engaged in grain production. It is no coincidence that, in the 2nd century BCE, the anonymous author of the *Lapis Pollae*,¹¹¹ in the *elogium*¹¹² boasted of having ensured that *pastores* gave way to *aratores*, an action full of meaning when viewed in a Sicilian context and attributed to an anti-Gracchan figure like *Popilius Laenas*.¹¹³

The diverse data currently available for the territory of Catina contribute to this broader picture, which remains fundamentally informed by the framework proposed by M. Mazza. According to this view, the rural landscape of the island was characterised not only by large estates but also by the presence of small—and medium—sized landholdings.¹¹⁴

The spread of slave-run estates in 2nd century BCE Sicily, and the significant numbers of enslaved labourers employed within them, is dramatically illustrated by the traumatic experience of the Servile Wars (135-132 BCE; 102-98 BCE).¹¹⁵ The devastation caused by these uprisings likely affected estates of all sizes, profoundly reshaping the structure of the eastern part of the island.¹¹⁶ The depopulation of the

¹¹⁰ Cf. Pasquinucci 2001-2002, with references.

¹¹¹ *CIL* I² 638 = *CIL* X 6950 = *ILS* 23 = *LLRP* 454 = EDR 116637. This inscription, known as the *Lapis Pollae*, is among the most significant Republican-era epigraphic documents; discovered near San Pietro di Polla in the Vallo di Diano, possibly the ancient *Forum Popili* (*Tabula Peutingeriana*, VI, 5, Miller; Dionysius Halicarnasensis, *Antiquitates Romanae*, I, 21, 4), it commemorates the public works of *P. Popilius Laenas*, consul in 132 BCE.

¹¹² Cf. Arcuri 2008, p. 4.

¹¹³ The inscription, probably part of an honorary monument, contains no explicit mention of the magistrate. For a summary of the extensive bibliography concerning attempts at identification, see Arcuri 2008, n° 11.

¹¹⁴ Mazza 1980. In eastern Sicily, it appears that during the 2nd and 1st centuries BCE, large estates devoted to cereal cultivation and pastoralism continued to coexist with, or were interspersed among, medium—and small—scale holdings. This is evidenced, for instance, by some sale contracts discovered at Camarina, in the Hyblaean territory (Cordano 1984; cf. Di Stefano 1994; Brancato 2022c).

¹¹⁵ Arcuri 2008, n° 5, with bibliography.

¹¹⁶ Diodorus, XXXIV-XXXVI. The Servile Wars appear to have negatively impacted grain production in Sicily. However, as Cicero notes, there was no significant decline in the number of farmers, unlike during the Punic Wars (*aratorum interitio facta nulla est*) (Cicero, *In Verrem*, II, III, 125). Still, as C. Soraci observes (2011, p. 18), ordinary agricultural labour must have been severely hampered. According to Plutarch, the presence of numerous unburied and decaying corpses led to a plague of locusts that, spreading across the fields, destroyed the grain crops (Plutarchus, *Quaestiones Convivales*, II, 3 [639e-641e]).

countryside¹¹⁷ that followed probably laid the foundation for the general reconfiguration of the landscape during the 1st century BCE, as seen in the territory of Morgantina,¹¹⁸ where there was a noticeable reduction in the number of settlements,¹¹⁹ as witnessed also in the afore discussed western margins of the Plain of Catania.

In this latter area, the expansion of rural settlements occurred in the decades following the end of the civil wars,¹²⁰ decades that were also marked in the Etnean region by a series of volcanic eruptions (141, 135, 123-121 BCE)¹²¹ (fig. 19). The literary sources note that the urban and peri-urban areas of Catania were particularly affected. They specifically mention the extensive destruction caused by the final so-called “Plinian” eruption,¹²² whose ash and lapilli damaged not only the urban buildings¹²³ but also its surrounding countryside.¹²⁴

Significantly, archaeological evidence suggests that between the late 2nd and 1st centuries BCE, the construction of luxurious *domus* by the ruling elite took place in the city,¹²⁵ buildings whose wealth derived largely from agricultural productivity, which appears to have resumed robustly during this period.¹²⁶

¹¹⁷ Valbruzzi 2012, p. 211.

¹¹⁸ Barresi, Patanè 2024, with bibliography; cf. Brancato 2020d.

¹¹⁹ Thompson 1999, p. 444-457; cf. Valbruzzi 2012, p. 210.

¹²⁰ Cf. Brancato 2020b.

¹²¹ Orosius, *Adversus Paganos*, V, 6, 2; V, 10, 11; V, 13, 3. On the Plinian eruption of Mount Etna affecting Catania, see Buscemi, Mazzaglia, Todaro 2024.

¹²² Coltelli, Del Carlo, Vezzoli 1998.

¹²³ The exceptional catastrophe finds numerous archaeological confirmations, both in urban contexts, such as the *domus* in the former Reclusorio della Purità (Tortorici 2016, site 60), and in suburban ones, as in the case of the votive deposit excavated at the site of Montedoro-Casalrosato in the territory of Aci (Privitera 2005; Brancato, Tortorici 2021), whose latest phase was sealed beneath a thick layer of lapilli (10-50 cm).

¹²⁴ The Senate deemed it appropriate to exempt Catina from the *decumae* (*vectigalia [...] remisit*); cf. Orosius, *Adversus Paganos*, V, 13, 3; Augustinus, *De Civitate Dei*, III, 31 [ed. CSEL XL], p. 160, l. 20 s.: *Legimus apud eos Artinaeis ignibus ab ipso montis vertice usque ad litus proximum decurrentibus ita mare feruisse ut rupes urerentur, ut pices navium solverentur. Eodem rursus aestu ignium tanta vi favillae scripserunt obpletam esse Siciliam, ut Catinensis urbis tecta obruta et pressa dirueret; qua calamitate permoti misericorditer eiusdem anni tributum ei relaxavere Romani*; cf. Manganaro 1996, p. 49.

¹²⁵ Tortorici 2016, site 107.

¹²⁶ Cf. Molè Ventura 2008, p. 42-43, n. 121.



Figure 19: contrada Castellito (Ramacca). View of the western edge of the Plain of Catania.

Credits/fonts: aerial photo by V. Mirto.

As previously noted, in the area north of Catania, elements indicative of a typically Roman rural landscape become clearly visible from the end of the 1st century BCE and into the early decades of the next.¹²⁷ The Acireale area, crossed by one of the most important road arteries in Roman Sicily,¹²⁸ undoubtedly attracted the interests of Roman landowners. Within this context should be placed the construction of the large *villa rustica* in the north-eastern sector of Santa Venera al Pozzo, over the remains of a 4th-3rd century BCE settlement, alongside the concurrent monumentalisation of the sulphurous spring through the construction of the sanctuary already discussed.

The substantial financial investment involved in building, within just a few decades, two sanctuaries of distinctly Italic style in a relatively limited area, at Santa

¹²⁷ Wilson 1990, p. 226-228; Spigo 1980-1981, p. 787-788; Spigo 1984-1985, p. 864; Bejor 1986, p. 486; Manganaro 1994, p. 111; Molè Ventura 2000, p. 208.

¹²⁸ On the Via Pompeia, see Sirena 2011, with bibliography; cf. Brancato, Tortorici 2025.

Venera al Pozzo¹²⁹ and Capo Mulini,¹³⁰ must be interpreted in light of the role played by Catina during the conflicts involving first Sextus Pompey and later Octavian.¹³¹

Numerous elements suggest that these sanctuaries were striking manifestations of the process of Romanisation in the extra-urban territory of the Etnean city.¹³² Furthermore, in the case of the productive settlement and sanctuary at Santa Venera, one might consider the testimony of ancient sources regarding the proscriptions of 43 BCE, when many Roman aristocrats, mostly of praetorian or senatorial rank, were exiled to the island, which was a preferred destination owing to their ownership of extensive estates intended for agricultural use.¹³³

A general reorganisation of Sicily's agrarian landscape likely followed the civil wars, marking a break with the landholding systems that had developed during Pompeian dominance. The new extra-urban settlement pattern was shaped by the foundation of the colony of Catina—a process that, by altering the city's social profile and the organisation of agricultural land, transformed Catania into the primary commercial hub of an export—oriented economy.¹³⁴ Indeed, although the province's obligations as a grain supplier appear to have eased after 31 BCE and Sicily disappears from the list of provinces providing the *Annona*,¹³⁵ they were reactivated in moments of severe crisis. In 22 BCE, Augustus himself was compelled to assume responsibility for the *cura annonae* in Sicily, under pressure from popular unrest caused by food shortages.¹³⁶

Conclusions

The entire Etnean district, including the alluvial plain, was involved in the settlement of the Roman citizen colony established under Augustus. Although its full

¹²⁹ Wilson 1990, p. 105-106, Portale 2005, p. 40-59; for the temple of S. Venera al Pozzo see Spigo 1980-1981, p. 787-788, cf. Fuduli 2015, p. 324.

¹³⁰ Tortorici 2021; cf. Libertini 1952.

¹³¹ See above, n. 47.

¹³² On the bibliography concerning the Romanisation of Sicily, see Marcone 1987; Bejor 1983. More recent reflections based on material culture can be found in Malfitana 2006a-b and Portale 2007; cf. Perkins 2007.

¹³³ R. Brancato in Brancato, Tortorici 2021, p. 203-204; cf. Hinard 1985, p. 227-552; Migliario 2009.

¹³⁴ Marino 2006, p. 10.

¹³⁵ Cf. Soraci 2011, p. 98-99, for the ancient sources and bibliography.

¹³⁶ Augustus, *Res gestae divi Augusti*, 5; Suetonius, *Divus Augustus*, 42, 3.

impact is difficult to quantify, this event had several significant consequences, among which was the expansion of the *chora Katanaia*, necessary to allow the distribution of land parcels. Indeed, the settlement of veterans north of Catania would only have been possible through the reassignment of existing properties, since, as reported by Diodorus,¹³⁷ the deduction of colonists to *Tauromenium* in 36 BCE may already have resulted in the loss of part of Catina's territory.¹³⁸ It is currently not possible to determine with certainty the extent of the changes that took place in Catina's rural landscape as a result of land distributions to Roman army veterans: the land assignments to Augustus's veterans did not, apparently, entail a systematic reorganisation of the agrarian landscape. It is more likely that these allotments affected the broad stretches of uncultivated land characteristic of the Etnean region, particularly along the margins of the alluvial plain. The division of land appears to have taken into account the existing rural configuration and did not result in a *centuriatio* of the territory.¹³⁹ Nevertheless, the arrival of a new community composed of Roman citizens in the region may explain the onset of a striking process of "Romanisation" of the local landscape. This transformation is visible in the alluvial plain through the development of new, large-scale settlements, as suggested by the site of Castellito and by the wealth reflected in imported goods found in surface scatters, as well as along the Ionian coast north of Catina (fig. 20). Following the Augustan reorganisation, senatorial interests concentrated in the Etnean area, as senators enjoyed the privilege of accessing Sicily without requiring official permission.¹⁴⁰ It is not by chance that literary sources begin to multiply references to the flourishing of large estates in this part of the island.¹⁴¹ Chief among them was the estate presumably belonging to Augustus himself.¹⁴² Moreover, for the 1st century CE, we can be certain that *ager publicus* cultivated with grain still existed in Sicily.¹⁴³

¹³⁷ Diodorus, XVI, 7, 1.

¹³⁸ Manganaro 1996, p. 53.

¹³⁹ Cf. Brancato 2019b, p. 333-334, n. 92, with bibliography on the issue of *centuriatio* in Sicily and the alleged attested cases.

¹⁴⁰ Tacitus, *Annales*, XII, 23; Cassius Dio, LII, 42, 6.

¹⁴¹ Mazza 1980-1981, p. 339-342; cf. Clemente 1980, p. 468-473.

¹⁴² Scramuzza 1937, p. 364-366.

¹⁴³ In Ephesian inscriptions dated to 103/104 CE (*ILS* 7193-7195; *CIL* III 6821 = *IEph.* 27 = *PIR*² V, 571), C. Vibius Salutaris is mentioned as *promagister portuum provinciae Siciliae item promagister frumenti mancipalis* (cf. Salmeri 1984, p. 18, n. 31; Soraci 2011, p. 163-167; Kokkinia 2018, p. 224).

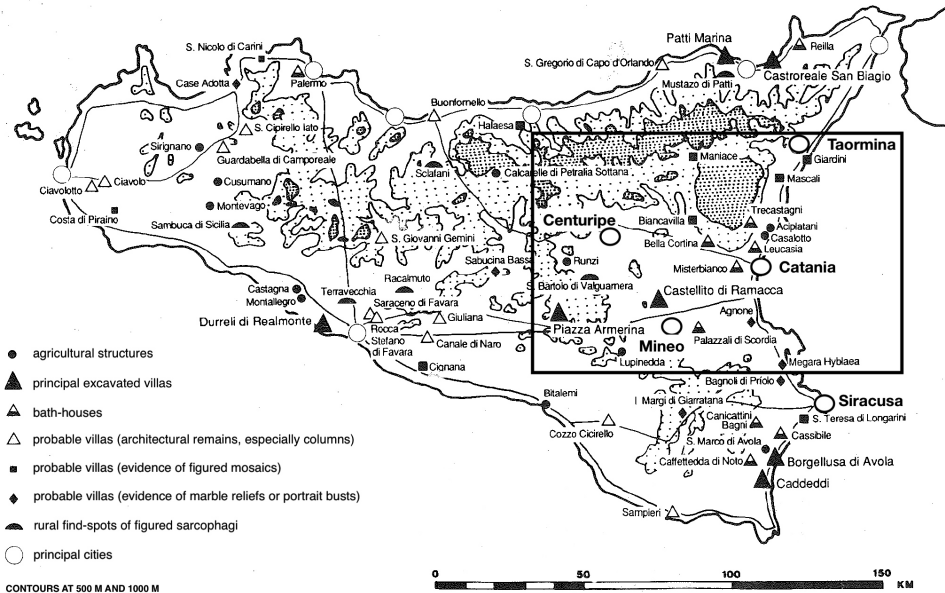


Figure 20: Sicily. The territory of Catina in the context of the island, with an indication of the main Roman settlements.

Credits/fonts: R. J. A. Wilson, *Sicily under the Roman Empire*, Warminster, 1990.

Among the major private landowners, a prominent figure was Vipsanius Agrippa, whose steward Iccius, responsible in 20 BCE for collecting the *fructus Siculi*, is mentioned by Horace.¹⁴⁴ Agrippa's estates in Sicily were probably gifts from Augustus, grateful for his support during the war against Sextus Pompey. S. Stone has hypothesised that much of the territory granted to the *princeps*' son-in-law may have been confiscated from Leontini.¹⁴⁵ Upon Agrippa's death, it was likely Augustus himself who took possession of his Sicilian holdings.¹⁴⁶

To this body of evidence, we may add certain inscriptions from the suburban and extra-urban area of Catina.¹⁴⁷ One epigraphic source refers to the *praedia Alfniana* (1st-2nd century CE), belonging to the family from which the wife of the emperor

¹⁴⁴ Horace, *Epistulae*, I, 12.

¹⁴⁵ Stone 1983, p. 16; Frasca 2009, p. 148.

¹⁴⁶ Salmeri 1984, p. 18-19; cf. Hirschfeld 1902, p. 309.

¹⁴⁷ On the Roman landownership in Sicily, see Wilson 1990, p. 214-217, with bibliography.

Trebonianus Gallus was descended.¹⁴⁸ The existence of a vast estate held by Vibius Severus is suggested by a boundary stone found at Monte Po,¹⁴⁹ about four kilometres east of Catania, along the presumed route to Termini.¹⁵⁰

In light of the broader context of eastern Sicily, the available data from the territory north of Catina between the late Republican and Augustan periods are of particular interest, though

non sono confrontabili se non per differenza con situazioni eventualmente verificatesi nell'entroterra, dove condizioni analoghe possono eventualmente essersi realizzate come alternative alle strutture propriamente urbane, piuttosto che come complementari, quali appunto le situazioni riscontrabili nella zona di Acium.¹⁵¹

Here, the forms of monumentalisation documented at the sites of Santa Venera and Capo Mulini, built only a few years apart, prompt reflection on the identity of the community from which they emerged. In both cases, the presence of sanctuaries dedicated to sulphurous springs or protective deities of the port area implies the existence of a complex, structured religious system maintained by Roman proprietors, loyalist elites, or their freedmen.

This social group in Catina, to which C. Molè Ventura links the cult at Capo Mulini,¹⁵² and probably that at the sanctuary of Santa Venera al Pozzo, was likely also involved from the Augustan period onwards in the exploitation of the alluvial plain, particularly its western fringes, accessible through a road network developed during these same years toward the southern slopes of the island.¹⁵³

¹⁴⁸ CIL X 7041 = *ISicily* 000325: (xvi) D(is) M(anibus) s(acrum) / Gallicano fidelissimo, qui fuit vilicus Afinianis, vix(it) ann(is) XLV. See Korhonen 2004, p. 95-96; cf. Portale 2005, p. 34.

¹⁴⁹ CIL X 7022 = *ISicily* 003159, see Korhonen 2004, p. 177-178; cf. Manganaro 1961, p. 194, n. 103. G. Manganaro (1961) considered the inscription on face A to be earlier on palaeographic grounds, dating it to the 1st century BCE or the 1st century CE. Initially interpreted as a Republican milestone, the editor later revised this view: as Korhonen (2004, p. 178) observes, the abbreviation *cons(ul)* is implausible in a Republican context. Comparable cippi bearing the word *finis* often refer to the limits of territorial units, though examples marking the boundaries of private estates are also known. According to Korhonen, in a later period—probably the 2nd or 3rd century CE—the cippus was reused to demarcate the boundary of the estate of a certain Vibius Severus.

¹⁵⁰ Cf. Brancato 2020a, p. 99-102, with bibliography; cf. Uggeri 2004, p. 22-23.

¹⁵¹ Molè Ventura 2000, p. 208.

¹⁵² Cf. Gagé 1964, p. 153-155; For attestations of *seviri* (or *quattuorviri Augustales*) in Sicily and at Catina, see Manganaro 1988, p. 38, 46-47, 49-51; Molè Ventura 1996, p. 192, 214, n. 144.

¹⁵³ Cf. Brancato 2019b.

From this perspective, the Etnean landscape as a whole may be appreciated as a densely inhabited rural area, characterised by functionally organised productive activities and by standardised forms of cultural Romanisation.¹⁵⁴ Nonetheless, the extra-urban landscape of Catina during the transitional period between the civil wars and the early Imperial age remains, on the whole, elusive. A comprehensive, diachronic understanding is still lacking due to the absence of stratigraphic data affecting most of the contexts that would otherwise allow for deeper analysis, from small, medium, and large rural settlements to major infrastructure such as the aqueduct.¹⁵⁵

Despite this, the distinctive features documented in the various territorial contexts forming the Etnean extra-urban zone remain highly significant. The monumental features around Acireale, for example, are clear indicators of a strong Roman cultural and economic presence. In the enduring economic relevance of the Ionian-Etnean area, these features dramatically point to a shift in land ownership, likely associated with a substantial Italic presence.¹⁵⁶

The introduction of veteran colonists, perhaps in multiple waves occurring in close succession, undoubtedly brought significant transformations to the social, economic, and cultural structure of the territory. Acium became a flourishing coastal settlement, thanks to the arrival of enterprising Roman operators who recognised the economic potential of the inland region, as evidenced by the productive installations at Santa Venera and the harbour at Capo Mulini.

The most striking traces of this process of landscape Romanisation are the construction of the two sanctuaries, tangible and monumental “Roman” presences whose acculturative impact on the local territory was unquestionably powerful.¹⁵⁷

Within the Ionian-Etnean coastal context, the territorial marking function of the Capo Mulini temple is particularly conspicuous. Regardless of the precise historical motivations behind its construction, the initiative should be interpreted within the

¹⁵⁴ Cf. Wilson 1990.

¹⁵⁵ Lagona 1964; Lamagna 1997; cf. Tortorici 2016, p. 294-295, with bibliography.

¹⁵⁶ The currently available archaeological evidence does not allow for a precise definition of the social background of the Romans settled in the area; however, some were likely of military origin. Particularly noteworthy in this regard is the discovery in Corso Savoia (Acireale-CT) of a hinged fibula bearing the inscription “Aucissa”, a type dated to the Late Republican and early Imperial periods. See catalogue entry UT 6 in the *Carta Archeologica* (Brancato, Tortorici 2021, UT 6). On the typology of the fibula, see Ertlinger 1973, p. 21-22, 89-94.

¹⁵⁷ Cf. Molè Ventura 1999.

framework of Augustan propaganda. What remains indisputable is the symbolic (*sēma*) function of the sanctuary, located scenographically along a major maritime route. The temple would have served as an effective tool in counteracting any lingering Pompeian sympathies, especially in the setting of the ancient port of Capo Mulini, clearly visible both to ships sailing the Ionian coast and to those frequenting the harbour for its economic and commercial activities.

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Abbreviations

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EDCS = Epigraphik Datenbank Claus/Slaby [<https://edcs.fak1.uni-ludwigshafen.de>].

EDR = Epigraphic Database Roma, in EAGLE. Electronic Archive of Greek and Latin Epigraphy, [<https://edr.dg.uzh.ch>; <http://www.edr-edr.it>].

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III- *Gestare ferrum*: Comparative Domain Modeling and Extrapolations of Iron Industries in the Qin-Han and Roman Mediterranean

Ching-Yuan Wu

Introduction

This paper is in part a retrospection of a recent work this author contributed to the panel “Law, Institutions, and Economic Performance in Classical Antiquity” at the Celtic Conference in Classics in 2019.¹⁵⁸ The aim at the time was to explore a lacuna in recent comparative studies by directing questions toward a comparison of the administrative efforts of the Qin-Han and Roman governments over the iron industries in their respective domains.¹⁵⁹ At the time,¹⁶⁰ the comparative approach on the iron industry of the two domains was only cursorily attempted by Donald Wagner, a specialist in ferrous technologies and industrial traditions of the Qin-Han domain. In striking detail and clarity, Wagner treated readers to a series of technological developments well-documented in the literary and archaeological records, and in particular the rise of large-scale cast iron and steel industrial furnaces and foundries from the Warring States Period to the Han Dynasty.¹⁶¹ His comparative exercise was more of a reflection on the contrast between the robust productivity that had been achieved by Han cast-iron technologies that could produce multiple steel items in one pouring, versus wrought-iron based Roman Mediterranean ferrous technologies, which must be produced one piece at a time.¹⁶² When also considering that the Han administration also included commandery-level iron logistics and sales bureaus to distribute the iron products,¹⁶³ the

¹⁵⁸ Wu (forthcoming).

¹⁵⁹ Mutschler, Mittag 2008; Scheidel 2009; Scheidel 2015; Beck, Vankeerberghen 2021; Hildebrandt, Gillis 2017.

¹⁶⁰ See a recent attempt by Lam 2023, p. 4-12, though less about the iron industry but rather about markets and connectivity. For brief mentions of iron but with no in-depth comparison, see Zhao 2015, p. 70.

¹⁶¹ Wagner 2008, p. 128-140.

¹⁶² Wagner 2008, p. 103, 169-170, 245-248.

¹⁶³ There are indications that not only sales and market regulation but also iron implement rentals were among the purview of the *tieguan* system in the Qin period, see Liu 2019, p. 48.

monopoly achieved under the Han emperor Wudi in 117 BCE onwards would not be feasible nor sensible in the Roman Mediterranean context.¹⁶⁴

Many of Wagner's points remain valid and can still be defended. What this author did was to interrogate such incomparability. A summary of things that Wagner did not discuss at the time are the following. First, recent scholarship discussed a range of evidence indicating Roman technological versatility in converting bloomery iron products via a number of carburizing processes (heat-treatment by quenching in liquids to produce martensite, tempering, cementation through heating iron in a container with charcoal for an extended time; "case hardening" or the application of carbon-rich substances to the surfaces of iron objects and then heating to cause carbon to diffuse into the surface of the metal; or welding pieces of steel to iron objects to increase hardness and durability) into a range of steel or steel-equivalent products.¹⁶⁵ When we further consider that the Roman Mediterranean's strength was more on widely distributed local smithies (as Wagner stated) and less on the scale of individual workshops (and even this can be challenged), whether overall productivity and efficiency can be on par with Han monopoly would no longer be "without doubt" and more of a question specific to the type of ferrous products.¹⁶⁶ Second, on the personnel engaged in production

¹⁶⁴ Wagner 2008, p. 245: "The state monopoly of the iron industry in Han China was a real monopoly of both production and sale. Both archaeological and written sources make it clear that this was no trivial matter, but one that brought significant advantages to the government and directly affected the daily life of a significant part of the population. At the other end of the Eurasian continent, by contrast, the idea of a Roman state monopoly of the iron industry would have been absurd. While there did exist large state ironworks run by the Roman army, most iron production occurred in thousands of tiny units scattered in villages throughout the Empire. There would have been no way at all of enforcing a monopoly, and it is also difficult to imagine any advantage the Roman state would have derived from such a monopoly."

¹⁶⁵ See reviews by Furger 2019, p. 44-53 and Lang 2017, p. 859-863. Layered construction and welding in particular seem to be a consistent feature; see Fulford *et al.* 2005, p. 246-249 for a variety of techniques of manufacture from armor pieces in northern Britain, including warm and cold working and partial carburization; Sim, Kaminski 2012, p. 101-104 for a three-layer steel *squamae* in the Carlisle hoard, and p. 153-158 for the first century CE six-band steel shield boss from Melrose (Edinburgh FRA 167). Also Williams 1977 for a second century CE steel fragment of a *lorica segmentata* from Ristissen.

¹⁶⁶ See, for example, the discussion of machinery assisted sheet iron production in Sim, Kaminski 2012, p. 50-56, esp. p. 56: "The sheer volume of armour that was needed to keep such an army equipped for war was vast, and the requirement for armour was unending. [...] Manpower alone would not meet the needs and it seems that systems of machines could have supplemented the effort from the labour force. Furthermore, hand production was not an effective way to produce sheet of a consistent thickness without tool marks. The use of machinery would have been a possible mechanism to produce some of the sheet seen in the archaeological record, however, poor visibility of machines (from spinning lathes to pile drivers) is

and administration of the iron industry, extant sources from both the Qin-Han and the Roman Mediterranean domains indicate a high degree of reliance on a patchwork of private sector owners¹⁶⁷ and producers.¹⁶⁸ Even in the Han monopoly scheme, the Han court's approach to fast-track the monopolization process was to elevate major private producers to serve as court officials and have them tailor a regimen for the state apparatus.¹⁶⁹ In effect one suspects that the overall scheme resonates with the censoria system in which the *conductores*, *mancipes*, and the *socii/societates* purchased contracts for iron mining operations, ironworks and ferrous metals related taxation.¹⁷⁰ Overall, what was understood as a monolithic iron-salt monopoly that became the hallmark of the Han bureaucracy from 117 BCE onwards may have been a conceptual simplification by historical narratives. So too the Roman side of things: while the *Digest* claimed that there were still private ownership of metalla,¹⁷¹ mentions of a *lex metalla dicta*¹⁷² and reports of emperors taking local mining assets into their possession suggest that efforts were made to aggrandize imperial holdings of vital resources, including iron.¹⁷³ A number of *procuratores (Augusti) ferrariarum* or *metallorum* also suggests that the

due to most machines being made from wood at this time. When this is considered in conjunction with the lack of literary evidence, this has created a skewed perspective of Roman technology." Similar remarks on wires for ring mail and scale mail, Sim, Kaminski 2012, p. 104.

¹⁶⁷ Haley 2003, p. 27; Domergue 1990, p. 274-277.

¹⁶⁸ Wagner 2008, p. 172-175; for a recent discussion on Qin-Han private producers, see Lam 2023, p. 73-74, and on "small-scale" ironworks in the Han capital region, Lam 2018, p. 99-100.

¹⁶⁹ For the turn towards monopolization and subsequent attempts (and debates on whether) to restore private sector production, see Wagner 2008, p. 172-191, Lam 2023, p. 70-79.

¹⁷⁰ Richardson 1976, p. 143-150; Cleere 1981, p. 89-93; Rico 2010, p. 404-410; Hirt 2010, p. 261-290 esp. 284-288. For a review of epigraphical sources, see Fillery-Travis 2015, p. 96-97.

¹⁷¹ *Quod tamen priuatis licet possidere* (in so far as [they] can be privately owned), *Digest*, XXVII, 9, 4 pr.; *Digest*, XXXIX, 4, 13, 1; Hirt 2010, p. 84-86; Millar 1977, p. 167-168.

¹⁷² E. g. the *lex metalla dicta* invoked in the *Lex portorii Asiae* (*si quid metallum ex Asia Romam ex lege metallis dicta* [the Greek version reads γεωργικὸς νόμος] *exportabitur, pro eo metallo proque uasculis quibus continebitur, [portitorii] pro centum libris quattuor asses [dant]*), § 34, l. 78-79; Cottier et al. 2008, p. 133-134.

¹⁷³ Suetonius noted complaints that Tiberius deprived established immunities (*ueteres immunitates*) and rights to mines and revenue collection (*ius metallorum ac uectigalium*) from cities and individuals (Suetonius, *Tiberius*, 49, 2), and Tacitus specifically accused Tiberius for having kept select estates—for instance, the gold and silver mines of Sextus Marius—for himself, despite making them public property (e. g. Tacitus, *Annals*, VI, 19, 1).

domus Caesaris was actively controlling certain aspects of the iron industry.¹⁷⁴ Thirdly, there is a complex dynamic at work concerning the mobility of and market for semi- or raw products such as iron bars, rods, pig-iron or wrought-iron ingots and recycled materials in both the Qin-Han¹⁷⁵ and the Roman¹⁷⁶ domains. Production units with different degrees of association to imperial/court systems of control were deliberately creating commodities that would in the end be customizable at the local level for specific needs.¹⁷⁷ When viewed through a prism of ancient-state actors at work, a comparative discussion of the Qin-Han and Roman domains can lead to meaningful observations on similar tendencies and limitations, to the point that there is the potential for their respective literary and archaeological sources to be used referentially, that is, with no causation but as resource for generating *could-have-been* scenarios.

In this paper, the comparative approach is again taken to explore how methods of control exercised by the Qin-Han and Roman state apparatus can lead to insights and extrapolations for the ancient states in question and potentially beyond. There are risks. Comparing the Qin-Han and Roman strategies for controlling industries and resources can be unfruitful, not the least because the two empires were geographically distant and barely connected, but also because pushing for any meaningful connection between them is of limited utility. Also, while regions across ancient Eurasia did share historical events (such as Alexander's eastern campaigns and the western migrations of the Xiongnu), critical resources (like tin, lapis lazuli, and silk), and technologies (such as paper, the compass, and printing), the underlying structures and logics of their state systems diverged in significant ways that defy cursory comparisons.

That said, the points of comparability identified earlier—such as the use of semi-products, the imperial control over essential resources, and the common reliance on

¹⁷⁴ Hirt 2010, p. 140-149; Bonsangue 2011, p. 376-384.

¹⁷⁵ Lam 2023, p. 33, 38, 92-94 (iron remelting and recasting at Dongpingling 东平陵), 99-103 (Tieshenggou 铁生沟 as a transportation, or preliminary processing, center for ore or semi-products to other ironworks under the management of the same iron office), 110-112 (potentially smithing scrap iron or forging imported semi-products at Taicheng 郟城), 135; Qin *et al.* 2016, p. 113-116, esp. 113 on Wu Gang 舞钢 and Xiping 西平 iron smelting site complex as sites for refining/decarbonizing (primarily pig iron) to produce steel or wrought iron with superior mechanical properties.

¹⁷⁶ Fillery-Travis 2015, p. 136-142; Domergue, Rico 2018, p. 219-220, esp. fig. 6; Pagès *et al.* 2022, e0268209.

¹⁷⁷ *E. g.* Dolenz 1996, p. 155-161 on the export products produced at Magdalenberg, but also double-pyramid bars produced at mining sites and delivered directly to their destination without the costly and cumbersome detour via Magdalenberg.

private proprietors due to inherent limitations in governance—suggest that certain observations from one ancient state can still provide useful frameworks, models, or at least guidance for studying similar questions in another. To further test this approach, the present paper will attempt to “pair” literary and archaeological evidence from both the Roman and Han domains, to see whether they can help understand the dynamics of control from a perspective that lends new findings. Our focus will be on intra- as well as trans-border iron trade. A specific set of cases for the trans-border trade considered here are the Roman-Parthian and Han-Nanyue examples, which will be explained shortly. First, we will turn to Lam Yongcheong’s recent monograph to elicit new attempts at the comparative perspective for discussing Qin-Han and Roman state agencies in dealing with the connectivity of production units specializing in ferrous metal processes.

Connected Iron Worlds

Lam’s discussion of the Qin-Han ironworks began with a comparative thought experiment of sorts. His question was how the Roman Mediterranean’s urbanization and transportation infrastructure can serve as a comparative model for the Qin-Han domain, in which increased connectivity and market integration across large swathes of imperial/court controlled domains were made possible as new cities and routes evolved into economically and technologically enabling networks that made state-controlled systems of production and redistribution of iron possible.¹⁷⁸ Lam found the range of ironworking techniques that could be identified among the iron scraps and fragments at the Taicheng (郟城) Foundry site in the Weihe (渭河) valley/Guanzhong (关中) basin was so diverse that they *must have* originated from a number of different iron foundries elsewhere, and it is only in this projection that Lam designated Taicheng as a potential center where such scrap iron and semi-products originating from a broader interregional exchange network (involving at the very list ironworks in Henan and Shandong) were deposited and converted into finished products through melting, casting, refining, smithing and other methods.¹⁷⁹ In other words, while the potential for identifying connectivity in the Han evidence is intriguing, they are for the large part projections.

The type of Roman evidence may serve in such a discussion is barely of circumstantial evidentiary worth. Yet, as a frame of reference, it is nevertheless useful

¹⁷⁸ Lam 2023, p. 4-12.

¹⁷⁹ Lam 2023, p. 107-114; for sites, see Lam 2023, p. 97-98 fig. 3.2, 3.3.

to have in mind. What ancient state was able to generate a connected world in which iron products circulated and production sites connected, even when there were no monopolizing structures imposing or orchestrating it? It happens that the Roman Mediterranean evidence concerning the transportation and commerce of ferrous semi-products is in relative abundance. Gaspard Pagès *et al.* had quite a few recent contributions analyzing a large collection of iron bars (many stamped) of various iron qualities (ferrite, steel, phosphoric iron) recovered from shipwrecks off the coast of Saintes-Maries-de-la-Mer (France) can be attributed to six major iron production areas across modern France (Sénonais-Pays-d'Othe, Puisaye, Montagne Noire, Canigou) and Belgium (Entre-Sambre-et-Meuse, Eastern Condroz).¹⁸⁰ Using network analyses, Pagès *et al.* were able to establish three different provenance groups that likely represented three separate commercial networks, operating north-south via the Rhône connecting Gaul, Germania and Britannia but also around the western Mediterranean basin.¹⁸¹ The problem for a comparative project is how such evidence can “work” for the Han domain. We cannot say that because the Roman Mediterranean has such connectivity, and hence the projections in the Han domain would necessarily be true. What is the lesson to learn here?

A constructive way to approach the comparison is to first recognize that projections can be useful for pushing the boundaries of belief. At the same time, we should consider reference models, such as the connectivity model proposed by Pagès *et al.*, and question whether they are truly free from flaws. Together, these tools help define the limits of ancient state modeling. Projections and reference models help refine our understanding of what ancient states could and could not achieve.

Mental Modelling of Ancient Domains

What we are considering, then, is how archaeological evidence can serve as parameters for what might be called ancient domain modelling, for lack of a better term. We can add additional parameters. For example, connectivities of the the Qin-Han and the Roman domains have unique formation processes that were very much diachronical, and even historical when literary sources are relatively abundant. The domains may be called by historically defined dynasties, but each were in fact assemblages of many territories with established ferrous metallurgical traditions, and

¹⁸⁰ Pagès *et al.* 2008; Pagès *et al.* 2011; Pagès 2014.

¹⁸¹ Pagès *et al.* 2022.

only became commanderies/provinces and client-kingdoms/fiefdoms of the Roman Mediterranean/Qin-Han China through gradual expansions. We deal each in order.

In the Roman domain, for instance, the network of connected iron extraction and processing sites in the western Mediterranean and the Rhône valley described by Pagès *et al.* and Domergue among others, were “Roman” only after the Caesarian and Augustan conquests, and so too Noricum, Britannia, Dalmatia, Pannonia, Dacia, and the Syrian and Nabataean territories. The “Roman” metallurgical system was one of continued acquisition from the second century BCE to the second century CE. The iron bars from shipwrecks off the coast of Saintes-Maries-de-la-Mer were flowing stream of iron resources that were before Caesar’s conquests peripherally Roman. As *negotiatores* and *conductores ferrariarum* mined, smelted and worked off of contracts gained from collective efforts pursued by private *societates*, and as *procuratores ferrariarum* oversaw operations and taxed opportunities along with merchandise,¹⁸² they converted streams of iron (semi-)products into “Roman” assets. So, too, extra-municipal territories of the *patrimonium regni Norici* proposed by Alföldy: the *stationes* in place as control points managing iron (semi-)products exiting production centers that were part of the imperial estate can be understood as “Roman”, in the sense that it was a closed source of revenue marked off for the *domus Caesaris*.¹⁸³ We might say that *Romanitas* co-opted established knowledge and ironworking traditions, and the *imperium Romanum* enabled new ways of connecting different production centers and patrimonies, though also likely disrupting established norms of connectivity as well.

What of the Qin-Han domain, in terms of layers of historical productivity and new forms of connectivity? One impression from the literary sources is that there were significant disruptions to producers and production centers in ways that would have been debilitating to conquered territories. A number of major iron producers with stack-mold, carburization, and malleable cast-iron technologies were originally based in

¹⁸² Hirt 2010, p. 119-148.

¹⁸³ Alföldy believed a separate territory was governed by a bureau connected to the provincial financial official. He suggested that *conductores ferrariarum* (mine managers) in the early 2nd century CE leased mining rights from the emperor, and their later disappearance (*ca* 160 CE) indicates the emperor resumed direct control of the mines. Alföldy 1974, p. 114-117, 167; Hirt 2010, p. 53-56. On governance of imperial estates, see Tacitus, *Annals*, IV, 15 and Cassius Dio, LVII, 23, 5 on the trial of the procurator *Augusti provinciae Asiae* Lucilius Capito for exercising power beyond his mandate, which was limited to financials.

a range of major kingdoms during the Warring States period.¹⁸⁴ As their kingdoms were conquered by the Qin empire during its expansionist phase in the third century BCE, the iron producers were first forced to join the colonization projects of peripheral or newly acquired territories, and later integrated into the Han imperial apparatus in 117 BCE during the monopolization drive.¹⁸⁵

However, disruptions and migrations of productivity were only part of the story. New fiefdoms in the early Han empire such as Huainan (淮南), Wu (吴), and Changsha (长沙) cultivated their own respective ferrous and non-ferrous metal industries, oftentimes overlapping with original production centers (since labor, fuel, and ore were structural demands) to aggrandize and compete with the Han court in Guanzhong. Sima Qian's biography of one of the most interesting feudal lords of the early Han Dynasty has the following.¹⁸⁶ Gaozu just suppressed a rebellion led by one of his old generals, and allotted the territories of the ancient kingdom of Wu and Kuaiji (会稽) to his nephew Liu Bi (刘濞), involving a grant of three commanderies and fifty-three cities. Among them the Yuzhang (豫章) commandery with a wealth of copper mines, which Liu Bi mined by attracting infamous labor sources such as bandits and convicts.¹⁸⁷ Beyond the literary evidence there are some indications of fiefdom-based industries that were organized parallel to the central Han state in Guanzhong. At the iron production site discovered in the southern part of the large city of Linzi (临淄), iron official seals from the Han dynasty, including those from the Qi Iron Official (齐铁官丞) and Qi Iron Mining (齐采铁印), have been found, and may have been a Han *tieguan* site.¹⁸⁸ But what period during the Han Dynasty remains unclear. Was this office set up in the early Han period as a regional branch of the central government (*i. e.*, the local government offices described by Tang Junfeng)?¹⁸⁹ From Michael Loewe's perspective, the Han empire only came into being because the emperor Gaozu reached a settlement

¹⁸⁴ Wagner 2008, p. 115-147; Li 2007, p. 84-93; Li 1995, p. 19-48; Wang *et al.* 2016, p. 136 table 2; Chen 2014, p. 346; Yang *et al.* 2014, p. 42; Wang *et al.* 2016, p. 132-136.

¹⁸⁵ For the migration of the Zhuo family, originally from Zhao, to Linqiong, and the Kong family from Weiliang to Nanyang, see Sima Qian, *Shiji*, 129, 3277-3278, Ban Gu, 24, 1164-1165; Wagner 2008, p. 239-242; Li 1995, p. 77; Yang 2004, p. 64-65.

¹⁸⁶ Sima Qian, *Shiji*, 106, 2821-2837.

¹⁸⁷ Sima Qian, *Shiji*, 106, 2822.

¹⁸⁸ Qun 1972, p. 51.

¹⁸⁹ Tong 2014, p. 4-5.

with many powerful “allies” in 202 BCE.¹⁹⁰ This is supported by the Han historian Sima Qian, noting that when Liu Bang passed away in 195 BCE, the Han court could directly control only a quarter of the empire’s nominal territory (15 commanderies), with the rest (42 commanderies) controlled by the fiefdoms of his descendants and allies, and each kingdom had its own bureaucratic system and laws, and the right to mint currency, mine minerals, and produce salt was clearly a privilege of the kingdom’s financial officials, not unique to the Qin and Han central governments.¹⁹¹ If we consider more capable feudal lords like King Liu Bi of Wu and King Liu Chang (刘长) of Huainan, who established strong support bases in their respective territories, arguing that the Han imperial court could establish a iron office *that they can control* in these regions would be hard to defend.¹⁹² Some scholars view the Qi Iron Official seals and the Qi Iron Mining seals together with the “Linzi Iron Mining” (临淄采铁) seals as representing the method by which local counties set up salt and iron market officials and their assistants.¹⁹³ This interpretation seems more reasonable, but it remains unclear whether these officials were part of the “central government,” like the local government offices found in the Donghai (东海) commandery records.¹⁹⁴ Zhang Chuanxi (张传玺) believes these iron-related seals should be understood as evidence of Liu Fei (刘肥) and his descendants of the (Han) Kingdom of Qi managing the iron industry in their fiefdom, not as part of the Han emperor’s iron official organization.¹⁹⁵ The likelihood, then, is that larger Han feudal kingdoms, like the one in Qi, developed their iron industries that *could* supply the Han court, but unlikely to have been controlled by it.

Amidst this fragmented political landscape with considerable rivalry between the Han court in Guanzhong and the feudal lords elsewhere, we find the Han court issuing customs laws regulating goods and persons, one of which preserved in the Zhangjiashan Han Slips corpus. Filed under the title *Second Year Decree: Ordinances of Ports and*

¹⁹⁰ Loewe 1986; also Tang 1989.

¹⁹¹ Sima Qian, *Shiji*, 17, 801-802, esp. 内地北距山以东盡諸侯地，大者或五六郡，連城數十，置百官宮觀，僭于天子 in the interior, to the north and east of the mountains, the lands were ruled by various feudal lords, with the larger ones governing five or six commanderies, several dozen cities, with hundreds of officials and palaces, competing with the emperor; Tang 1989; Yang 2003, p. 116.

¹⁹² Chen 2004.

¹⁹³ Fan, Han 2001, p. 66.

¹⁹⁴ Tong 2014, pp. 17-18; Liu 2019, p. 48.

¹⁹⁵ Zhang 1983, p. 228-229.

Passes (Ernian Lüling: Jin Guanling),¹⁹⁶ the text of 186 BCE under Empress Lü (241-180 BCE, regency 188-180 BCE) described meticulous regulations concerning who and what could pass through the five garrisoned passes of the Guanzhong region to secure the capital of Chang'an.¹⁹⁷ While most of the regulations concerning goods were horses, at one point we also find a list of items that cannot exit the Guanzhong region, including gold, artifacts containing gold, and copper, and a specific clause prohibiting export of iron.¹⁹⁸ Such sort of controls over ferrous or other metal implements have Qin precedents. Qin agricultural implement management schemes, for instance, shaped a closely monitored and controlled pre-Han environment in which some of the productivity tools were owned and leased by the Qin state, not to be discarded even when they become damaged.¹⁹⁹ We note that this is an export ban, not import, and it does not cover movement of any goods and persons between feudal kingdoms beyond the Guanzhong region. The only other specific control we see that sought to limit the trade and commerce of ferrous and non-ferrous items were also related to a ban issued under Empress Lü in 181 BCE, specifically concerning *manyi* and the *waiyue* (south and southeastern non-Han ethnicities).²⁰⁰ This special case will be discussed shortly.

¹⁹⁶ For English terms, see Li, Xing 2001, p. 128. For discussion on the controversy on the date set as the second year of Empress Lü, see Peng, Chen 2007, p. 86-87.

¹⁹⁷ Osamu *et al.* 2001; Jiang 2012, p. 105-106.

¹⁹⁸ Peng, Chen 2007, p. 309-310. Bamboo Strip 492 制詔御史，其令扞關、鄆關、武關、函谷、臨晉關，及諸其塞之河津，禁毋出黃金，諸奠黃金器及銅，有犯令[以下缺簡。The edict of the censor commands that the passes of Pingguan, Yunguan, Wuguan, Hangu, Linjin, and all other border checkpoints along the Hejin be prohibited from allowing the export of gold, including gold vessels and copper. Those who violate this order [text missing]. Bamboo Strip 493 制詔御史，其令諸關，禁毋出金器、鐵。其以金器入者，關謹籍書。出，復以闕出之籍器。飾及所服者不用此令。 . Editors report that the word iron (previously not positively identified but the left radical 金 was legible) was confirmed under infra-red lighting conditions.

¹⁹⁹ Liu 2019, p. 52-53; 55-56 also discussed cases where there were also privately owned agricultural implements sold by the Qin state, and for these there were no inscriptions indicating official ownership, and the monitor-and-control regimen would unlikely be applied.

²⁰⁰ Ban Gu, *Hanshu*, 95, 3851: 高后自臨用事，近細士，信讒臣，別異蠻夷，出令曰：毋予蠻夷外粵金鐵田器；馬牛羊即予，予牡，毋與牝。After Empress Lü took power, she relied on petty officials, believed their slanders, and issued a decree that no gold, iron, or agricultural tools should be given to the barbarians beyond Yue; horses, cattle, and sheep may be given, but only males, not females. Sima Qian, *Shiji*, 113, 2968: 高后時，有司請禁南粵關市鐵器。During the reign of Empress Lü, an official requested a ban on the trade of ironware in the Nanyue border markets.

On the Roman side, there are a number of examples in which sales of ferrous and non-ferrous metal products would lead to dire consequences. On ferrous materials, a key example is the prohibition of sale “to foreign barbarians of any race” (*alienigenis barbaris cuiuscumque gentis*) published in 455-457 CE under Marcianus, covering not just weapons of all kinds²⁰¹ but also any iron whatsoever, worked or unworked (*nihil penitus ferri uel facti iam uel adhunc infecti*), at pains of confiscation and death.²⁰² Earlier examples can also be found, but not a blanket ban against “foreign barbarians of any race,” rather more specifically “enemies” (*hostes*), presumably both foreign and domestic, including those declared enemy of the state. A passage by Scaevola commenting on the *lex Iulia de maiestate* states that the transfer of arms, money, horses, and other war-related goods *to the enemy* were a criminal offense, though it doesn't specify whether this involves a sale,²⁰³ while in one remark by Paulus we find selling items like whetstones, iron, grain, or weapons *to the enemy* (*hostibus*) may face capital punishment.²⁰⁴ The implication seems to be that merchants doing business with *amici*

²⁰¹ Perhaps only those produced by the state *fabricae*, for bows were not mentioned in the *Notitium Dignitatum* yet and hence not a banned item, until under Justinian, when bows were no longer to be sold by private individuals, see Koehn 2018, p. 142.

²⁰² *Codex Justinianus*, IV, 41, 2 pr.: *Imperator Marcianus. Nemo alienigenis barbaris cuiuscumque gentis ad hanc urbem sacratissimam sub legationis specie uel sub quocumque alio colore uenientibus aut in diuersis aliis ciuitatibus uel locis loricas et scuta et arcus sagittas et spathas et gladios uel alterius cuiuscumque generis arma audeat uenundare, nulla prorus isdem tela, nihil penitus ferri uel facti iam uel adhunc infecti ab aliquo distrahat. Perniciosum namque romano imperio et proditioni proximum est barbaros, quos indigere conuenit, telis eos, ut ualidiores reddantur, insturere. Marcian(us) a. Constantino pp.* [Let no one sell armor, shields, bows, arrows, swords, *spathae*/broad swords, or any other kind of weapon to foreign barbarians of any race who come to this most sacred city under the guise of an embassy or in any other form, nor let any iron, whether already forged or still in the process of being made, be sold or otherwise removed. For it is harmful to the Roman Empire and very close to treason to equip barbarians, who naturally require them, with weapons, so that they may become stronger. Marcianus to the praetorian prefect Constantius].

²⁰³ *Digest*, XLVIII, 4, 4: *Scaevola libro quarto Regularum. Cuius[ue] dolo malo iureiurando quis adactus est, quo aduersus rem publicam faciat [...] cuiusue opera dolo malo hostes populi Romani commeatu armis telis equis pecunia aliaue qua re adiuti erunt etc.* [Scaevola in the fourth book of the *Regularum*: and by whose evil intent someone has been made to take an oath to act against the state [...] or by whose effort with evil intent enemies of the Roman people shall have been aided by provisions, arms, missiles, horses, money or anything else: or to make enemies out of friends of Roman people etc.].

²⁰⁴ *Digest*, XXXIX, 4, 11 pr., *Paulus libro quinto Sententiarum. Cotem ferro subigendo necessariam hostibus quoque uenundari, ut ferrum et frumentum et sales, non sine periculo capitis licet* [Paulus, in the fifth book of the *Sententiae*, writes: The sale of a whetstone necessary for sharpening iron to the enemy, like iron, grain, and salt, is not without the danger of capital punishment].

populi Romani such the client kings of the east would not find themselves subject to such regulations, while those who were declared *hostes populi Romani*—including many Roman citizens in civil wars—may find these bans inconvenient.

Other than bans in the Roman domain, there were taxes. In a letter from Hadrian to the free city of Aphrodisias confirming their rights to provincial taxation, we learn that imperial procurators would levy taxes against cities in the *formula provinciae* for actions so general as “the use of iron” (περί τῆς τοῦ σιδήρου χρήσεως), and for items so specific as iron nails (καὶ τοῦ τέλους τῶν ἥλων).²⁰⁵ Such ferrous taxation is not attested elsewhere, as Reynolds’ explorations into “odd taxes” in the extant literature have found.²⁰⁶ We also find in the *portorium Asiae* two clauses that concern ferrous and non-ferrous metal ores. The first is a tax exemption for stone or rock that has been mined in order to extract iron and other metals, and have been considered as “unserviceable” (ὁ ἂν μηκέτι [χρή]σιμον ὑπάρχη).²⁰⁷ The second is a tax on all ores shipping to Asia, which fell under the purview of a mining law (γεωρυχικὸν νόμον), with the scheduled customs tax being 4 asses per hundred Roman pounds.²⁰⁸ It is not clear whether ores transported not to Rome but elsewhere would have been taxed, but the demand is clearly there. A good example for iron ores is Leptiminus, a town with a lot of olive oil and fish sauce to export but no local source of iron. Survey indicates that the town had a strikingly abundant amount of metallurgical debris (urnace/hearth linings, tap slag, iron bloom, hearth bottoms, vitrified clay fuel, ash glazing) as well as smithing slag remains, and

²⁰⁵ Oliver 1989, doc. 69 p. 166, l. 8-9: ἐξηρημένην τοῦ τύπου τῆς ἐπαρχείας [...] περί τῆς τοῦ σιδήρου χρήσεως καὶ τοῦ τέλους τῶν ἥλων.

²⁰⁶ Reynolds 1982, p. 117-118.

²⁰⁷ Cottier *et al.* 2008, p. 52-53, l. 66-67: καὶ ὁ ἂν φόβου πολεμίων χάριν εἰσηγμένον ἢ ἐξηγμένον ὑπάρχη, ὁ ἂν μηκέτι [χρή]σιμον ὑπάρχη, λίθον ἢ τὴν πέτραν, ἢ ἂν χρυσοῦ, ἀργύρου, | [...c. 6...σιδή]ρου, μολύβου, χρυσογάλκου ἕνεκεν ἢ ὠρυγμένα, τούτων ὅτι ἂν φέρηται τέλος μὴ διδόντω. [(whatever) has been imported or exported to deal with threats from enemies, whatever is no longer serviceable, in respect of stone or rock, that has been mined in order to extract gold, silver, (copper), iron, lead, orichalcum, whatever anyone may carry of these, he is not to pay telos, trans. Knibbe].

²⁰⁸ Cottier *et al.* 2008, p. 56-57, l. 78-79: ἥτις ἂν γῆ ἐξ Ἀσίας εἰς Ῥώμην κατὰ τὸν γεωρυχικὸν νόμον ἐξάγηται, ὑπὲρ τῆς γῆς ταύτης σκευῶν τε, ἐν οἷς ἂν αὐτὴ ὑπάρχη, [τῶι τελῶννι διδ]όντων ἑκατὸν λείτρων ἀσσάρια τέσσαρα. πλείον ὑπὲρ τῶν πραγμάτων τούτων τέλος μὴ ὀφειλέσθω κτλ. [Whatever ore is exported from Asia to Rome according to the lex on mining, on this ore and on the vessels in which it is contained, they are to (give the collector) four asses per hundred pounds; more in telos is not to be owed on these things. trans. Knibbe]

the explanation was that unprocessed iron ores were brought in as saleable ballast that could be converted in a receptive market.²⁰⁹

Together, these epigraphical evidence indicate that the types of actors with real stakes, demands and regulatory tasks in the Roman domain were truly many and far in between, taking up different roles and perspectives in the use commerce of ferrous (semi-)products both in circulation and just being produced. As part of a parameter setting project, individualized mobilities ought to be considered as well. That is, even when not transferred in bulk or purposely designated as merchandise, iron items, tools and implements in private possessions could have still entered an external domain where its ontological state could be retained or transformed into symbolic objects.²¹⁰ On top of these, the Roman military apparatus also represents a moving body of ferrous and non-ferrous production centers. Those situated on (or within the supporting zone of) the *limes* would even acquire iron ores to smelt and manufacture a wide range of ferrous and non-ferrous items.²¹¹ The number of individuals who know how to produce items must have been significant. Those with such knowledge were not only restricted to the *ferrarii* or blacksmiths, part of the train of specialist craftsman soldiers (*immunes*) who were in the service for metalworking, stonecutting, and woodworking duties.²¹²

²⁰⁹ Mattingly *et al.* 2001, p. 79-80.

²¹⁰ Hingley 2006, p. 237-239 on the variety of depositions of iron objects among Briton communities; on tools associated with the Roman military being reused as is in Vimose, found sporatically from bogs and peat-digging activities, see Christensen 2005, p. 60-69.

²¹¹ Here are a few examples, not at all comprehensive: Parker 1984, p. 37 mentions courtyard of the centurion's quarters at Lejjün on the *limes Arabicae* with significant metal-working activities, including a group of pits with iron slag, a number of spearpoints, blades and nails; Ployer, Sommer 2022 reports a number of *fabricae* along the Danube *limes*: at Regensburg Legionslager I a third century *fabrica/armamentarium*, p. 40 (6a), 67 (6a-I); at Straubing-Ostkastell a potential *fabrica* (or *horreum*), p. 42 (7a), at Lauriacum reports of late Roman *fabrica* for metal processing associated with *Lauriacensis scutaria* mentioned in the *Notitia Dignitatum*, p. 47 (14f), at Wien the Legionslager Zentralbereich with *fabrica* Am Hof, p. 55 (30d). For metalworking associated remains, such as iron slags and casting tile and tools (tongs, crucibles, blacksmith's hammer) at the Oberstimm fort, Allison 2013, p. 196 and Hesselbach fort, Allison 2013, p. 230; for discussion of high concentration of domestic items found along with metallurgical items in spaces potentially *fabricae*, see discussion of the late first century CE forts I and II at Rottweil (*Ara Flaviae*) by Allison 2013, p. 177-178.

²¹² Digest, L, 6, 7: *Quibusdam aliquam vacationem munerum graviorum condicio tribuit, ut sunt menses, optio valetudinarii, medici, capsarii, et artifices et qui fossam faciunt, veterinarii, architectus, gubernatores, naupegi, ballistrarii, specularii, fabri, sagittarii, aearii, buccularum structores, carpentarii, scandularii, gladiatores, aquilices, tubarii, cornuarii, arcuarii, plumbarii, ferrarii, lapidarii, et hi qui calcem cocunt, et*

Vegetius pointed out the rustic plebs were superb soldiers for many reasons, including “handling iron” (*gestare ferrum*),²¹³ and his high opinion of blacksmiths among those most appropriate for the military suggests at least a preference for if not a standing policy to recruit them.²¹⁴ It may be impossible to gauge the concentration of metallurgically literate individuals in and near Roman military encampments relative to urban and rural areas in general, but the likelihood is that Roman forts and fortresses would have not only collected such skilled individuals but also groomed additional ones, either systematically or through on-the-job haphazard training.

The externals of domain modeling

The discussion of frontier and military establishments bring up the dimension of internal and external regions within modelled domains. We can envision a closed matrix comprising producers, intermediaries and manufacturers from various areas of the Roman Mediterranean that must have been self-sustaining, but it would not be enough if we do not consider the “externals” with known metallurgical traditions, for instance those from beyond the *limes*. How Roman Mediterranean iron ores, (semi-) products and metallurgically literate talents moved. On the matter of iron exports, the Paulus and Scaevola passages have the tendency to be cited as evidence for bans, but

qui silvam infidunt, qui carbonem caedunt ac torrent [Some are granted exemption from more onerous duties, such as the measurers, the overseer of the infirmary, doctors, scribes, workers who dig trenches, veterinarians, architects, steersmen, shipwrights, crossbowmen, scouts, craftsmen, archers, clerks of the treasury, builders of cattle pens, carpenters, shingle makers, gladiators, eagle-bearers, trumpet players, horn players, bowyers, plumbers, blacksmiths, stonecutters, those who prepare lime, those who cut timber, those who gather charcoal, and those who transport it].

²¹³ Vegetius, *De re militari*, I, 3, 1: *de qua parte numquam credo potuisse dubitari aptiorem armis rusticam plebem, ... duratis ad omnem laborum tolerantiam membris, cui gestare ferrum, fossam ducere, onus ferre, consuetudo de rure est* [On this matter, I never believe it could be doubted that the rustic common folk ... carrying iron, digging ditches, and bearing burdens are customary tasks in the countryside]. On *gestare ferrum* as “handling iron,” see Stout 1921, p. 426-247.

²¹⁴ Vegetius, *De re militari*, I, 7, 6: *sequitur ut cuius artis uel eligendi uel penitus repudiandi sint milites indagemus. piscatores aucupes dulciarios linteones omnesque qui aliqui tractasse uidebuntur ad gynaecea pertinens longe arbitror pellendos a castris; fabros ferrarios carpentarios macellarios et ceruorum aprorumque uenatores conenit sociare militiae.* [It follows that we should investigate to which profession the soldiers ought either to be selected from or utterly rejected. Fishermen, bird-catchers, confectioners, linen-workers, and all who seem in any way to have practiced something pertaining to the gynaeceum, I think should be expelled far from the camps; blacksmiths, wagon-makers, butchers, and hunters of stags and wild boars ought to be associated with military service].

as Rankov's study shows, even if they were blanket bans (which they were not),²¹⁵ the fact that Roman iron products were found in Germanic tribes north of the Rhine and Danube *limes* and elsewhere needs to be properly addressed.²¹⁶ That is, even if there were bans, they may not work. Ferrous products from both sides of the Roman *limes* likely continued to circulate, licit or otherwise, due to simple necessity and a natural part of the everyday life of border communities. We recall Herodianus' description of Caracalla's letter to Artabanus IV, in which the Roman princeps described smuggling Roman metal ores and finished products to Parthia as a known phenomenon comparable to the smuggling of Parthian perfumes and textiles.²¹⁷

τὰ δὲ γράμματα ἔλεγεν ὅτι [...] δύο δὲ ταύτας ἀρχὰς εἶναι μεγίστας, τὴν τε Ῥωμαίων καὶ τὴν Παρθυαίων. [...] ταῦτα δὴ συνελθόντα, πάντων τε οἷς πόλεμος κατορθοῦται συμπινεόντων, ῥαδίως αὐτοὺς ὑφ' ἐνὶ διαδήματι βασιλεύσειν πάσης οἰκουμένης. τὰ τε παρ' ἐκείνοις φυόμενα ἀρώματα ἢ θαυμαζόμενα ὑφάσματα καὶ <τὰ> παρὰ Ῥωμαίοις μεταλλεόμενα ἢ διὰ τέχνην ἐπαινούμενα μηκέτι μόλις καὶ σπανίζοντα λανθάνοντά τε δι' ἐμπορῶν κομισθήσεσθαι, μίᾳ δὲ γῆς οὐσης καὶ μίᾳ ἐξουσίας κοινὴν καὶ ἀκώλυτον ἀμφοτέροις τὴν ἀπόλαυσιν ἔσεσθαι.

The letter said that [...] these two powers, the Romans and the Parthians, are the greatest. [...] When these forces are united, with all those for whom war succeeds breathing together, they would easily rule the entire world under a single diadem. The perfumes and admired fabrics produced by [the Parthians], or [products] mined by the Romans or praised for their craftsmanship, would no longer be rare or hard to obtain, secretly carried by merchants, but with one land and one authority, both would have common and unhindered enjoyment of them.

²¹⁵ In the case of Paulus, Rankov saw no reason to read the sentence *cotem ferro subigendo necessariam hostibus quoque* ("even to the enemy") *venundari, ut ferrum et frumentum et sales, non sine periculo capitis licet* but rather *cotem [...] necessariam quoque [...] venundari* (following Mommsen, "(the sale) even of a single whetstone" etc.), turns a citation of a law to Paulus' own juridical opinion, that "the sale of the most insignificant item which might help an enemy, let alone basic materials such as iron, corn or salt, is, to his mind, a capital offense." It was not a ban on iron, but "a general view that helping an enemy in any way is treason and punishable by death," a reading reinforced by the Scaevola excerpt also in the *Digest* that any aid in the form of provisions, arms, projectile weapons, horses, money etc. would have been criminal. Rankov 1999, p. 117-118.

²¹⁶ Kolendo 1980; Kolendo 1994; Orzechowski 2018, p. 397-398 suggests discussing the import/export phenomenon as a "*limes* zone" question, pointing to the Cotini of Dio Cassius, LXXI, 12 during the Marcomanni war, who were likely the Gotini that worked iron in Tacitus, *Germania*, 43, 2: *Cotini, quo magis pudeat, et ferrum effodiunt*.

²¹⁷ Herodianus, IV, 10, 2.

In historical context, the letter (if indeed real)²¹⁸ was a ploy: Caracalla ambushed Artabanus by surprise and for a brief period forced the Parthians to withdraw from Mesopotamia, until his assassination and eventual peace offering by Marcinus.²¹⁹ Historical context aside, what is of concern here is the expression *καὶ <τὰ> παρὰ Ῥωμαίοις μεταλλεύόμενα ἢ διὰ τέχνην ἐπαινούμενα*. The word iron is not present, but a generous interpretation of *μεταλλεύόμενα* can assumedly be metals that include iron. Since there are findings that some Roman smithies were capable in manufacturing steel,²²⁰ it is not inconceivable that Roman ferrous products may have had a good market demand. Or, it may be simply that ferrous items were naturally useful, and there is always a market for useful things—arms, tools, and other items of individual interests. Between the two empires, such items will be moved, even at the expense of the movers' reputations as smugglers (*λανθάνοντά τε δι' ἐμπορῶν κομισθήσεσθαι*).

What is also important to note is that the movers mentioned in the Caracalla letter, the *emporoi*, were likely logistics systems owned and operated by elites based at Palmyra (and perhaps other caravan towns at Dura-Europos and Petra). They run both caravans (some of whom were also ship-owners that operated in tandem the Red Sea route) and frontier defenses.²²¹ A fragmentary bilingual tariff law from Palmyra (*OGIS* 2, 629) in Palmyrene and Greek helps describe a model of taxation for border trade in the month of Xandikos/April of 137 CE.²²² The decree outlined new tax rates for various goods traded in and out of Palmyra, including slaves, agricultural produce, luxury items like purple-dyed fleece and olive oil, exacted using camel-load and donkey-load as units for dry goods, and goatskins and alabaster vessels for liquids (l. 9-52). For slaves (l. 1-8) and prostitutes (l. 75) there were counts *per capita*, and all shops and sellers moving in the city were taxed monthly. There was also tax for the use of water (l. 88).

²¹⁸ Seland 2014, p. 88: “The letter is likely to be a literary construct, never actually written or sent. That, however, does not diminish its value as a normative description of cross-border trade etc.”

²¹⁹ Herodianus, IV, 10, 5-15.

²²⁰ Lang 2017, p. 862-863 discusses excavated finds including steel blooms, ingots, and semi-products intentionally produced in the smelting furnace, suggesting that high-carbon steel was made using the direct process. For Norican steel, see Furger 2018, p. 44-50.

²²¹ Seland 2020, p. 90-92; Sander 2022, p. 48-51 (for military representations of camel-back merchant elites), 51-54 (discussion of frontier warriors).

²²² Ἐτους ημῶν, μηνὸς Ξανδικοῦ ιη', δόγμα βουλῆς. In the year 448 (of the Seleucid era) on the 18th of the month Xandikos: Matthew 1984, p. 174.

Again, this is another example that cannot be taken as support unless with the assertion that metals (ferrous or non-ferrous) were among the taxable cargos. Potentially, the workshops mentioned in lines 80-83 included *fabricae*. To speculate whether the missing 30 or so lines in the new tax law (or the fragmentary old law attached) contained relevant clauses would not be constructive. What is perhaps more useful is to note some of the structural circumstances that must have been accompanied by exchanges or at least the mobility of metal items ferrous and otherwise more than a common occurrence. Firstly, the Hadrianic *boule* was clear in its intention to publish the decree regulating taxation practices because the city magistrates needed a tax law that was up-to-date to arbitrate disputes between tax-collectors and merchant elites, which seemed to have been so frequent during Hadrian's later years as to require a pronounced response by the civic institution. Magistrates along with a board of ten men would determine the dues for unstipulated but taxable items according to category, and publish such terms in a public space (in this case, on a stone column opposite the temple called *Rabaseire*), so that the tax farmers know precisely of such promulgation of the tax schedule, and merchants have at least an official guarantee on the import customs of taxable goods.²²³

The wish to continue trade in an orderly manner meant that even if metals were not taxable cargo, the continuous flow of caravans would guarantee movement of and the opportunistic exchange for (in the Leptiminus example), deposition of (such as the symbolic conversion of iron items in Britannia), or loss of ferrous and non-ferrous metal items. When viewed in context of the Caracalla letter, the context of which was a product of war and instability with normal commercial activities driven into an illicit affair, the Palmyrene tariff decree offered an enabling mechanism for a basic level of mobility. Yet again, what the Caracalla letter and the Palmyrene tariff decree indicate is that trans-border interactions would continue even when such mechanisms were

²²³ Panel 1: [...] δεδόχθαι, τοὺς ἐνεστῶτας ἄρχοντας καὶ δεκαπρώτους διακρίνοντας | τὰ μὴ ἀνειλημμένα τῷ νόμῳ ἐνγράφει τῇ ἐγγιστα μισθώσει καὶ ὑποτάξει ἐκάστω εἶδει τὸ | ἐκ συνηθείας τέλος, καὶ ἐπειδὴν κυρωθῇ τῷ μισθουμένῳ, ἐνγραφῆναι μετὰ τοῦ πρώτου νόμου στήλῃ λιθίνῃ τῇ οὕσῃ ἀντικρὺς [i]ερ[οῦ] λεγομένου Ραβασείρη, ἐ[πι]μελείσθαι δὲ τοὺς τυγχάνοντες κατὰ καιρὸν ἄρχοντας καὶ δεκαπρώτους καὶ συνδικ[οὺς τοῦ] μηδὲ νπαραπράσσειν || τὸν μισθούμενον [it is resolved that the magistrates in office and the *dekaprotoi* should determine the dues not set down in the law and write them into the next contract, and assign to each class of goods the tax laid down by custom; and that when they have been confirmed by the contractor they should be written down together with the first law on the stone column opposite the temple called *Rabaseire*; and that the magistrates who are in office at any time and the *dekaprotoi* and *syndikoi* should take care to see that the contractor does not exact any excess charge].

wanting or ceased to exist due to war. When further considering that ferrous (semi-) products were not just traded in bulk but carried as personal items, there is need to assume that the mobility (and exchange) of iron was ever continuous, and presumably leading to ever-evolving exchanges in knowledge of new types of ferrous products. With such continuity of exchange and discovery, we have Pliny the Elder's remarks on Seric iron sent along with their textiles and furs, and Parthian iron that was tempered purely by sharpening alone, without mixing in a softer alloy like other ferrous production processes in the Roman Mediterranean.²²⁴

The analysis of the Roman Mediterranean evidence so far suggests that attested literary descriptions of political and diplomatic efforts to regulate, check, or facilitate trade can be difficult to assess in terms of effectiveness. What they may reveal is the continuation of established and active engagement at the private and everyday levels. That said, using literary accounts or anecdotes as proxy data for trans-border exchanges and activities is an established approach separate to the comparative. Extrapolations work within a data domain: from the Caracalla letter, fictive or otherwise, one can make suppositions concerning the Roman-Parthian conflict, and the borderland trade situated within the broader geographical and historical context of Syria, Mesopotamia, Arabia, and associated lands. The Palmyrene tariff decree both structured trade into taxed commodities and hinted at the volume of informal trade. The constant flow of caravans and merchants challenged war and instability. What to test now is that mechanisms of exchange, in a sense, helps the comparative approach become less to justify (arguably one cannot) cross-domain extrapolations, but rather to find some use to the extrapolation of one domain for the other. This is where we make one final effort, introducing a case concerning borderland trade and diplomacy between ancient states of the Qin-Han domain, in which there is bare-bones literary evidence to work with.

The Nanyue Ban and the Comparative Extrapolation Question

As we turn to the Han evidence, it is again important to emphasize on the outset that the purpose is not to argue cross-domain application of *evidence* works, but to test whether extrapolated *observations*—in this case the manifold ways to extrapolate data concerning mechanisms of exchange—can be helpful in approaching sets of limited

²²⁴ Plinius, *Naturalis historia*, XXXIV, 145: *ex omnibus autem generibus palma Serico ferro est; Seres hoc cum vestibus suis pellibusque mittunt; secunda Parthico. neque alia genera ferri ex mera acie temperantur, ceteris enim admiscetur mollior complexus.*

evidence so that there can be more meaningful interpretations. The Nanyue ban is one such set of limited evidence that this last section of the paper will be concerned with. We will first describe the evidence, then approach it from what we have learned in the Roman-Parthian extrapolation.

The Kingdom of Nanyue was established by Zhao Tuo (赵佗), a magistrate of Longchuan in the Nanhai commandery who, during the tumultuous last years of the Qin empire, took control of Guilin and Xiang commanderies, and declared himself King of Nanyue.²²⁵ The Han emperor Gaozu subsequently recognized his claim to the title king but in the rites of a feudal lord, and according to Sima Qian dictated that he shall not cause disturbance to the kingdom of Changsha, which was the southern border of the Han empire.²²⁶ Then the ban came during the reign of Empress Lü. Sima Qian reported only that “officials requested a ban on the trade of ironware with Nanyue.”²²⁷ Sima Qian gave Zhao Tuo voice to respond in direct speech:

高帝立我，通使物，今高后聽讒臣，別異蠻夷，隔絕器物，此必長沙王計也，欲倚中國，擊滅南越而并王之，自為功也。

Emperor Gaozu established me as king and granted trade rights. Now, the Empress (Lü) listens to slanderous ministers, alienates us by designating us *manyi*, and cuts off the exchange of goods. This is surely a scheme by the King of Changsha, who wants to rely on China to destroy Nanyue and annex it, thus achieving personal glory.

In the aftermath of this diplomatic row, Zhao Tuo harassed the border towns of Changsha Kingdom while the Han army from the north was languishing by an epidemic, and with the death of the Empress Zhao Tuo declared himself emperor. The new emperor Wendi restarted diplomacy and managed to have Zhao Tuo retract the claim to imperial status.²²⁸ At the conclusion of the affair, Sima Qian made no subsequent references to commerce or iron.

The account in Bangu's *Hanshu* gives even more context as well as more voice to Zhao Tuo, and warrants attention. Wendi's ambassador arrived with the imperial correspondence explaining why inappropriate policies were adopted under Empress Lü's last years (because of bad ministers), what measures Wendi took in addressing Zhao Tuo's grievances (getting rid of offending generals in the Changsha Kingdom)

²²⁵ Sima Qian, *Shiji*, 113, 2967.

²²⁶ Sima Qian, *Shiji*, 113, 2967-2968.

²²⁷ Sima Qian, *Shiji*, 113, 2969: 有司請禁南越關市鐵器。

²²⁸ Sima Qian, *Shiji*, 113, 2969-2970.

and how Zhao Tuo's family in northern China was taken care of. Zhao Tuo responded in kind, publishing a decree withdrawing his claim to imperial status and accepting Han vassalage. He also sent an official correspondence to Wendi, which Ban Gu may have transmitted in full, for it also retained the language of the ban in direct quotation. For clarity we include the full letter here.²²⁹

蠻夷大長老夫佗昧死再拜上書皇帝陛下：老夫故粵吏也，高皇帝幸賜臣佗璽，以為南粵王，使為外臣，時內貢職。孝惠皇帝即位，義不忍絕，所以賜老夫者厚甚。高后自臨用事，近細士，信讒臣，別異蠻夷，出令曰：『毋予蠻夷外粵金鐵田器；馬牛羊即予，予牡，毋與牝。』老夫處辟，馬牛羊齒已長，自以祭祀不脩，有死罪，使內史藩、中尉高、御史平凡三輩上書謝過，皆不反。又風聞老夫父母墳墓已壞削，兄弟宗族已誅論。吏相與議曰：『今內不得振於漢，外亡以自高異。』故更號為帝，自帝其國，非敢有害於天下也。高皇后聞之大怒，削去南粵之籍，使使不通。老夫竊疑長沙王讒臣，故敢發兵以伐其邊。且南方卑溼，蠻夷中西有西甌，其眾半羸，南面稱王；東有閩粵，其眾數千人，亦稱王；西北有長沙，其半蠻夷，亦稱王。老夫故敢妄竊帝號，聊以自娛。老夫身定百邑之地，東西南北數千萬里，帶甲百萬有餘，然北面而臣事漢，何也？不敢背先人之故。老夫處粵四十九年，于今抱孫焉。然夙興夜寐，寢不安席，食不甘味，目不視靡曼之色，耳不聽鍾鼓之音者，以不得事漢也。今陛下幸哀憐，復故號，通使漢如故，老夫死骨不腐，改號不敢為帝矣！謹北面因使者獻白璧一雙，翠鳥千，犀角十，紫貝五百，桂蠹一器，生翠四十雙，孔雀二雙。昧死再拜，以聞皇帝陛下。

I, the Great Elder of the *manyi*, Zhao Tuo, humbly bow to the Emperor's throne: I was once a Qin magistrate. Emperor Gaozu granted me a seal and made me the King of Nanyue, designating me as a foreign vassal, sending regular tributes. When Emperor Hui ascended the throne, he did not sever ties out of a sense of obligation, and thus I was greatly honored. However, when Empress Lü assumed power, she befriended petty officials, trusted slanderous ministers, and alienated the *manyi*, issuing an edict stating that "the export of gold, iron, and tools to the outer Yue was forbidden; export of horses, cattle, and sheep were allowed, but only the males, not the females." My territory is remote; my horses, cattle, and sheep have grown old and unfit for sacrifice. I have been accused of committing a capital offense. To rectify this, I sent memorials through the interior minister Fan, the central minister Gao, and the high minister Ping for redress, but none were answered. I also heard that my parents' tombs had been destroyed, and my family and clan were persecuted and executed. My ministers debated, saying, "We can no longer rise under the Han, and we must assert our independence in the south." Thus, I took the title of Emperor for my own, not out of desire to harm the world, but because of these injustices. When Empress Gao heard of this, she became furious and had Nanyue's records erased, and communications were cut off. I suspected that the King of Changsha

²²⁹ Ban Gu, *Hanshu*, 95, 3851-3852.

was influenced by slanderous officials, which led me to raise troops and attack his borders. The south is low and swampy, and within the barbarian tribes there are many smaller kingdoms. To the west, there is the kingdom of Xiyou, whose people are weak, and they call themselves kings; to the east, there is Min Yue, with a few thousand people who also claim to be kings; to the northwest, there is Changsha, which is partly *manyi*, and they too call themselves kings. That is why I boldly claimed the title of emperor, though it was merely for my own amusement. I have stabilized a land of hundreds of cities, with territories stretching over thousands of miles to the east, west, south, and north, with an army of over a million soldiers. Yet, I face north and serve the Han Emperor, why? It is because I dare not betray my ancestors. I have spent forty-nine years in Yue, and now I have grandchildren. I wake early and sleep late, my bed is uncomfortable, my food tasteless, I cannot enjoy the colors of my surroundings, nor the sounds of the bells and drums, because I cannot serve the Han properly. Now, Your Majesty, I beg for your mercy and compassion, to restore my former title and allow communication with the Han as before. Even in death, my bones will not decay, and I will no longer dare to assume the title of emperor. Humbly, I send a pair of white jade discs, a thousand kingfishers, ten rhinoceros horns, five hundred purple shells, a container of camphor, forty pairs of green silk, and two pairs of peacocks. I humbly bow and present this to the Emperor.

Ban Gu seems to have been eager in presenting Zhao Tuo as an rightfully aggrieved party, more so than Sima Qian, who left out information that Zhao Tuo's family in northern China persecuted and his ancestral tomb desecrated, and Zhao Tuo's account that the King of Changsha, supported by ministers and in particular military leaders, orchestrated the ban on iron and mares, cows, and ewes. It is striking to read Zhao Tuo designating Kingdom of Changsha as "partly *manyi*," perhaps Ban Gu's note of the competition between Zhao Tuo and the grandsons of the King of Changsha Wu Rui (吴芮).²³⁰ At the time of Empress Lü's ban Wu Rui has long deceased, and the reigning king was his great-grandson Wu You (吴右).²³¹ From all accounts, Zhao Tuo clearly had the upper hand in 180 BCE in terms of military preparedness, making it suspicious to believe that Wu You's party would try to orchestrate a ban without preparation. But for our purposes, the most curious is Zhao Tuo's focus on the inavailability to acquire mares, cows and ewes in his official correspondence to Wendi. He claimed that this ban had

²³⁰ At the time of Gaozu's death, Wu Rui was the only vassal who did not have kinship relations with the imperial Liu family. Like Zhao Tuo, he also happened to have been a Qin magistrate of Fanyang south of the Yangzi River, before raising a militia force comprising the local *yue* ethnic group and sided with Han forces, then vassal king under Gaozu, see Sima Qian, *shiji*, 9, 396, Ban Gu *hanshu*, 34, 1894; 65, 3859.

²³¹ Sima Qian, *shiji*, 17, 804-838. Ban Gu did not see anything notable among Wu Rui's issues who succeeded him as the king of Changsha, merely that this line terminated after a few generations; Sima Qian on the other hand gave names and dates for those who succeeded him.

devastated his herds and flocks to the point that only old male animals were left, while making no mention of the effects of the part of the ban concerning iron implements. We have no way to ascertain whether he was speaking in earnest; it may be obfuscation. But obfuscation for the lack of ferrous metallurgical capability? Then the Han court already knew by issuing the ban. Or was it obfuscation for a level of ferrous metallurgical capability that exceeded the expectations of the Han court? At the heart of this inquiry is the need to ask to what extent was Nanyue capable of iron production at levels that could satisfy the Nanyue state.

Various types of iron metal tools, agricultural implements, and ironworking artifacts discovered in Guangxi, Guangdong, and other regions dated to the Warring States period lead to the question whether they were locally produced central plains products, or they were imports.²³² If the former, then large-scale local production of iron tools with advanced forging and casting techniques have grown root in Lingnan, potentially round the time of the Qin conquest of the *baiyue* peoples between 219 to 218 BCE. Although there is also the likelihood of these being imported, discoveries like the iron-footed bronze cauldron and iron double-headed axe in the Warring States tombs at Yinshan in Pingle (平乐银山岭), Guangxi, which are distinct from the Central Plains and Chu artifacts, suggest that iron production in Lingnan might have begun to develop earlier, perhaps as a result of the expansion of the Chu state into the Lingnan region.²³³ By that time, the well-established ironworking techniques from Hunan, which were already advanced, may have started to spread gradually into the Lingnan region, though not at a significant scale. In addition to local production, the flow of Chu-made iron tools into present-day Guangxi and Guangdong was likely widespread. Among the 199 iron tools (including 11 copper-iron composite tools from Yinshan in Pingle) discovered in 110 Warring States period tombs across Guangxi, including bamboo-leaf-shaped harvesters used for collecting grain.²³⁴

²³² Huang 1996, p. 60; Bai 2005, p. 366-367: Since iron tools from the Qin and early Han periods typically lack inscriptions, we can rely on typology to identify tools (such as the hollow-headed axe, vertical chisel hoe, and straight-edged spade) and weapons (like the ratchet and forked halberd) produced in the regions south of the Great Wall. These artifacts are found at early Han sites such as Spider Mountain in Chifeng (赤峰蜘蛛山), Anzhangzi (凌源安杖子) in Lingyuan, and Xiaohuangdi in Jinxi (锦西小荒地). Similarly, items like the hollow-headed axe, chisel, and various types of swords found at the Wuyishan Chengcun (武夷山城村) and the Pingle Yingshan site in Lingnan, are all in the shape and style of tools made in the Central Plains.

²³³ Zheng 1996, p. 54.

²³⁴ Zheng 1996, p. 52-56.

What these suggest is that, under the early years of the Nanyue Kingdom under Zhao Tuo, several key technology transfers and capacity expansions must have occurred before Empress Lü's issuance of the ban, though scale is a problem. If we read Empress Lü's ban as a proxy, it seems reasonable to assert that Zhao Tuo imported iron and metal tools in large quantities from the Changsha Kingdom before the ban, and this would still make sense, given the considerable number of ferrous instruments and tools that look like northern imports. Scholars also propose reading a spike in activity during the time of Empress Lü's ban, even those the vast majority of iron items can only be assigned general dates and cannot be precisely dated. That said, since accounts were likely true that Nanyue had the upperhand militarily and were actually in control of the southern borders of the Kingdom of Changsha, and if the Kingdom of Changsha had ferrous metals to commerce and transact, it seems more likely that cross-border trade of iron would continue, though under the Kingdom of Nanyue's terms. With the Kingdom of Changsha's defenses having been tested and defeated in the aftermath of Empress Lü's ban, and with certain demand for ferrous if not also non-ferrous products produced elsewhere, it seems reasonable that the flow of ferrous goods would continue, and one suspects that personnel trained in smelting and working with cast-iron would have been targeted for extraction by the Nanyue troops. The combination of early development under the Qin empire, followed by continued imports and interests of ferrous goods before the ban, and even following the ban as the southern border defenses were dismantled, meant that there were indeed multiple factors that could be mustered to explain the growth of the Nanyue iron industry.

Narratives on the Nanyue region gaining metallurgical capacity tend to seek out corroboration with historical sources.²³⁵ One narrative is that Zhao Tuo led developments in agricultural economy and the corresponding iron industry, laying a solid foundation for responding to the iron and husbandry ban under Empress Lü, in turn accelerating the mastery of advanced forging techniques within the Nanyue Kingdom.²³⁶ The overall sentiment may be hard to quibble with, but when one asks just what were the circumstances that enabled an acceleration in the mastery of

²³⁵ Lam *et al.* 2019, p. 126; but authors noted that while funerary iron tools from the late Warring States to early Western Han periods in the Guangzhou region, sample size remains small.

²³⁶ Zheng 1996, p. 54: 估计在南越国以前，该遗址已经采矿冶炼，但规模不大，吕后关市铁器之后，才迅速扩大发展起来 [It is estimated that before the Nanyue Kingdom, mining and smelting had already occurred at this site, but on a small scale. It was only after the establishment of the ironware market during Empress Lü's reign that it rapidly expanded and developed]. Huang 1996, p. 60.

techniques, the narrative would be in need of an answer. There is also a narrative that points to Zhao Tuo's sending of three ministers to negotiate the dropping of the ban being a sign that Nanyue was being starved of all the iron products it used to import, and found it a top priority to continue the iron trade. However, in the actual letter reported by Ban Gu, Zhao Tuo's complaint was focused on mares, cows and ewes, not to restore access to ferrous products from the central plains region.²³⁷ The argument may be that it was haphazard, and iron was intended. Alternative interpretations can perhaps be also inviting. By not referring to the iron ban, Zhao Tuo may have been projecting strength, now that he might have scored three goals: Changsha's production of iron products (if any were left) may continue to be acquired through commerce; Changsha's productivity in terms of personnel and technical knowledge base have now been acquired through recruitment or capture of skilled smiths and smelters; the influx of talent and resource have lifted Nanyue's productivity to levels that may lower dependencies of iron production elsewhere.

Conclusions

This paper addressed the methodological challenges of the comparative approach through two angles of attack. The first is to locate the pragmatic and utilitarian angle, which is described as the creation of modeling domains to facilitate a structured, yet flexible, use of evidence to build specialized worlds. In the case of the present paper, the worlds built up consisted of generalized rules and frameworks elicited from literary and archaeological evidence, paired with two sets of diachronic, fragmented landscapes that aimed to represent the progressive acquisition and integration of lands with established metallurgical traditions. In the process, the co-option of metallurgical traditions into the *Romanitas* and the later imposition of new rules and norms by the *imperium Romanum* offered a concrete domain that can then be "paired" with its Qin-

²³⁷ Huang 1996, p. 60: 赵陀与汉廷关系恶化的一个重要原因史吕后“禁南粤关市铁器”，实施对南粤的金铁天气禁运，为此迫使赵陀连接派遣内史藩、中尉高、御史平三次上书汉廷请求解禁，南粤渴望得到中原铁器的迫切心情于此可见。[One important reason for the deterioration of Zhao Tuo's relationship with the Han court was Empress Lü's "ban on the ironware market in Nanyue," which imposed an embargo on the export of metal and iron tools to Nanyue. This forced Zhao Tuo to send the Interior Minister Fan, the Middle Lieutenant Gao, and the Censor Ping three times to petition the Han court to lift the ban. This reflects the urgent desire of Nanyue to obtain iron tools from the Central Plains].

Han counterpart, again from the ground up, with the Warring States in the background and imposed upon by conquests, migrations, feudalisms, and monopolization.

Reaching this step is not enough. Each domain may seem at first to be closed systems, but with importation of additional parameters and even an “external” dimension, with domains increasingly an aggregative set that relates with others, depending on available evidence. Outside the Roman Mediterranean there is always some other domain necessary to be described, such as the Roman-Parthian case, which involves two empires with distinct cultural, political, and geographical characteristics but with shared anecdotes of trade and commerce that necessarily devolve into manifold forms of relations. Then there is the Han-Nanyue case, which involves the Han court based in Guanzhong and a peripheral kingdom with questionable claims to vassal status and cultural and historical ties. The more detailed the external description, the more observations and extrapolations one can make. When taken to several degrees forward, however, domains become less apparently relevant, even when each domain would be open by intent. The distancing effect necessarily requires particular caution in cross-domain discussions. The way forward can be ironically backwards: systems are best to be compared within their own distinct historical and social contexts while also being examined through the lens of shared phenomena, such as the evolution of metallurgy or the imposition of imperial control over local traditions.

What is observable of the comparable approach is that as domains increase in distance, extrapolations from any two domains with degrees removed necessarily decrease in efficacy; but conversely, increasing distance between domains further highlights the importance of historical and social specificity. For example, Roman imperialism and Han imperialism may share overarching themes of centralization, but their specific manifestations—driven by cultural, political, and geographical factors—would become too distinct to allow for overly simplistic or deterministic comparisons. In other words, the comparative approach may in its advanced stages may increasingly require domain modelling to grow in specificity and dynamism, even as comparisons lead to recognizably shared phenomena, like the evolution of metallurgy or the imposition of imperial control. There is no end result to speak of in comparative exercises, because it drives the comparisons to compete for something that the other is lacking.

To conclude, this paper aims to show that the comparative approach to the Qin-Han and Roman Mediterranean industries ought to be by design ever expanding, from technologies and hierarchies to geographical and chronological scopes. Arguably,

such projects are meant to be discoveries of kind not necessarily focused on resolving any specific issue or reaching any sort of concrete proofs. The comparative approach affords no certain teleological ending but rather seeks to set up concrete ways in which the understandings of multiple dimensions of specific domains can be discussed and “paired” in ever increasingly comprehensive manner.

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Abbreviation

OGIS = Dittenberger W., *Orientalis Graeci inscriptiones selectae*, 2 vol., Leipzig, 1903-1905 [rééd. Hildesheim, 1986].

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