Building with Water: The Rise of the Island-City in the Early Modern Mediterranean

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Military engineers dispatched to the Sicilian coastline in the first decades of Spanish Habsburg rule encountered a vulnerable landscape punctuated by aging fortifications incapable of withstanding the assault of modern artillery.[1] In his *Relazione delle cose di Sicilia* of 1546, Viceroy Ferrante Gonzaga wrote that at the outset of his tenure in 1535, he found the island "very weak and open" to the near and present danger posed by Ottoman expansionist ambitions and the increasing corsair presence in and around North Africa.[2] Gonzaga's successor, Don García de Toledo, echoed this sense of urgency in a letter of 1570, in which he described the pressing ("urgente, et urgentissima") need to fortify ports and strengthen local infrastructure.[3] Throughout the sixteenth century, Spanish efforts to remedy the state of Sicilian defensive systems concentrated on the construction of a nearly continuous chain of watchtowers and bastioned cities intended to gird the island against rising threats.[4]

The small city of Trapani, at Sicily's northwestern corner, was thought to be at particular risk given its proximity to North Africa. Located at the tip of a narrow tongue of land projecting from the coast, Trapani was also uniquely susceptible to incursions from both land and sea. In 1526, to counteract the city's topographical vulnerability, engineer Pietro Antonio Tomasello de Padua cut a sea canal along the existing stretch of walls fronting the mainland. A view of the city published in Rome in the mid-sixteenth century indicates the contours of this artificial waterway, which severed the peninsula—and with it, the urban core—from the *terra ferma* (Figure 1).[5] In his *Istoria di Trapani* (1595), engineer-cum-chronicler Francesco Pugnatore observed that the canal "extends along the eastern walls of the city, such that the water of the sea, passing through, leaves the city and the castle—together—isolated."[6] The city was thus transformed into a fortified island, suspended just beyond the shore.

Tomasello's reconception of Trapani as an "island-city" was not an anomaly in the history of early modern military engineering. From the fifteenth through the seventeenth centuries, the practice of excavating defensive waterways across the isthmuses of peninsular cities gained currency across the Mediterranean. In this article, I trace the rise and dissemination of this urban type, arguing that the island-city was likely modeled on interventions in ancient settlements in the Greek archipelago and that it emerged as an early modern phenomenon in the Adriatic and Ionian territories of the Venetian *stato da mar*.[7] Over the course of the sixteenth century, a wave of experimentation with the type swept Iberian outposts in the western Mediterranean basin, from North Africa to the Tuscan coast. By the turn of the seventeenth century, it had been fully assimilated into a shared Iberian vernacular of defensive design.

The circulation of the island-city type between these far-flung places might seem to rehearse a familiar narrative of architectural cross-pollination. Fortification technologies were rendered portable by itinerant engineers, who routinely left behind drawn and textual records as they traversed the Mediterranean. What sets this case apart, however, is the insight it offers into the role of colonial territories in developing defensive models within the larger region. By reconstructing the mechanisms that fueled the dissemination of the island-city, we can chart an alternative map of architectural

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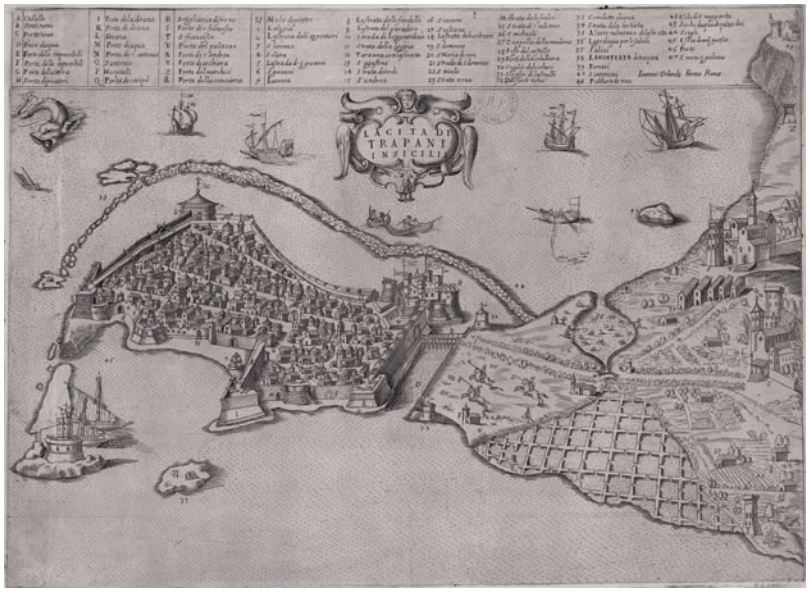


Figure 1 Giovanni Orlandi, *La città di Trapani in Sicilia*, 1560 (IFN-8440455, Bibliothèque Nationale de France, Paris).

influence in the Mediterranean—one that finds its center of gravity well beyond the familiar shores of the Italian and Iberian Peninsulas. Indeed, Sicily was an incubator for the development of this type throughout the sixteenth and seventeenth centuries, a fact that challenges the island's long-standing marginalization in the historiography of early modern architecture.[8] In focusing attention on the exchange of architectural knowledge between understudied geographies, this article furthers contemporary disciplinary efforts to forgo the traditional dichotomy between "centers" of production and their "peripheries" in favor of a more flexible understanding of the cultural dynamics that shaped the period.[9]

Building with Water

The rise of the island-city demands that we rethink the status of landscape in early modern defensive design. Landscape had, of course, loomed large in the discourse of urban planning at least since Vitruvius's *De architectura*, which espoused a direct link between a city's site and its internal architectural logic. In the Vitruvian tradition, the orientation of streets was often predicated on the direction of winds in order to prevent unhealthy air from penetrating the urban fabric. In the case of fortified cities, this basic urban calculus intersected with the burgeoning science of warfare. The topographical challenges posed by coastal environments complicated the negotiation between city and site yet further: in a city with waterside ramparts, for instance, Vitruvius stipulated that the forum should be placed adjacent to the harbor; in an inland city, in contrast, the forum should be situated at the town center.[10]

Writing in the late fifteenth century, Francesco di Giorgio Martini expressed a distinctly Vitruvian attitude toward landscape. When designing the walled enclosure of a stronghold or fortress, he advised, the "prudent and skilled" architect must adapt the rules of building to suit "the nature of the site, adding and reducing and composing."[11] We find the same principle at play in Francesco de' Marchi's *Della architettura militare*, published posthumously in 1599. This treatise includes a series of illustrations of fortified cities abutting natural or artificial ports. In one of de' Marchi's imagined cities, a circular harbor interrupts the neat, radial organization of the streets like a bite from an apple; in another, a gridded city bends to meet the river bifurcating it, the parallel streets distorted to match the waterway's undulating contours (Figure 2).[12] For both Martini and de' Marchi, topography determined urban morphology.

As Spain claimed coastal frontiers across the Mediterranean in the early decades of the sixteenth century, the elemental tension between landscape and design that had long defined military urbanism took on new urgency. Engineers were often forced to construct walls and bastions on unstable terrain, subject to the ebb and flow of shifting tides. These conditions prompted the development of diverse strategies for harnessing aqueous environments, from earthen embankments to large-scale land reclamation. Spanish builders readily drew on foreign expertise in hydrology. In the seventeenth century, engineers from the Low Countries were in demand across the Spanish empire. A Dutch engineer was tasked with the drainage efforts that carved the rigid urban plan of colonial Mexico City from the watery landscape of Tenochtitlan; similarly, a Flemish engineer fortified key Spanish outposts in the Mediterranean.[13] As architectural historian Maurizio Vesco has shown, Spanish viceregal authorities on sixteenth-century Sicily instead demonstrated a preference for Venetian-trained engineers. Having cut their teeth in the

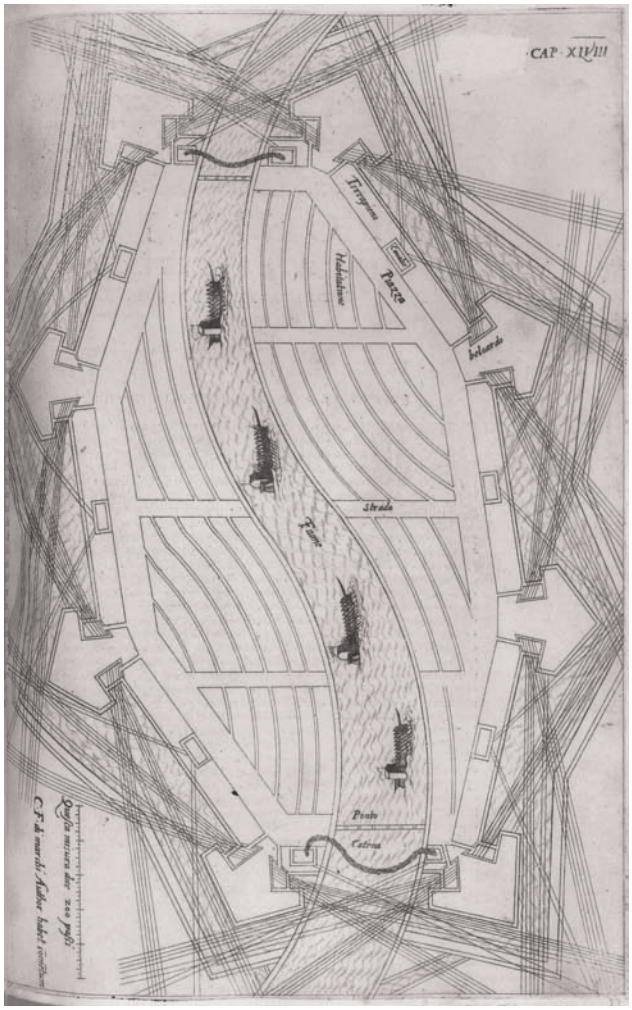


Figure 2 Francesco de' Marchi, design of a river city, 1603 (*Della architettura militare*, fol. 94r, plate XLVIII; F Typ 625.03.558, Houghton Library, Harvard University).

urban canals and flooded marshes of Venice and the Veneto, such figures were well versed in what one writer, in 1533, called the method of "building in water."[14]

That method was especially valuable on Sicily, where the extension of coastal cities' fortified perimeters beyond the water's edge required that wall and bastion foundations be laid in silt. Engineers in Palermo devised machinery to lower stone blocks onto the seabed and developed mortar capable of resisting the erosion caused by continual exposure to salt water.[15] Tomasello, who transformed Trapani into an island-city, was likely conversant in such practices given his prior position as *magistro ingigneri* of Padua, a Venetian colony that experienced periodic flooding by the Brenta River.[16] At midcentury, the engineer Bartolomeo Cascon, also of Venetian origin, was similarly charged with overseeing the construction of bastions on the muddy banks of a canal in Syracuse, on Sicily's southeastern coast.[17]

For Habsburg authorities scattered across the southern Mediterranean, Venice was synonymous with water. Following Charles V's successful campaign at Tunis in 1535, the Italians and Spaniards tasked with refortifying the nearby presidio, or military outpost, of Goletta found themselves mired in a messy building site that one engineer darkly described as nothing but "water and mud."[18] Perched on a narrow strip of land that divided the sea from a shallow lagoon fronting the city of Tunis, Goletta was battered by currents from both fore and rear. The Lombard engineer Ferramolino da Bergamo, then engaged in the refortification of Sicily, was commissioned to produce a series of designs for Goletta. His proposals proved unsuccessful, as they required walls and bastions to be constructed directly on the seabed. Following Ferramolino's departure from the presidio, engineer Francisco de Tovar begged Charles V to enlist the help of a Venetian, "because in Venice the foundations are made in water, as it must be done here . . . it thus would be advisable for you to send an official from there."[19]

Despite its regional associations, the concept of "building in water" gained a foothold in Spanish architectural discourse by the end of the sixteenth century. Cristóbal de Rojas used similar language in his *Teórica y práctica de fortificación* (Madrid, 1598), where he described the proper "mode of building in the sea" and commented on the "inconveniences" of constructing a fortress or tower in aqueous conditions.[20] *Los veinte y un libros de los ingenios y máquinas*, a hydrological treatise written by Juanelo Turriano that same year, similarly outlined how best to construct buildings "within the sea" and how to stabilize stone walls against the "great fury and impetuousness" of crashing waves.[21] Teofilo Gallacini's early seventeenth-century treatise on the architectural geometry of the ideal port remains our primary touchstone for innovations supporting construction in coastal sites during the period. Like Turriano, Gallacini detailed complex systems of driven piles, wooden chains, and other apparatuses to support construction on seabeds and imagined fantastical devices to enable engineers to breathe underwater and "walk" across its surface.[22] In the final years of the sixteenth century, Gallacini produced drawings for the new port of viceregal Naples, further demonstrating the importance of foreign hydrological technologies within a Spanish context.[23]

These construction strategies betray an essential pragmatism, one that defied rigid distinctions between a city and its preexisting site. If the Vitruvian tradition of urban planning placed architecture at the mercy of landscape, building in water quite literally breached its boundaries. Raising a stone wall against the tides may have been an innovation born of necessity, but it was also a powerful statement of architecture's potential to defy landscape. The island-city, exploiting the limitations of a peninsular site to defensive advantage, was

nothing if not pragmatic. Yet the excavation of an artificial waterway represented a decidedly nonarchitectural solution to the problem of cities projecting into the sea. In this sense, the island-city should be understood as the result of a subtractive practice that shifted architecture's materiality from brick and mortar to landscape itself. To create an island-city was, in effect, to build *with* water.

Since antiquity, engineers have channeled through land and redrawn the topographical boundaries of coastal settlements, providing historical precedents for later, landscape-driven defensive design. Greek and Roman war chronicles are awash with references to the excavation of ditches—most often dry—along the stone walls of fortified towns or along the wooden ramparts and earthworks of temporary camps.[24] Wet ditches, in turn, harbored vessels from storm or siege, or provided access between adjacent harbors.[25] Artificial waterways were also excavated across coastal promontories. The earliest known example of this type of waterway is a defensive ditch in Vroulia, at the southern tip of Rhodes, datable to the mid-seventh century BCE.[26] Also in the seventh century BCE, Corinthian colonists separated Leucadia (the island of modern Leukas, or Levkás) from the Acarnanian coast of Greece by digging a navigable canal across the isthmus joining the peninsula to the *terra ferma*.[27] By the time of the Peloponnesian War, the canal had filled in with deposits of silt, forcing ships to be dragged across the isthmus. In the first century, Roman engineers recut the canal and constructed a stone bridge across it to connect Leucadia to the mainland.[28] And in the fifth century BCE, the Achaemenid king Xerxes commissioned the Persian engineers Artachaees and Bubares to dig a similar canal across the mountainous peninsula of Athos. Herodotus characterized the canal as an exercise in vanity, rather than a necessity of war: "With no trouble they could have drawn their ships across the isthmus, yet [Xerxes] ordered them to dig a canal from sea to sea, wide enough to float two triremes rowed abreast."[29] Lysias, in turn, eulogized the act of "trenching Athos" as a statement of Xerxes's ascendancy over nature: "Despising alike the effects of nature, the dispositions of Heaven and the purposes of men . . . he forced a passage for ships across the land."[30]

In each of these three cases—at Vroulia, Leucadia, and Athos—the canal's excavation was intended to provide expedient passage for ships, rather than to surround a peninsular city with water for defensive purposes. Nonetheless, these waterways were likely prototypes for the form of canal (*fosso* or *fossato*) that defined the early modern island-city.[31]

The practices of building *in* water and building *with* water—both modes of direct intervention in the natural topography—accord more closely with our contemporary discourse of "landscape urbanism" than with theorizations of early modern design. As James Corner and others have described it, landscape urbanism trades a simple opposition between natural topographical conditions and urban morphology for an awareness of their interpenetrations. This concept has informed recent discussions of the infrastructure of coastal cities, providing a platform for addressing the topographical mutability and architectural vulnerability of the urban waterfront.[32] The significance of landscape-driven design in the Mediterranean from antiquity to the early modern period suggests that the current urge to reassess the architectural potential of the natural environment has deep historical roots. From an early modern perspective, this new language of landscape enables us to circumvent the traditional city–site binary and focus attention on the stakes (both practical and conceptual) of building at the littoral. It provides a model for incorporating the island-city—a type that, by its very name, speaks of landscape and urbanism in the same breath—into our architectural lexicon of the period.

Islands Real and Imagined

The arrival of the island-city on Sicilian shores in the first decades of the sixteenth century can be traced to earlier experiments in the eastern Mediterranean basin. An expansive theater of war, the region became a testing ground for new fortification technologies and, as such, represents a natural point of origin for the island-city. The emergence of the island-city in the eastern seas also coincided with a growing regional interest in spaces surrounded by water that crystallized in the genre of the *isolario*, or "book of islands." First popularized in Venice, island books elevated landform to literary subject, producing a portrait of Italy's maritime hinterland that was at once cartographic survey and constructed historical narrative.[33] The earliest volumes focused largely on the Aegean, the setting of naval battles such as the Ottoman sieges of Rhodes. Beginning with Cristoforo Buondelmonti's foundational *Liber insularum archipelagi* (1420), manuscripts and printed books created a taxonomy of Mediterranean and global archipelagoes.

Despite its pretense of empiricism, the genre was marked by a fluid and flexible understanding of topography. On the first page of his *Isolario* (1528), Benedetto Bordone declared his intention to describe not only islands—as the title of the volume would suggest—but rather "all of the islands *and peninsulas* of the world."[34] Tommaso Porcacchi's *L'isole piu famose del mondo* (1572) similarly gestured toward the relationship between the two topographical forms. A peninsula, Porcacchi wrote, is "almost an island, but is neither an island nor a continent"; an island is instead "separated and divided" from land and fully surrounded by water.[35] Porcacchi prefaced his definitions with references to ancient authors. Strabo, he said, had argued that "all of the earth is an island, which looks out at the sea that surrounds it." Pliny, too, maintained that all

land—set within the expanse of the sea—"appears in the guise of an island."[36]

This impulse to reimagine landmasses as islands was evidently felt across the eastern Mediterranean basin. In 1521—just five years before Tomasello transformed Trapani into an island-city—the Ottoman cartographer Piri Reis observed in his *Kitab-ı Bahriye* (*Book of Navigation*) that "Tripana [Trapani] is located on a low peninsula that almost looks like an island."[37] Piri Reis is known to have been familiar with the rhetorical conventions of island books. The maps that formed the focal point of his manuscript were based on those of the first printed *isolario*, published by Bartolommeo da li Sonetti in 1485.[38]

In the early modern imaginary, land not only had the capacity to masquerade as an island but also could quite literally assume its form. Throughout the period, Sicilian humanists debated claims by Diodorus Siculus and others that Sicily was once connected to the Italian mainland and had separated from its southernmost tip only after a violent earthquake or flood had forced the sea through the peninsula.[39] In his *Descriptio Siciliae*, written in the mid-sixteenth century, Antonio Filoteo degli Omedei suggested that the division of these adjacent landmasses—"separated, sawed, cut, and divided from one another"—was literalized in the etymological origins of the island's name, taken by ancient authors to mean "to cut" (*sicilire*).[40] Antonio's close contemporary Tommaso Fazello mused that during antiquity the earth was "disturbed and distorted." Mountains rose up from valleys, islands surfaced spontaneously from the bowels of the sea, continents collided and fused, and waves carved new contours into the coastlines. It was only reasonable, Fazello remarked, to assume that Sicily was once attached to Italy.[41]

From the perspective of these beliefs in the mutability of topography, even a city could be mistaken for an island. Constantinople, Venice, and Tenochtitlan—each of which was famously surrounded by water—appear in the pages of island books, sandwiched between islands large and small. The urban core of Byzantine-era Constantinople occupied an anvil-shaped tract of land between the Golden Horn to the north and the Bosphorus to the south and east. As a cartographic view of the city in Buondelmonti's manuscript illustrates, a sinewy sea moat was excavated along nearly the full length of the fifth-century Theodosian walls, partially severing Constantinople from the *terra ferma* and making it almost an island-city (Figure 3).[42] In contrast, a spare linear woodcut of Venice in Bordone's volume underscores that city's natural insularity. Framed by the *terra ferma* at left and a sequence of islands at right, the image sets the city adrift on the surface of the lagoon (Figure 4).[43] For Porcacchi, too, cities that appeared "in the guise" of islands defied simple definition. He justified his inclusion of Constantinople among his description of "so many islands of the archipelago" by noting that the city is "all that an island is not" but is "nevertheless bathed on three sides by the sea."[44] Porcacchi's ambivalence aside, the first edition of his text is bookended by views of Venice and Tenochtitlan, with the "Isola, et Città di Vinetia" appearing first and the "gran Città e isola Temistitan" last.[45] By identifying both cities *as* islands, Porcacchi collapsed the distinction between topography and urban space.

Figure 3 Cristoforo Buondelmonti, view of Constantinople, ca. 1470 (*Christophori Ensenii ad reverendissimum patrem Iordanum cardinalem description Cycladum aliarumque insularum* [ca. 1470]; Plut. 29.25, fol. 42r, Biblioteca Medicea Laurenziana; reproduced by courtesy of MiBAC, Florence).

From Buondelmonti to Porcacchi, island books reflected fundamental changes in how topography was theorized and experienced. The historiographical tendency to view military architecture in primarily technical terms has left little room for recognizing how defensive innovations reflected broader shifts in cultural consciousness.[46] Yet the concurrent rise of island books and island-cities suggests that this early modern awareness of landscape and its architectural potential resonated widely across the Mediterranean. In this sense, the *isolario* expressed the slippage between island and city in word and image at the same moment that the island-city was first realized in water and earth.

Figure 4 Benedetto Bordone, view of Venice, 1547 (*Isolario di Benedetto Bordone nel qual si ragiona di tutte l'isole del mondo, con li lor nomi antichi & moderni, historie, fauole, & modi del loro viuere, & in qual parte del mare stanno, & in qual parallelo & clima giaciono* [Venice, 1547], XXX; F Typ 525.47.229, Houghton Library, Harvard University).

Figure 5 Carlo Gambacorta, plan of Taranto depicting the Aragonese-era canal, ca. 1560–78 (*Tavole corografiche della città maritime della Puglia* [ca. 1560–78]; ms. XII.D.69, Biblioteca Nazionale Vittorio Emanuele III, Naples).

Between Southern Italy and the *Stato da Mar*

Following the Ottoman siege of the port of Otranto in 1480, the Aragonese began an intensive project to strengthen the lapsed defenses of Puglia, the "heel" of the Italian boot. In the city of Taranto, located on a peninsula on the Adriatic coast, silt and detritus were cleared from a navigable sea canal first opened in Roman antiquity. Engineers widened the canal by cutting through the rocky land front of the peninsula, thus isolating the city from the *terra ferma* (Figures 5 and 6).[47] In 1484, Venice seized the nearby city of Gallipoli and similarly cut a canal across the narrow isthmus connecting that city to the Puglian coastline.[48] It has been suggested that the canal in Gallipoli was initially planned by Venetian engineers but only later executed by the Spanish, around 1500.[49] However, contemporary fortification efforts on the Ionian island of Corfu indicate that this defensive strategy was endemic to the Venetian *stato da mar*. In the town of Corfu, engineers cut a navigable canal through the narrow neck of a rocky promontory where a citadel survived from the Byzantine period. The extant waterway divided the historic *borgo* from an expanding settlement on the *terra ferma* (Figure 7).[50]

These eastern Mediterranean island-cities likely served as early models for subsequent experiments on Sicily. In 1527—immediately after he severed Trapani from the western coast of the island—Tomasello called for the excavation of a canal across Syracuse's land front, which would have allowed a

direct mode of communication between the flanking Porto Grande and Porto Piccolo (or Marmóreo).[51] His proposal to make Ortygia—the main body of the Syracusan peninsula and the site of its historic settlement—into an island-city was not executed until the 1670s. Tomasello was, however, successful in isolating the Castello Maniace, a fortified complex at the tip of the peninsula, from the main body of the landmass.[52] We might liken the Maniace to the Venetian type of "island-fort" (*scoglio-fortezza*), which converted a natural outcropping into a defensive machine.[53]

Figure 6 Aerial view of Taranto, with the Aragonese canal in the foreground (BAMS Photo Rodella, Brescia).

There was powerful precedent for the translation of defensive technologies from Puglia to Sicily. The engineer Antonello da Trani, employed on Sicily from 1518 to 1523 by Viceroy Ettore Pigantelli, was previously involved in the fortification of cities across Puglia, including Otranto, Barletta, and his native Trani. This southern Italian axis of communication was supported in part by familial patronage networks. In 1521—in the midst of his tenure on Sicily—Antonello was commissioned by Ettore's son Fabrizio, then prior of the knights, to design a fortress at Molfetta, near Bari.[54] Puglian fortification technologies also formed part of the architectural inheritance that Antonello left to Tomasello, his successor on the island. The monumental round towers that Tomasello frequently built on Sicily were likely first introduced to Puglia in the late fifteenth century by Francesco di Giorgio, under the aegis of the Aragonese crown.[55]

These exchanges belie the dominant perception of Sicily's geographical allegiances during the period. The consolidation of Spanish control is thought to have forged an architectural link between Sicily and the Iberian world, pivoting the island westward, away from its Greco-Byzantine past. Yet Sicily remained in close contact with sites across the eastern Mediterranean throughout the early modern period and, as a result, was exposed to architectural innovations crisscrossing the region. In fact, all three engineers who oversaw refortification of the island in the first half of the sixteenth century—Antonello, Tomasello, and Ferramolino da Bergamo (whom we previously encountered in Goletta)—spent their formative years in

Figure 7 Georg Braun and Abraham Hogenberg, view of Corfu, 1572, detail (*Civitates orbis terrarum* [Cologne, 1572]; Special Collections, UCLA Library).

Figure 8 View of the *contrafossa* in Corfu with the sixteenth-century Savorgnan bastion at right (author's photo).

Venetian milieus. Prior to his arrival on Sicily, Antonello served as *capitano generale dell'artiglieria* of the Venetian Republic from 1510 to 1512.[56] Both Antonello and Ferramolino were trained by Gabriele dei Tadini da Martinegro, who played an instrumental role in the fortification of Venetian territories before he entered the Spanish service.[57] Throughout their careers, Antonello, Tomasello, and Ferramolino can be placed in Venetian outposts as far east as Crete. These engineers thus entangled Sicily in the ties that bound Venice to its own rapidly expanding maritime empire.

Ferramolino's oeuvre offers further evidence of the circulation of architectural knowledge between Sicily and the Venetian *stato da mar*. In charge of fortification efforts on Sicily from 1537 to 1550, Ferramolino first arrived on the island from the Peloponnese port of Corone (Koroni), which had returned to Venetian control following a brief period in Ottoman hands.[58] In 1538, at the outset of his tenure on Sicily, Ferramolino traveled to Dalmatia, along the eastern coast of the Adriatic, where he contributed to the defenses of Ragusan Dubrovnik.[59] A letter the engineer sent to Ferrante Gonzaga, then viceroy of Sicily, indicates that he was also present on Corfu that year, where he would have been exposed to ongoing experimentation with the island-city type.

Between October 1537 and February 1538, the Veronese engineer Michele Sanmicheli widened the *contrafossa* that separated Corfu's fortified core from the *terra ferma* and constructed a scarped seawall along its banks.[60] Shortly thereafter, in 1545 and 1555, the waterway was outfitted with a pair of monumental bastions executed by the military engineers Giulio Savorgnan and Marc Antonio Martinego (Figure 8).[61] We can trace this basic formula for the fortification of an isthmus—a waterway flanked by a pair of bastions—to Sanmicheli's previous experience in the Dalmatian city of Zara (Zadar), also under Venetian control. There, he excavated a navigable canal (*foša*) across the isthmus of the peninsula occupied by the city (Figure 9).[62] Begun in 1534, the canal was completed three years later, along with two angled bastions that controlled its points of entry. A heavily classicizing gate designed by Sanmicheli's nephew, Gian Girolamo, further dramatized the city's isolation from the *terra ferma*.[63] These Adriatic and Ionian island-cities suggest that, in its infancy, the type was very much a Venetian phenomenon. It was Sicily's investment in Venetian architectural knowledge that laid the groundwork for the type's subsequent appropriation by engineers in the service of the Spanish crown.

Island Exchanges

Sicily and Malta shared a precarious position in the volatile waters between Italy and North Africa. After the fall of Rhodes in 1522, Charles V relinquished Malta and the adjacent island of Gozo to the displaced Hospitaller Knights. The diplomatic arrangement, fraught by haggling between the knights' grand master and the imperial court, was intended to gird Spanish territories against Ottoman expansion.[64] The close contact between Sicily and Malta, coupled with the islands' defensive interdependence, encouraged the exchange of engineers and ideas.[65] Period correspondence indicates that construction on Malta was overseen by the Sicilian viceroy, who, in conjunction with the grand master, wielded final approval on designs.[66] In the midst of Palermo's refortification, Tomasello was sent to the Maltese city of Mdina by then viceroy Pignatelli to survey the architectural situation and produce a drawing of the royal castle and the city itself. The drawing was presented to the viceroy upon Tomasello's return to Sicily,

Figure 9 View of Zadar, ca. 1570 (K VII i 174 E, Kriegsarchiv, Karten- und Plansammlung, Vienna).

Figure 10 Proposal for the fortification of Valletta, with indications of a dry ditch along the bastioned land front, 1576 (MPD 13.023, Archivo General de Simancas, Ministerio de Educación, Cultura y Deporte, Gobierno de España).

indicating the depth of Pignatelli's investment in construction efforts on the island.[67] Ferramolino similarly made two trips to Malta, in 1535 and 1541. There, he strengthened the defenses of the fortress of Saint Angelo, situated at the tip of the small peninsula of Birgu, by excavating a canal below sea level to shelter galleys from enemy fire.

The island-city type likewise circulated between Sicily and Malta, where the fortification of peninsular sites was a common concern. Early plans for the Maltese city of Valletta, constructed *ex novo* on the Sciberras Peninsula, included the excavation of a dry ditch from harbor to harbor across the isthmus—a final line of defense against a potential Ottoman siege (Figure 10).[68] A letter sent from the grand master of the knights' order, Jean de la Cassière, to Phillip II in August 1576 reported that the engineer Scipione Campi had arrived in Valletta earlier that summer. Campi, who impressed the grand master with the "valor and experience" he showed during his visit, recommended widening the ditch and strengthening the site's existing bastions.[69] The engineer was also in Syracuse that year, and his proposals for the two cities were likely shaped by one another. In Syracuse, he focused on the fortification of the land front, where in 1566 a small fortress had been constructed on the former site of the Castello Marchetti. The complex featured two city-side bastions in addition to a land-side pair constructed during Gonzaga's viceregal tenure.[70]

With the completion of Campi's plan in 1577, the city-side bastions and the adjacent portion of the fortress were demolished, and two new bastions were constructed beyond the old enceinte. As such, the late sixteenth-century defensive system of the Syracusan peninsula consisted of two parallel lines of fortification intended to protect the peninsula against assaults from either land or sea. The most significant dimension of Campi's 1576 proposal—the excavation of a waterway below sea level to divide the city from the *terra ferma*—remained unexecuted (Figure 11).[71] In the same year, the engineer suggested cutting a nearly identical waterway through the peninsular city of Augusta, just north, although work on Augusta's fortifications was delayed in favor of concentrating resources on Syracuse.[72] Tiburzio Spannocchi dismissed the depth of Campi's planned canal in Syracuse as unviable, citing the engineer's lack of experience in "executing works in water."[73]

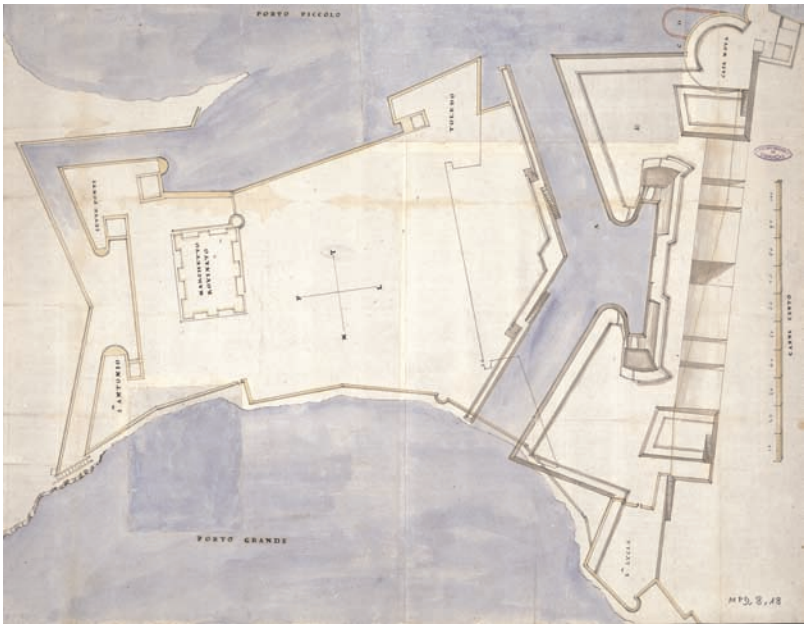


Figure 11 Proposal for the fortification of Syracuse according to earlier designs by Campi, including a ravelin on the site of the destroyed Toledo bastion and the unrealized canal, 1578 (MPD 8.018, Archivo General de Simancas, Ministerio de Educación, Cultura y Deporte, Gobierno de España).

Spannocchi's own design for the fortification of Augusta nonetheless suggests that he recognized the value of this form of waterway. In his *Descripción de las marinas de todo el reino de Sicilia* (1578), an atlas of the Sicilian coastline commissioned by Philip II, Spannocchi recommended the excavation of a canal in Augusta, thus echoing Campi's designs for both cities. An accompanying illustration depicts Augusta severed from the Sicilian coastline, although the waterway was not executed because of the rocky terrain (Figure 12). An anonymous proposal for Augusta produced in the late sixteenth century once again called for cutting across the isthmus, attesting to the continued popularity of Campi's vision for the city.[74]

Efforts to transform Syracuse and Augusta into island-cities only intensified in the seventeenth century as connections between Sicily and Malta were forged anew. Interest in the defensive potential of peninsular sites on both islands—spanning nearly two centuries—made the region fertile ground for the development of the type. The island-city's localization in the southern Mediterranean should be understood, however, against the backdrop of a larger constellation of Iberian outposts where fortification efforts similarly revolved around cities projecting into the open sea.

Figure 12 Tiburzio Spannocchi, proposal for the fortification of Augusta, 1578, detail (*Descripción de las marinas de todo el reino de Sicilia . . .* [1578]; MSS/788, fols. 30v–31r, Biblioteca Nacional de España, Madrid).

Iberian Island-Cities

Just as engineers trained in Venice and the Veneto facilitated the early dissemination of the island-city between the *stato da mar* and southern Italy, itinerant Italians who moved among

the architectural circles of João III, Charles V, and Philip II popularized the type in both Spanish and Portuguese contexts.[75] The transformation into an island-city of the Portuguese stronghold of Ceuta, located across the Strait of Gibraltar from Spain, was especially influential for the later adoption of the type in Iberian territories. Ceuta, which occupied the narrow neck of Morocco's Almina Peninsula, was bounded by *terra ferma* to the west and the looming profile of Monte Hacho to the east.[76] The site's natural defenses were initially reinforced by a system of ditches. In the eleventh century, the Andalusian geographer Al-Bakri mentioned the presence of a dry ditch across the isthmus that isolated the city from the *terra ferma*. By the time of the Portuguese conquest in the early fifteenth century, that ditch was one of four distributed across Ceuta's eastern and western flanks.[77] Although it was dry, it anticipated the reconception of the peninsula as an island.[78]

In 1541, the engineer Benedetto da Ravenna arrived in Ceuta in the company of his Portuguese counterpart Miguel de Arruda.[79] Benedetto's service to the Portuguese crown followed almost three decades of work in Habsburg territories. Following his involvement in the campaign at Tripoli, he was appointed royal engineer of the Kingdom of Naples in 1511.[80] After his eventual departure for Spain, Benedetto traveled widely, participating in the defense of Rhodes in 1522 and the invasion of Provence in 1524, alongside Tadini, who trained two of the architects responsible for the refortification of Sicily. It was Benedetto's knowledge of the defenses of Spain's North African outposts, gleaned during a journey to survey the region in 1534, as well as his experience in the modern technology of bastionization, that likely prompted João III to enlist his help inspecting Portuguese fortifications along the Moroccan coast.[81] Benedetto's proposal for the refortification of Ceuta, outlined in a report sent to the imperial court in Lisbon, entailed the construction of a bastioned system along the perimeter of the city, including a pair of monumental angled bastions facing the *terra ferma*.[82] Yet the defining Portuguese intervention in the city's defenses during Benedetto's tenure was topographical rather than architectural. Between 1541 and 1549, the existing dry ditch was converted into a broad, navigable canal that severed the city from the mainland. The still-extant waterway, which provided secure passage for ships between the Atlantic and the Mediterranean, cuts a dramatic profile along the Muralla Real, the modified line of fortifications at the city's land front (Figure 13).[83]

During the first half of the sixteenth century, the practice of severing peninsular cities or fortresses from the *terra ferma* spread across the Portuguese colonial world, from the Mediterranean to South Asia. Period sources indicate that Ceuta was a direct inspiration for Diu, located at the tip of a small peninsula on India's northwestern coast. Diu was occupied by the Portuguese since 1535, but it was not until 1546—when the excavation of the navigable canal in Ceuta was well under way—that a waterway was cut through sandstone at the base of the peninsula according to plans by the engineer Francisco Pires, thereby rendering Diu an island-city (Figure 14).[84] The Portuguese had experimented with the fortification of peninsular sites in India since the beginning of the sixteenth century. Of particular note is Cananore (Kannur) on India's southwestern coast, which was officially absorbed by Portugal in 1505. As a defensive measure, a waterway was cut through the base of a small peninsula located a short distance from the town (Figure 15). The undertaking, which isolated a Portuguese *fortaleza-feitor* (fortress-warehouse) within the sea, was copied shortly thereafter in the Sri Lankan port of Colombo.[85]

Given the fluid movement of engineers between Iberian territories, knowledge of these Portuguese island-cities likely shaped subsequent interventions in Spanish outposts. The fortification of the presidio of Mazalquivir (Mers-el-Kébir), occupying a rocky promontory on the coast of modern Algeria, was marked by these trans-Iberian exchanges. Leonardo Turriano, who penned the definitive account of the fortification of Mazalquivir and the nearby presidio of Oran in November 1598, rose to prominence in the architectural circles of Philip II after making his name in the imperial court in Lisbon and contributing to the fortification of the Canary Islands, then under Portuguese control.[86] When Turriano arrived in Mazalquivir in 1594 to survey the presidio's fortifications, he did so armed with broad knowledge of the Portuguese colonial landscape. Here, too, the legacy of early experiments in the eastern Mediterranean remained close at hand. Like the engineers responsible for Sicily's refortification, Turriano was familiar with the Venetian fortifications of Dalmatia. In his atlas of the Canaries, he referenced San Nicolò in Šibenik, a *scoglio-fortezza* attributable to Gian Girolamo Sanmicheli.[87]

Engineers never succeeded in severing Mazalquivir from the *terra ferma*, yet period accounts of the presidio's fortification reveal it as a flash point for debates around landscape-driven approaches to defensive design. The first phase of construction in Mazalquivir can be dated to between 1563 and 1569, when engineer Giovanni Battista Antonelli razed and reconstructed an existing fortified complex on the site.[88] Antonelli subsequently returned to Mazalquivir from Spain in 1574, in the company of Vespasiano Gonzaga, a general and military engineer.[89] Turriano, who detailed the disputed plans for the defense of Mazalquivir in his 1598 manuscript, lambasted Antonelli's interventions. Along with Vespasiano, he argued that the engineer had made the presidio even more vulnerable to the assault of enemy artillery by leaving the peninsula's tip devoid of any fortification.[90] Antonelli had instead excavated a ditch across the rocky land front and

Figure 13 View of the Fosso Reale, Ceuta (© Dario Lo Presti).

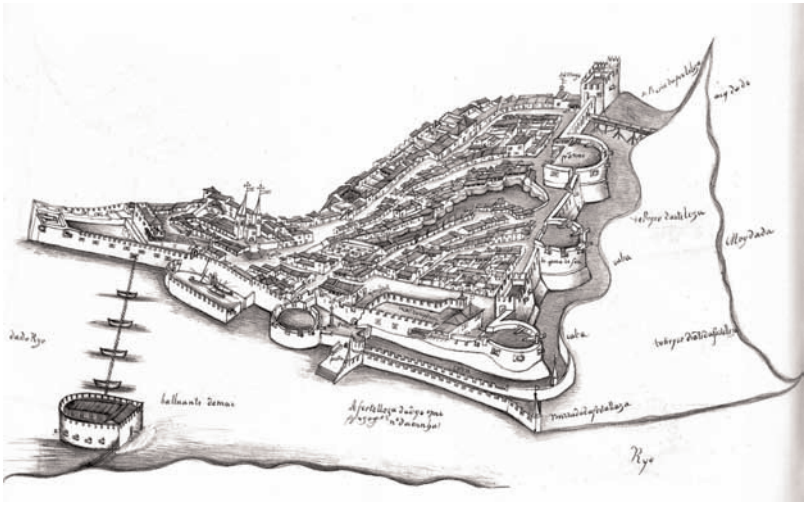


Figure 14 Gaspar Corrêa, view of Diu in 1535 (*Lendas da India* [1545], in *Lendas da India por Gaspar Correa*, vol. 3, ed. Rodrigo José de Lima Felner [Lisbon: Typographia da Academia Real das Ciências, 1862], 624 *bis*; Wikimedia Commons).

Figure 15 António Boccaro, view of Cananore, 1635 (*Livro das plantas de todas as fortalezas, cidades e povoaçõens da Índia* [Goa, 1635]; BPE CXV / 2-1 [Biblioteca Pública de Évora], Biblioteca Nacional de Portugal, Lisbon).

Figure 16 Giovanni Battista Antonelli, design for the fortification of Mazalquivir by Vespasiano Gonzaga, 1574 (MPD 7.103, Archivo General de Simancas, Ministerio de Educación, Cultura y Deporte, Gobierno de España).

fortified it with two lateral bastions. Vespasiano felt that Antonelli had blindly implemented a bastioned system without regard for the peninsula's particular topographical conditions.[91] He proposed excavating the existing ditch below sea level and expanding the fortified enceinte such that it would hug the peninsula's rocky contours (Figure 16).[92] By his own estimation, this would trade a moat for the sea itself. "The deep sea," he argued, "is the greatest moat in the world."[93] Turriano characterized Vespasiano's designs for Mazalquivir as examples of "natural fortification."[94] We might liken the engineer's approach to the practice of building *with* water: at Mazalquivir, Vespasiano wrote, "We should trust more in the sea" than in brick-and-mortar defenses.[95]

Vespasiano's and Turriano's criticism of his work at Mazalquivir aside, Antonelli evidently shared his contemporaries' belief in the sea's defensive potential. Antonelli's *Epitomi delle fortificationi moderne*, written in Toledo between April 1560 and March 1561—just two years before his arrival in Mazalquivir—contains what may be the first direct reference to the island-city in period literature: "The maritime sites that are strong are those that are surrounded by harborless, impetuous, and tempestuous seas or by one part or the other disjointed from the land by canals."[96] The manipulation of waterways (both natural and artificial) was Antonelli's claim to fame. In 1529, he proposed the excavation of a canal in Panama; later, in the 1580s, he was at the forefront of a large-scale imperial initiative to render Spain's rivers navigable.[97]

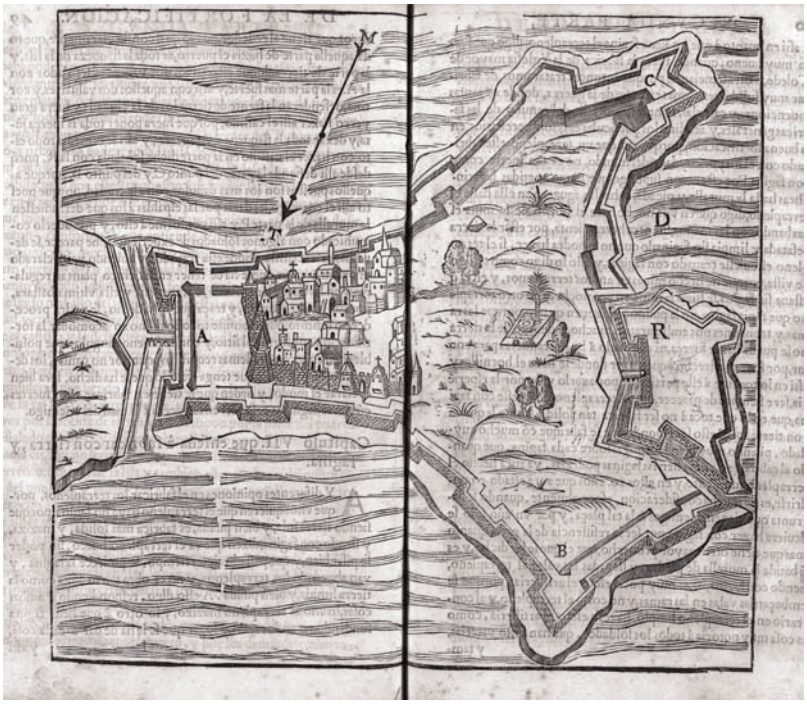
Subsequent interest in the island-city type again passed back and forth between texts and building sites. At Cádiz, a peninsular city along Spain's southwestern coast, a wide, navigable canal was cut across the isthmus, transforming it into a true island-city (Figure 17).[98] A woodcut included in Rojas's treatise of 1598 suggests that the engineer may have had a hand in the excavation of the canal. The image depicts an unnamed fortified city separated from the *terra ferma* by an artificial waterway (Figure 18). Scholars have identified the illustration as a reimagining of Cádiz, then bounded at its land front by a dry ditch.[99] Rojas, who first arrived in Cádiz in 1589, was closely involved in its fortification. In 1597, he consulted on the defensive system of Ceuta, which had passed in 1581 from Portuguese to Spanish control.[100] There, Rojas would have encountered the Portuguese-era canal, which represents the most likely source for his reimagining of Cádiz as an island-city. The publication of his treatise in 1598—coinciding with the date of his return to Cádiz—immediately followed his visit to Ceuta.[101]

Rojas was not the only engineer in Cádiz interested in the island-city type. Several others who had contributed to the fortification of Mazalquivir were involved in construction efforts there, including Vespasiano Gonzaga, whose initial design for fortifying the Algerian presidio's land front included a ditch excavated below sea level.[102] Rojas inherited responsibility for the fortification of Mazalquivir from Spannocchi, who similarly proposed cutting a canal through the isthmus of Augusta in his atlas of 1578.[103]

Over the course of the sixteenth century, the island-city was made mobile by these itinerant engineers, whose overlapping paths between Spanish and Portuguese territories in the western Mediterranean turned their defensive experiments into a shared vernacular. In the years after Cádiz was severed from the *terra ferma*, that vernacular resurfaced on Sicily, where the type was first adopted in a Spanish milieu.

Figure 17 Francesco Ambrosi, *Cadiz obispado y celebre puerto de mar en España*, ca. 1680 (Municipal Historical Museum, Cádiz; Alamy).

Figure 18 Cristóbal de Rojas, design of a fortified city (likely Cádiz), 1598 (*Teórica y práctica de fortificación* [Madrid, 1598]; 1598-3, fols. 49v–50r, Biblioteca Central Militar, Madrid).



Afterlife

Syracuse and Augusta reemerged in the late history of the island-city. Mirroring designs of the 1570s by Campi and Spannocchi, the Tuscan engineer Giovanni de' Medici in 1640 proposed the excavation of a wide waterway across Augusta's land front, with a ravelin positioned at its midpoint (Figure 19). As was the case in the sixteenth century, the project was not completed; a plan of the city made by the Sicilian engineer and cartographer Francesco Negro in collaboration with Carlo Ventimiglia for their *Atlante di città e fortezze del regno di Sicilia* (1640) shows the isthmus still intact (Figure 20).[104] That same year, de' Medici was also in Valletta, where a dry ditch and additional outworks of his design were constructed across the land front; he was also in Syracuse, where he likewise suggested the excavation of a waterway along that city's land-side bastions.[105]

De' Medici's approach anticipated the transformation of Augusta and Syracuse into island-cities some decades later.[106] In 1671, the Flemish engineer Carlos de Grunenbergh began working to modernize the defenses of Sicily.[107] His plans for Syracuse and Augusta, produced shortly after his arrival on the island, were sent to the imperial court in Madrid for approval. In Syracuse—once again prioritized over Augusta—work progressed swiftly and was largely completed by 1673.[108] Grunenbergh's design for Syracuse, consistent with that of his predecessors, comprised parallel lines of fortification bounded by waterways that together flanked the isthmus.[109] By excavating a broad *darsena* along the existing city-side bastions, Grunenbergh fully suspended the city within the sea (Figure 21).[110] Contemporary observers mythologized the city's transformation: one late seventeenth-century account declared Syracuse a "peninsula made into an island by the art of war."[111] In his *Memorie patrie per lo ristoro della città di Siracusa* (1791), the local humanist Tommaso Gargallo similarly lauded the "famoso taglio" (famous cut) that made the city an island.[112] That deceptively simple cut suggested a powerful return to origins. Ancient geographers believed the city was once a natural island off the Sicilian coast; according to Ovid, "There was a time when Ortygia floated on the waves, now it is fixed."[113]

In 1682, a nearly identical canal was excavated across the Augustan isthmus (Figure 22).[114] The completion of the waterway at Augusta immediately followed Grunenbergh's involvement in the fortification of Valletta. In January 1681, he briefly left Sicily for Malta, where he recommended modifications to the land front of the Floriana fortress. A letter sent from Messina in 1682 concerning Valletta's defenses indicates his awareness of ongoing construction efforts there even after his return to Sicily.[115] Sensitivity to topographical conditions was a common thread of Grunenbergh's designs for both Valletta and Augusta. Like sixteenth-century proponents of "natural

Figure 19 Francesco Negro, Proposal for the fortification of Augusta by Giovanni de' Medici, 1640 (MSS/1, fol. 61, Biblioteca Nacional de España, Madrid).

fortification," he argued that Valletta's defenses had been constructed without regard for the terrain.[116] He proposed adding a lower enceinte fronting the Grand and Marsamxett Harbors and stipulated that the walls be constructed in stone capable of withstanding continual spray from seawater. In Augusta, too, the bastioned enceinte was in direct contact with the sea; as a result, Grunenbergh was forced to stabilize the foundations with wooden piles driven into the seabed.[117] His fluency in these construction technologies can be ascribed to his origins in the Low Countries, where—as was the case in Venice—engineers were steeped in the practice of "building in water."

Carlos de Grunenbergh's prior exposure to Spain's territories elsewhere in the Mediterranean provides an alternate source for his knowledge of the island-city type. In 1669, he went along with his brother Fernando to the Tuscan Maremma, a coastal region formally annexed by Philip II in 1557 as the Stato dei Presìdi. Paralleling concurrent fortification efforts across Sicily, Malta, and North Africa, the Habsburg crown undertook an intensive campaign to modernize the region's defenses. Fernando completed several works in the city of Orbetello, including a new bastion, a powder magazine, and the land-side gate.[118] The city, sited on a peninsula

Figure 20 Francesco Negro, plan of Augusta indicating the intact isthmus, 1640 (MSS/1, fol. 54, Biblioteca Nacional de España, Madrid).

Figure 21 Carlos de Grunenbergh, plan of the city and castle of Syracuse, 1673 (MPD 9.055, Archivo General de Simancas, Ministerio de Educación, Cultura y Deporte, Gobierno de España).

Figure 22 Carlos de Grunenbergh, plan of the fortifications of Augusta, 1682 (MPD 05.038, Archivo General de Simancas, Ministerio de Educación, Cultura y Deporte, Gobierno de España).

Figure 23 Martino Merian, *Circumsessio Orbetelli cum praelio navali inter hispanos et gallos. Bellagerung Orbetelli sampt dem feeteeffen*, 1646, detail (Collezione Graziani Orbetello).

jutting into a lagoon, was flanked by two isthmuses, which together joined the presidio of Monte Argentario to the Tuscan coastline.[119] In Orbetello, Fernando would have encountered a model of a true island-city. Before the Ottoman siege of 1646, an existing defensive waterway across the land front was expanded into a wide, navigable canal (Fosso Reale) (Figure 23).[120] Given Carlos's involvement in the surrounding region of Grosseto, we can assume that he was also familiar with Orbetello's modified topography.

The seventeenth-century Fosso Reale was the culmination of earlier proposals to render Orbetello an island-city. Pietro Cataneo's plan of 1547 for modifications to Orbetello's defensive system entailed deepening the existing waterway across the isthmus. In his 1554 treatise, Cataneo acknowledged the particular strength of cities isolated by artificial waterways or the sea and claimed that surrounding Orbetello with water would make it second only to Venice, "the strongest city in the world." Orbetello, he noted, was frequently called "little Venice" because of its topographical resemblance to that iconic "floating" city.[121] Cataneo thus inscribed Orbetello into a literary tradition that cast cities as islands. In this sense, the seventeenth-century afterlife of the island-city speaks to the *longue durée* of the type, and to an enduring interest in urban spaces surrounded by the sea. The mutability of natural topography—its capacity to be reshaped and reimagined—had clearly entered the early modern bloodstream.

The island-cities discussed in this article by no means constitute an exhaustive list. Many of the engineers who surveyed and fortified Spanish territories in North Africa and Sicily were also sent to the crown's Atlantic and Caribbean colonies and likely brought knowledge of the island-city type with them to the Americas.[122] Within the context of the Mediterranean, however, the rise of the island-city from the fifteenth through the seventeenth centuries subverts established paradigms of how—and, most important, where—architectural ideas developed. Indeed, the history of the island-city is a history of colonial frontiers, continually lashed by the tides of war. Only recently have we begun to view these frontiers as laboratories where designs were tested and ad hoc solutions devised. But rarely do we acknowledge the transmission of models between those places that linger at the margins of our gaze—whether from the *stato da mar* to Sicily or from one North African outpost to another. In its dissemination across the eastern and western seas, the island-city lays bare points of contact that transgressed territorial boundaries. As historians of early modern urbanism and military engineering increasingly look beyond the well-trodden landscapes of Italy and Spain, these neglected patterns of exchange may alter our understanding of the mobility of architectural knowledge in the Mediterranean.

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Notes

1. I am grateful to Alina Payne, Gülru Necipoğlu, Thomas B. F. Cummins, Maurizio Vesco, and Lauren Jacobi for their insights during the early phases of my research for this article. Unless otherwise noted, all translations are my own.

Fernand Braudel, *The Mediterranean and the Mediterranean World in the Age of Philip II*, trans. Siân Reynolds, 2 vols. (New York: Harper & Row, 1973), 2:850; Ferdinando Maurici, "Le fortificazioni di Trapani nel Medioevo e nella prima età moderna (secoli X–XVI)," in *Trapani in un disegno a penna del Museo Pepoli*, ed. Maria Luisa Famà and Daniela Scandariato (Trapani: Regione Siciliana, 2009), 69.

2. D. Ferrando Gonzaga, *Relazione delle cose di Sicilia fatta da D. Ferrando Gonzaga all'imperatore Carlo V, 1546*, ed. F. C. Carreri (Palermo: Tipografia "Lo Statuto," 1896), 5.

3. Archivio di Stato di Palermo (ASPa), Deputazione del Regno, Atti, vol. 230, 20r, 21v.

4. Teresa Colletta, "Le fortificazioni nel viceregno spagnolo: La Sicilia e l'Italia peninsulare," in *L'urbanistica del Cinquecento in Sicilia*, ed. Aldo Casamento and Enrico Guidoni (Rome: Kappa, 1999), 45; Isidoro la Lumia, *La Sicilia sotto Carlo V imperatore: Narrazione istoria con documenti inediti* (Palermo: Fratelli Pedone Lauriel, 1862), 286. Intensive repairs were also made to existing towers along the Sicilian coastline, the vast majority of which survived from the Norman and Aragonese periods. Colletta, "Le fortificazioni nel viceregno spagnolo," 45. From 1535 to 1543, a staggering 137 towers were constructed along the southern and eastern coasts of the island. Giuseppe Bonaffini, *Un mare di paura: Il Mediterraneo in età moderna* (Caltanissetta: Salvatore Sciascia, 1997), 32; Giuseppe Agnello and Lucia Trigillia, *La spada e l'altare: Architettura militare e religiosa ad Augusta dall'età sveva al barocco* (Palermo: Arnaldo Lombardi, 1994), 104. On this subject, see also Lucio Santoro, *Castelli angioini e aragonesi nel regno di Napoli* (Milano: Rusconi Immagini, 1982); Ferdinando Maurici, *Le torri costiere della Sicilia* (Palermo: Enchiridion, 1985).

5. Dufour attributes the fortification of Trapani to Ferramolino. Liliane Dufour, "El reino de Sicilia: Las fortificaciones en tiempos de Carlos V," in *Las fortificaciones de Carlos V,* ed. Carlos José Hernando Sánchez (Madrid: Ediciones del Umbral, 2000), 501. I defer to Vesco, who dates the project to the period of Tomasello's involvement. Maurizio Vesco, "Pietro Antonio Tomasello de Padua: Un ingeniero militar véneto en la Sicilia de Carlos V," *Espacio, tiempo e forma* 7, nos. 22–23 (2009–10), 59, 65. The canal, filled in during the nineteenth century, corresponds to the present-day Via XXX Gennaio. See *Sicilia: Guide verdi d'Italia* (Milan: Touring Club Italiano, 2010), 102.

6. Francesco Giovan Pugnatore, *Istoria di Trapani: Prima edizione dall'autografo del secolo XVI*, ed. Salvatore Costanza (Trapani: Corrao, 1984), 164.

7. The term that I have chosen to use in this article, *island-city*, has not been used previously. Scholarship on early modern fortification technology and military urbanism has not identified the island-city as a coherent type. To my knowledge, the first scholar to address the practice of cutting and isolating landmasses as a repeated defensive measure is João Barros Matos. His brief analysis of the subject focuses on the relationships among Ceuta, Cádiz, and Diu, and emphasizes the importance of the practice within a Portuguese context. João Barros Matos, "The Defensive Front Land of Cadiz and Benedetto da Ravenna's Projects in a Portuguese Context," in *Fortified Places in the Bay of Cadiz*, ed. Antonio Tejedor Cabrera and Mercedes Linares Gómez del Pulgar (Parma: Festival Architettura, 2013), 67–75.

8. Sicily and southern Italy remain largely overlooked in mainstream scholarship on early modern architecture and urbanism. Historiographical ambivalence toward the region is rooted in the nineteenth-century *questione meridionale*, or "southern question," which emerged in the aftermath of the Risorgimento. The southern territories, marked by a legacy of feudalism and foreign rule, were seen as barbaric and thus fundamentally inferior to cities like Florence and Rome, which were heralded as cradles of Italy's cultural ascendancy and national identity. On this subject, see Rosario Villari, *Il Sud nella storia d'Italia: Antologia della questione meridionale* (Rome: Laterza, 1988); Francesco Abbate, ed., *Interventi sulla "questione meridionale"* (Rome: Donzelli, 2005); Robert Lumley and Jonathan Morris, eds., *The New History of the Italian South: The Mezzogiorno Revisited* (Devon: University of Exeter Press, 1997).

9. Scholarship on the mobility and circulation of architectural knowledge in the early modern period has expanded dramatically in recent decades. A foundational source is Thomas DaCosta Kaufmann, *Toward a Geography of Art* (Chicago: University of Chicago Press, 2004).

10. Vitruvius, *On Architecture: Books I–V*, trans. and ed. Frank Granger (Cambridge, Mass.: Harvard University Press, 1998), 1.4.1–8, 1.6, 1.7.

11. Francesco di Giorgio Martini, *Trattati di architecttura ingegneria e arte militare*, ed. Corrado Maltese (Milan: Polifilo, 1967), 2:456.

12. Francesco de' Marchi, *Della architettura militare* (1603), 69r, 94r–94v.

13. On the hydraulic expertise of engineers from Venice and the Low Countries, see Salvatore Ciriacono, *Building on Water: Venice, Holland and the Construction of the European Landscape in Early Modern Times* (New York: Berghahn Books, 2006). On the drainage of Mexico City, see John López, "'In the Art of My Profession': Adrian Boot and Dutch Water Management in Colonial Mexico City," *Journal of Latin American Geography* (2012), 35–60; Vera Candiani, *Dreaming of Dry Land: Environmental Transformation in Colonial Mexico City* (Stanford, Calif.: Stanford University Press, 2014). The demand for Venetian practitioners in aqueous landscapes was not limited to Spanish viceregal patronage. During the early years of Ottoman hegemony, the swamps surrounding Timişoara, a strategic urban center in the Romanian hinterland, were refortified by Italian engineers, many of whom were Venetians. Cristina Fenesan, *Cultura otomanaÌ a vilayetului Timişoara (1552–1716)* (Timişoara: Editura de Vest, 2006), 33; L. A. Maggiorotti and F. Banfi, "Le fortezze di Temesvar e di Lippa in Transilvania," in *Atti dell'Instituto di Archittetura Militare*, pt. 3 (Rome, 1930), 29–30. I owe this reference to Diana Belci (Ion Mincu University of Architecture and Urbanism, Bucharest).

14. For this phrase, see ASPa, Letter Viceregie (1533), vol. 391, c. 437r, as quoted in Maurizio Vesco, "Pietro Antonio Tomasello da Padova e la fortificazione in Sicilia nel secondo ventennio del Cinquecento," *Storia dell'Urbanistica*, 3rd ser., 28, no. 1 (2009), 137n4.

15. Maurizio Vesco, "Un nuovo assetto per il quartiere della Kalsa nel Cinquecento: L'addizione urbana del piano di porta dei Greci," in *Il quartiere della Kalsa a Palermo: Dalle architetture civili e religiose delle origini alle attuali articolate à museali*, ed. Giovanna Cassata, Evelina de Castro, and Maria Maddalena de Luca (Palermo: Regione Siciliana, Assessorato dei Beni Culturali e dell'Identità Siciliana, 2013), 48–51, 52, 59n19; Maurizio Vesco, "Il Castellammare di Palermo: Un progetto non realizzato di Pietro Antonio Tomasello da Padova," in *Ricostruire–1: Architettura, Storia, Rappresentazione*, ed. Maurizio Vesco (Palermo: Caracol, 2014), 14. In Trapani, proposals for the fortification of the city focused on the port. While the project was never completed, Tomasello initially intended to sink the small island of Santa Margarita beneath sea level to prevent enemy fleets from using it as a base to fire on the city. ASPa, TRP, LV, vol. 278, c. 125r, as cited in Vesco, "Pietro Antonio Tomasello de Padua," (2009–10), 59n31.

16. ASPa, TRP, LV, vol. 259, c. 141v, as quoted in Vesco, "Pietro Antonio Tomasello de Padua," (2009–10), 50; Vesco, "Pietro Antonio Tomasello da Padova," (2009), 127. The Paduan engineer Giovan Maria Buzzaccarino was similarly recruited by Pedro de Toledo, viceroy of Naples, in 1538. Vesco, "Il Castellammare di Palermo," 20.

17. Lavinia Gazzè, "Inediti su Antonio Ferramolino a Siracusa," *Archivio Storico Siracusano*, 3rd ser., 15 (2001), 135–36n11.

18. Archivo General de Simancas, Estado Sicilia, legajo 1113, año 1538, n. 76. See also Guido Tadini, *Ferramolino da Bergamo: L'ingegnere militare che nel '500 fortificò la Sicilia* (Bergamo: Poligrafiche Bolis, 1977), 45–50; Jalel Akacha and Marcelli Garulli, "Architetti e ingegneri militari al presidio della Goletta di Tunisi (1535–1574)," in *Architetti e ingegneri militari italiani all'estero dal XV al XVIII secolo*, 3 vols., ed. Marino Viganò (Livorno: Sillabe, 1993–99), 2:83.

19. Quoted in Tadini, *Ferramolino da Bergamo*, 50. See also Akacha and Garulli, "Architetti e ingegneri militari," 83.

20. Cristóbal de Rojas, *Tres tratados sobre fortificación y milicia*, ed. Ramón Gutiérrez (Madrid: Comisión de Estudios Históricos de Obras Públicas y Urbanismo, 1985), 347.

21. Juanelo Turriano, *Los veinte y un libros de los ingenios y máquinas de Juanelo, los quales le mando escribir y demonstrar el Chatolíco Rei D. Felipe Segundo Rey de las Hespañas y Nuebo Mundo* (1598), 394v–395r, mss. 3272–3376, Biblioteca Nacional de España, Madrid. For a biographical sketch of Turriano, see Manuel Silva Suárez, ed., *El Renacimiento: De la técnica imperial y la popular* (Zaragoza: Real Academia de Ingenería, 2008), 735.

22. For a facsimile of Gallacini's treatise, see Giorgio Simoncini, ed., *Sopra i porti di mare*, vol. 1 (Florence: Leo S. Olschki, 1993).

23. Giovanni Menna, "Naples and Its Port Area from Middle Ages to XX Century: Strategies for an Integration," *Bollettino del Dipartimento di Conservazione dei Beni Architettonici ed Ambientali Università degli Studi di Napoli "Federico II"* 12, no. 1 (2012), 553–69. On Gallacini's ties to Neapolitan architectural circles more generally, see Alina Payne, *The Telescope and the Compass: Teofilo Gallaccini and the Dialogue between Architecture and Science in the Age of Galileo* (Florence: Leo S. Olschki, 2012), 159–60.

24. A. W. Lawrence, *Greek Aims in Fortification* (Oxford: Clarendon Press, 1979), 280; Victor Chapot, "Fossés et tranchées dans les guerres de l'antiquité," *Revue des Études Grecque*s 28, no. 127 (1915), 117. For example, Cicero describes a deep ditch that extended across the northeastern side of Etruscan Rome from the Porta Collina to the Porta Esquilina. M. Tullius Cicero, *De republica*, ed. C. F. W. Mueller (Leipzig: Teubner, 1889), 2.6, in Perseus Digital Library, ed. Gregory R. Crane (Tufts University), http://www.perseus.tufts.edu (accessed 1 June 2018).

25. On Ostia, see Steven L. Tuck, "The Expansion of Triumphal Imagery beyond Rome: Imperial Monuments at the Harbors of Ostia and Lepcis Magna," *Memoirs of the American Academy in Rome* 6 (2008), 325–41.

26. Lawrence, *Greek Aims in Fortification*, 279.

27. The initial cut is mentioned by Strabo, and the canal is mentioned by Polybius, Pliny, and Livy, who recalled: "Leucadia, which is now an island separated from Acarnania by a canal of moderate depth, was then a peninsula." Titus Livius (Livy), *The History of Rome, Book 33*, trans. and ed. Rev. Canon Roberts (New York: E. P. Dutton, 1912), 17.6, in Perseus Digital Library, http://www.perseus.tufts.edu (accessed 1 June 2018). On Leukas, see also Richard Stillwell, William L. MacDonald, and Marian Holland McAlister, *The Princeton Encyclopedia of Classical Sites* (Princeton, N.J.: Princeton University Press, 1976).

28. See William Smith, ed., *Dictionary of Greek and Roman Geography* (London: John Murray, 1854).

29. Herodotus, *The Histories*, ed. A. D. Godley (Cambridge, Mass.: Harvard University Press, 1920), 7.24.1, in Perseus Digital Library, http://www.perseus.tufts.edu (accessed 1 June 2018).

30. *Lysias*, trans W. R. M. Lamb (Cambridge, Mass.: Harvard University Press, 1930), 2.28–29, in Perseus Digital Library, http://www.perseus.tufts.edu (accessed 1 June 2018).

31. Herodotus noted that the Persians intended to make the towns on Athos "into island and not mainland towns." Herodotus, *The Histories*, 7.22.3.

32. See Carola Hein, "Port Cities and Urban Waterfronts: How Localized Planning Ignores Water as a Connector," *Wiley Interdisciplinary Reviews: Water* 3, no. 3 (May/June 2016), 419–38. On landscape urbanism more broadly, see Charles Waldheim, *Landscape as Urbanism: A General Theory* (Princeton, N.J.: Princeton University Press, 2016).

33. See Bronwen Wilson, "Assembling the Archipelago: *Isolarii* and the Horizons of Early Modern Public Making," in *Making Space Public in Early Modern Europe: Performance, Geography, Privacy*, ed. Angela Vanhaelen and Joseph P. Ward (New York: Routledge, 2013), 101–26.

34. Benedetto Bordone, *Isolario di Benedetto Bordone nel qual si ragiona di tutte l'isole del mondo, con li lor nomi antichi & moderni, historie, fauole, & modi del loro viuere, & in qual parte del mare stanno, & in qual parallelo & clima giaciono* (Venice, 1547), aaii, emphasis added.

35. Thomaso Porcacchi, *L'isole piv famose del mondo descritte da Thomaso Porcacchi da castiglione arretino e intagliate de Girolamo Porro padovano con l'aggiunta di molte isole* (Venice, 1604), Proemio.

36. Porcacchi, Proemio.

37. Pirî Reis, *Kitâb-ı Bahriye [Book of Navigation]*, ed. Bulent Arı (Ankara: Republic of Turkey, Prime Ministry, Undersecretaryship of Navigation, 2002), 386.

38. Wilson, "Assembling the Archipelago," 115.

39. Sarah Spence, "The Straits of Empire: Sicily in Vergil and Dante," in *Medieval Constructions in Gender and Identity: Essays in Honor of Joan M. Ferrante*, ed. Teodolinda Bartolini (Tempe: Arizona Center for Medieval and Renaissance Studies, 2005), 136.

40. "Descrizione della Sicilia di Giulio (Antonio) Filoteo degli Omedei dal ms. della Biblioteca Comunale di Palermo, segn. Qq G 71," in *Opere storiche inedite sulla città di Palermo ed altre città Siciliane*, ed. Gioacchino di Marzo (Palermo: Luigi Pedone Lauriel, 1876), 6:2–3.

41. Tommaso Fazello, *Storia di Sicilia* (1558), vol. 1, trans. Antonio de Rosalia and Gianfranco Nuzzo (Palermo: Regione Siciliana, Assessorato dei Beni Culturali e Ambientali e della Pubblica Istruzione, 1990), 90.

42. Ian R. Manners, "Constructing the Image of a City: The Representation of Constantinople in Christopher Buondelmonti's *Liber insularum archipelagi*," *Annals of the Association of American Geographers* 87, no. 1 (1997), 77, 83; Clive Foss, *Byzantine Fortifications: An Introduction* (Pretoria: University of South Africa, 1986), 41, 43. Çiğdem Kafescioğlu attributes Buondelmonti's inclusion of the city to its status as the planned endpoint of his journey through the Aegean Sea, which the volume chronicled. Çiğdem Kafescioğlu, *Constantinopolis/Istanbul: Cultural Encounter, Imperial Vision, and the Construction of the Ottoman Capital* (University Park: Pennsylvania State University Press, 2009), 14.

43. Bordone, *Isolario*, Xr, XIXv–XXr. On the association between Venice and Tenochtitlan, see David Kim, "Uneasy Reflections: Images of Venice and Tenochtitlan in Benedetto Bordone's *Isolario*," *RES: Anthropology and Aesthetics* 49/50 (Spring/Autumn 2006), 80–91.

44. Porcacchi, *L'isole piv famose del mondo descritte*, 131. The text mentions the presence of a wet ditch (132) but does not represent the waterway in the accompanying print of Constantinople.

45. Porcacchi, 65, 157.

46. On the aesthetics of fortifications, see Nicholas Adams, "Military Architecture and Renaissance Art History or 'Bellezza on the Battlefield,'" *Architectura* 14, no. 2 (1984), 106–18. On the concept of "military urbanism" and the interrelationship of fortification technology and city planning, see Martha D. Pollak, *Cities at War in Early Modern Europe* (Cambridge: Cambridge University Press, 2010).

47. Michael S. A. Dechert, "The Military Architecture of Francesco di Giorgio in Southern Italy," *JSAH* 49, no. 2 (1990), 168; Clara Gelao, *Puglia rinascimentale* (Milan: Jaca Book, 2005), 179, 182. The canal was widened in the nineteenth century. *L'Italia: Puglia* (Milan: Touring Club Italiano, 2005), 325.

48. Gianni Custodero, *Castelli di Puglia* (Lecce: Capano, 2004), 129–30, 140.

49. For the alternate attribution to Spanish engineers, see the Touring Club Italiano guide *L'Italia: Puglia*, 412.

50. The initial cutting of Corfu's canal is generally dated to the late fifteenth century. See Quentin Hughes, "The Defenses of Corfu," *Fort* 14 (1986), 17–38.

51. Vesco, "Pietro Antonio Tomasello de Padua," (2009–10), 66; Vesco, "Pietro Antonio Tomasello da Padova," (2009), 137.

52. To accommodate the site's altered topography, Tomasello directed the construction of bastions on the artificial banks of the canal, and on the seabed. Gazzè suggests that Bartolomeo Cascon, an architect of Venetian extract, would have been qualified to oversee construction efforts in the Sicilian city of Syracuse in 1547, where architects were forced to counteract the "muddy and humid" terrain. Gazzè, "Inediti su Antonio Ferramolino a Siracusa," 136.

53. The *scoglio-fortezza* type became popular in the 1540s under the Sanmicheli engineers. See Dragos Cosmescu, "Venetian Island-Fortresses: Renaissance Innovation of Military Architecture," in *Defensive Architecture of the Mediterranean: XV to XVIII Centuries*, vol. 5, ed. Víctor Echarri Iribarren (Alicante: Editorial Publicacions Universitat d'Alacant, 2017), 319–26.

54. Achille Petrignani, "Gli architetti militari in Puglia," in *Atti del IX Congresso Nazionale di Storia dell'Architettura: Bari, 10–16 ottobre 1955* (Rome: Centro di Studi per la Storia dell'Architettura, 1959), 140; F. Strazzullo, *Architetti e ingegneri militari napoletani dal '500 al '700* (Naples: Arte Tipografica, 1969), 4.

55. Vesco, "Il Castellammare di Palermo," 17.

56. During his tenure as viceroy of Naples (1523–27), Charles Lannoy asked Charles V to retain Antonello, given his specialized knowledge of engineering and artillery. Vesco, "Il Castellammare di Palermo," 19, 20.

57. Tadini was active across the Mediterranean, contributing to fortifications in Crete, Rhodes, Pamplona, and Melilla. Leone Andrea Maggiorotti, *Architetti e architetture militari*, vol. 3, *Gli architetti militari italiani nella Spagna, nel Portogallo e nelle loro colonie* (Rome: La Libreria dello Stato, 1939), 41–53.

58. Maria Georgopoulou, *Venice's Mediterranean Colonies* (Cambridge: Cambridge University Press, 2001), 55–73; Andrea Nanetti, *Atlante della Messenia veneziana: 1207–1500, 1685–1715* (Imola: Meduproject and Editrice La Mandragora, 2011), 121.

59. Bertolotti is the only author to reference Ferramolino's presence on Corfu, on the basis of a letter Ferramolino sent to Federico Gonzaga in September 1538. Antonino Bertolotti, *Architetti, ingegneri e matematici in relazione coi Gonzaga: Signori di Mantova nei secoli XV, XVI e XVII, ricerche archivistiche mantovane* (1889; repr., Genoa: Tip. del R. Istituto Sordo-Muti, 1971), 35. On Ferramolino's brief tenure in Dubrovnik, see Alice Biro, "Italienische Architekten und Ingenieure in der Republick Ragusa (Heute Dubrovnik) als Moderne Kriegsbaumeister," in Viganò, *Architetti e ingegneri militari italiani*, 2:33–41, 50.

60. Jordan Dimacopoulos, "Sanmicheli nei territori veneziani del Mediterraneo orientale," in *Michele Sanmicheli: Architettura, linguaggio e cultura artistica nel Cinquecento*, ed. Howard Burns, Christoph Luitpol Frommel, and Lionello Puppi (Milan: Electa/CISA Andrea Palladio, 1995), 210; Lionello Puppi, *Michele Sanmicheli architetto: Opera completa* (Rome: Caliban, 1986), 102.

61. On the involvement of Savorgnan and Martinego in Venetian territories, see Deborah Howard, *Venice Disputed: Marc'Antonio Barbaro and Venetian Architecture, 1550–1600* (New Haven, Conn.: Yale University Press, 2015); Ennio Concina and Elisabetta Moltena, *"La fabrica della fortezza": L'architettura militare di Venezia* (Verona: Banca Popolare di Verona, 2001), 136.

62. Pavuša Vežić, "Vrata Michelea Sanmichelija u Zadru," *Institut za povijest umjetnosti* 29 (2005), 93, 106; Krumo Prijatelj, "Sanmicheli e la Dalmazia," in Burns et al., *Michele Sanmicheli*, 222. On the excavation of the "canal" in Zadar, see A. Žmega , "Zadarske utvrde 16. stoljeća," *Institut za povijest umjetnosti* 27 (2003), 107–18. The waterway excavated in 1537 should not be confused with the "canal" of Zadar, which runs the length of the peninsula.

63. Puppi, *Michele Sanmicheli architetto*, 78–79.

64. See Victor Mallia-Milanes, "Charles V's Donation of Malta to the Order of St. John," in *Peregrinationes: Acta et Documenta—Carlo V e Mercurino di Gattinara suo Gran Cancelliere*, vol. 2 (Malta: Accademia Internazionale Melitense, 2001); Michel Fontenay, "Charles Quint, Malte et la défense de la Méditerranée," *Revue d'histoire moderne et contemporaine* 50e, no. 4 (Oct.–Dec. 2003), 6–28.

65. See Paolo Militello, *Ritratti di città in Sicilia e a Malta: XVI–XVII secolo* (Palermo: Officina di Studi Medievali, 2008); Fabrizio D'Avenia, *Nobiltà allo specchio: Ordine di Malta e mobilità sociale nella Sicilia moderna* (Palermo: Associazione Mediterranea, 2009); Anthony Bonanno and Pietro Militello, eds., *Interconnections in the Central Mediterranean: The Maltese Islands and Sicily in History* (Palermo: Officina di Studi Medievali, 2008); Maurizio Vesco, "Designing the Bastion against the Turks: Sicily and Malta," in *Draughtsman Engineers Serving the Spanish Monarchy in the Sixteenth to Eighteenth Centuries*, ed. Alicia Cámara Muñoz (Madrid: Fundacion Juanelo Turriano, 2016), 247–70.

66. Viceroy García de Toledo visited Malta in the spring of 1566, a moment that coincides with the foundation of Valletta. For his impressions, see Archivo General de Simancas, Estado Sicilia, legajo 1130, año 1566, n. 47.

67. ASPa, TRP, LV, vol. 269, c. 156r, as quoted in Vesco, "Pietro Antonio Tomasello da Padova," (2009), 137.

68. Quentin Hughes, "Italian Engineers Working for the Knights of Malta," in Viganò, *Architetti e ingegneri militari italiani*, 1:40, 43.

69. Archivo General de Simancas, Estado Sicilia, legajo 1145, año 1576, n. 101; Hughes, "Italian Engineers," 44.

70. See José Ramón Soraluce Blond, *Las fortificaciones españolas de Sicilia en el Renacimiento* (Coruña: Universidade da Coruña, 1998), 76–79, 74; Liliane Dufour, *Siracusa città e fortificazioni* (Palermo: Sellerio, 1987), 32, 45–46, 44.

71. Dufour, *Siracusa città e fortificazioni*, 46.

72. Liliane Dufour, *Augusta: Da città imperiale a città militare* (Palermo: Sellerio, 1989), 41; Valeria Manfrè, "El virrey de Ligne y la actualización de las defensas de las ciudades portuarias: Carlos de Grunenbergh en Trapani, Catania, Augusta y Siracusa," in *La Sicilia dei viceré nell'età degli Asburgo (1516–1700): La difesa dell'isola, le città capitali, la celebrazione della monarchia*, ed. Stefano Piazza (Palermo: Caracol, 2016), 217, 219.

73. Blond, *Las fortificaciones españolas*, 82; Dufour, *Siracusa città e fortificazioni*, 63–64.

74. Tiburzio Spannocchi, *Descripción de las marinas de todo el reino de Sicilia* (1578), 30r, 30v–31r, ms. 788, Biblioteca Nacional de España; Dufour, *Augusta*, 41–42, 44.

75. For a detailed account of contributions by Italian engineers in the service of the Spanish crown, see Alicia Cámara, *Fortificación y ciudad en los reinos de Felipe II* (Madrid: Nerea, 1998).

76. Jorge Correia, *Implantação da cidade portuguesa no Norte de África: Da tomada de Ceuta a meados do século XVI* (Porto: FAUP, 2008), 83.

77. Correia, 94; Mohamed Cherif, *Ceuta aux époques almohade et mérinide* (Paris: Editions l'Harmattan, 1996), 74, 78; José Antonio Ruiz Oliva, *Fortificaciones militares de Ceuta: Siglos XVI al XVIII* (Ceuta: Instituto de Estudios Ceutíes, 2012), 15. On the fortification of Ceuta, see also José Luis Gómez Barceló, "Ceuta, una ciudad fortificada," in *Arquitectura militar y artillería en el Norte de África: De la fortificacíon islámica a los modelos abaluartados*, ed. Antonio Bravo Nieto (Melilla: Centro Asociade a la UNED, 2008), 145–66.

78. The ditch in question was the Hafr al-Suhaj. Correia, *Implantação da cidade portuguesa*, 84.

79. Correia, 118; Rafael Moreira, "Fortalezas do Renascimento," in *A arquitectura militar na expansão portuguesa: Porto, Castelo de S. João da Foz, junho-setembro de 1994* (Lisbon: Comissão Nacional para as Comemorações dos Descobrimentos Portugueses, 1994), 129, 138; Martin M. Elbl, "Portuguese Urban Fortifications in Morocco: Borrowing, Adaptation, and Innovation along a Military Frontier," in *City Walls: The Urban Enceinte in Global Perspective*, ed. James D. Tracy (Cambridge: Cambridge University Press, 2000), 380; Gaspare de Caro, "Benedetto da Ravenna," in *Dizionario biografico degli italiani*, vol. 8 (1966), http://www.treccani.it/enciclopedia/benedetto-da-ravenna_(Dizionario-Biografico) (accessed 26 June 2018).

80. John B. Bury, "Benedetto da Ravenna (c. 1485–1556)," in *A arquitectura militar na expansão portuguesa*, 132; J. Campos, "The Mediterranean Vanguard of Modern Fortification: Benedetto da Ravenna and Portugal—Vila Viçosa and Mazagan," in Echarri Iribarren, *Defensive Architecture of the Mediterranean*, 5:xxvii.

81. Bury, "Benedetto da Ravenna," 131–33; Maggiorotti, *Architetti e architetture militari*, 33, 35, 44, 60. See also Matos, "The Defensive Front Land of Cadiz," 68, 73. On Portuguese fortifications in Africa more generally, see Jorge Correia, "Dimensões da castelologia portuguesa no Norte de África

entre quatrocentos e meados de quinhentos," *Anais de História de Além-Mar* 9 (2008), 9–36.

82. Correia, *Implantação da cidade portuguesa*, 119; Antonio Torrecillas Velasco, *Dos civilizaciones en conflitto: España en el África musulmana—Historia de una guerra de 400 años (1497–1927)* (Valladolid: Quiron, 2006), 155; Moreira, "Fortalezas do Renascimento," 129.

83. Oliva, *Fortificaciones militares de Ceuta*, 40–42; Elbl, "Portuguese Urban Fortifications," 360, 382; Correia, *Implantação da cidade portuguesa*, 121. Also in 1541, the same team of architects produced plans for the fortification of Mazagão (el Jadida), which featured a wet ditch encircling the city on three sides. The completed waterway sealed Mazagão off from the surrounding coastline. As was the case on Sicily, the water's edge demanded an adaptive approach to design, with one bastion constructed entirely on the seabed. On Mazagão, see Jorge Correia, "Mazagão: A última praça portuguesa no Norte de África," *Revista de História da Arte* 4 (2007), 185–211; Elbl, "Portuguese Urban Fortifications," 381; Campos, "The Mediterranean Vanguard of Modern Fortification," xxxv.

84. Matos, "The Defensive Front Land of Cadiz," 71; Moreira, "Fortalezas do Renascimento," 138, 142; Francisco Sousa Lobo, "Indo-Portuguese Fortification," in *Indo-Portuguese Encounters: Journeys in Science, Technology and Culture*, ed. Lotika Varadarajan (New Delhi: Aryan Books, 2006), 779, 787.

85. Moreira, "Fortalezas do Renascimento," 142, 144; Zoltán Biedermann, "Colombo versus Cannanore: Contrasting Structures of Two Colonial Port Cities (1500–1700)," *Journal of the Economic and Social History of the Orient* 52, no. 3 (2009), 414–20, 422–23; André Pinto de Sousa Dias Teixeira, "The Fortress of Cannanore and Military Architecture during the Reign of King Manuel I," in *Winds of Spices: Essays on Portuguese Establishments in Medieval India with Special Reference to Cannanore*, ed. K. S. Matthew and Joy Varkey (Kannur: Institute for Research in Social Sciences and Humanities, 2006), 144.

86. G. Perbellini, "Le fortificazioni delle isole di São Miguel e Terceira nell'arcipelago delle Açores," *Castellum* 13 (1971), 157; Alicia Cámara, "Leonardo Turriano al servicio de la corona de Castilla," in *Leonardo Turriano: Ingeniero del rey*, ed. Alicia Cámara, Rafael Moreira, and Marino Viganò (Madrid: Fundación Juanelo Turriano, 2010), 62; Cámara, *Fortificación y ciudad*, 57.

87. Cámara, "Leonardo Turriano," 57–58.

88. Beatriz Alonso Acero, *Orán-Mazalquivir, 1589–1639: Una sociedad española en la frontera de Berbería* (Madrid: Consejo Superior de Investigaciones Científicas, 2000), 30.

89. Alicia Cámara Muñoz, "Immagini di Orano e Mazalquivir di Vespasiano Gonzaga in un manoscritto inedito di Leonardo Turriano," in *Vespasiano Gonzaga: Non solo Sabbioneta*, ed. Ca' Gioiosa di Mantova, trans. Fabrizio Schepisi and Raffaele Tamalio (Rome: Il Bulino, 2008), http://digilander.libero.it/cagioiosa/vespasiano.html (accessed 13 May 2016); Antonio Sánchez-Gijón, *Luis Escrivá: Su Apología y la fortificación imperial* (Valencia: Generalitat Valenciana, 2000), 195.

90. Cámara Muñoz, "Immagini di Orano e Mazalquivir," n.p.; José Javier de Castro Fernández and Fernando Cobos Guerra, "El debate en las fortificaciones del imperio y la monarquía española (1535–1574)," in Hernando Sánchez, *Las fortificaciones de Carlos V*, 265. For a detailed account of the fortification of Mazalquivir, see also Cámara, "Leonardo Turriano," 94–117.

91. Castro Fernández and Cobos Guerra, "El debate en las fortificaciones del imperio," 265–66; Cámara Muñoz, "Immagini di Orano e Mazalquivir"; Sánchez-Gijón, *Luis Escrivá*, 196.

92. Cámara, "Leonardo Turriano," 62. The project was not undertaken because of its technical difficulty and excessive cost. Cámara Muñoz, "Immagini di Orano e Mazalquivir," n.p.

93. Quoted in Sánchez-Gijón, *Luis Escrivá*, 196. For Vespasiano's proposal, see also J. J. de Castro Fernández and J. M. de Castro, "Juan Bautista Antonelli y el diseño del fuerte de Mazalquivir (Mens el Kevir)," in Echarri Iribarren, *Defensive Architecture of the Mediterranean*, 5:215–22.

94. Instituto de Historia y Cultura Militar, *Colección Aparici*, tomo V, 94–96, as quoted in Cámara Muñoz, "Immagini di Orano e Mazalquivir," n.p.; Cámara, "Leonardo Turriano," 63–67. On the relationship between Antonelli and Vespasiano, see J. Miguel del Rey Aynat, "La condición de lugar, una condición propia de las arquitecturas 'a la moderna' en la obra de los Antonelli," in Echarri Iribarren, *Defensive Architecture of the Mediterranean*, 5:93–100.

95. Quoted in Cámara Muñoz, "Immagini di Orano e Mazalquivir," n.p.

96. Giovan Battista Antonelli, *Epitomi delle fortificationi moderne*, ed. Mario Sartor (Udine: Forum, 2009), 213, 8r, note 22. De' Marchi's treatise includes a discussion of a design for a fortress "sited on the point of a maritime outcropping or on a peninsula within the sea," but the design leaves the isthmus intact and circumscribes the star-shaped enceinte within a moat. De' Marchi, *Della architettura militare*, 70r–72r, plate XXVI.

97. Alicia Cámara Muñoz, "La profesión de ingeniero: Los ingenieros del rey," in Silva, *El Renacimiento*, 148; Maggiorotti, *Architetti e architetture militari*, 139–42; Alicia Cámara Muñoz, "Antonelli, Giovan Battista (Gatteo, 1531–Toledo, 1588)," in Silva, *El Renacimiento*, 706.

98. Francisco-Ramón Lozano-Martínez, Federico Arévalo Rodríguez, and Gabriel Granado-Castro, "La obra coronada en la fortificación de Puertas de Tierra de Cádiz durante el siglo XVII," in Echarri Iribarren, *Defensive Architecture of the Mediterranean*, 5:199–200. For an alternative dating, see Matos, "The Defensive Front Land of Cadiz," 67.

99. Cámara, *Fortificación y ciudad*, 192; Oliva, *Fortificaciones militares de Ceuta*, 63.

100. Oliva, *Fortificaciones militares de Ceuta*, 43. On Rojas's involvement in the fortification of Cádiz, see Cámara, *Fortificación y ciudad*, 189–92.

101. Oliva, *Fortificaciones militares de Ceuta*, 48–51.

102. Other engineers in Cádiz at the time included Benedetto da Ravenna, Giovan Battista Calvi, and Giovan Giacomo Palearo Fratin (El Fratin). See Bury, "Benedetto da Ravenna," 131–32; Maggiorotti, *Architetti e architetture militari*, 58; Matos, "The Defensive Front Land of Cadiz," 73; Oliva, *Fortificaciones militares de Ceuta*, 35; Mariano Esteban Piñeiro, "Calvi, Giovan Battista (Caravaggio, h. 1525–Perpiñán, 1565)," in Silva, *El Renacimiento*, 709–10; Alicia Cámara Muñoz, "Fratin, Giovan Giacomo Palearo (Morcote, h. 120–Pamplona, 1586)," in Silva, *El Renacimiento*, 716; Castro Fernández and Cobos Guerra, "El debate en las fortificaciones del imperio," 264.

103. Alicia Cámara Muñoz, "La ciudad de los ingenieros y la monarquia española: Tiburzio Spannocchi y Giulio Lasso," in Casamento and Guidoni, *L'urbanistica del Cinquecento in Sicilia*, 25; Maggiorotti, *Architetti e architetture militari*, 162.

104. Manfrè, "El virrey de Ligne," 217; Dufour, *Augusta*, 49.

105. Hughes, "Italian Engineers," 44–45; Dufour, *Siracusa città e fortificazioni*, 48. In the seventeenth century, plans were made to excavate the moat between the city and the Maniace; the project was not completed. Dufour, *Siracusa città e fortificazioni*, 37.

106. Dufour, *Siracusa città e fortificazioni*, 49; Dufour, *Augusta*, 49.

107. Dufour, *Siracusa città e fortificazioni*, 49–50; Nicola Aricò, "Carlos de Grunenbergh e le città ioniche del teatro geografico antiguo y moderno del Reyno de Sicilia (1686)," *Lexicon* 7 (2008), 23–36; Manfrè, "El virrey de Ligne," 205–26.

108. Manfrè, "El virrey de Ligne," 209, 219, 221.

109. Dufour, *Siracusa città e fortificazioni*, 50–51.

110. Agnello and Trigillia, *La spada e l'altare*, 56; Manfrè, "El virrey de Ligne," 221.

111. Quoted in Liliane Dufour and Henri Raymond, *Siracusa tra due secoli: La metamorfosi dello spazio, 1600–1695* (Palermo: Arnaldo Lombardi, 1998), 58n90.

112. Quoted in Dufour, *Siracusa città e fortificazioni*, 50n215.

113. Ovid, *Metamorphoses*, *Books IX–XV,* ed. G. P. Goold, trans. Frank Justus Miller (Cambridge, Mass.: Harvard University Press, 1984), bk. 15, lines 336–37. Arab sources similarly mentioned a channel of indeterminate origin

that separated the city from the *terra ferma* at its land front. Dufour, *Siracusa città e fortificazioni*, 32.

114. The waterways Carlos de Grunenbergh designed in Syracuse and Augusta resembled a type of bastioned trace protected by wide moats that was popularized by French military engineers. Dufour, *Augusta*, 49. In 1702, French engineer Bernard Renau (then in the service of Philip V) proposed excavating a monumental waterway along the land front of the isthmus connecting the city of Coruña to the coast of Galicia. Engineers active in Coruña at that time included Spannocchi, Rojas, Turriano, and the Grunenbergh brothers. On the fortification of Coruña, see José Ramón Soraluce Blond, *Castillos y fortificaciones de Galicia: La arquitectura militar de los siglos XVI–XVIII* (Coruña: Fundación Pedro Barrié de la Maza, Conde de Fenosa, 1985), 29–37, 51–59.

115. Alison Hoppen, *The Fortification of Malta by the Order of St. John, 1530–1798* (Edinburgh: Scottish Academic Press, 1979), 59.

116. Hoppen, 59.

117. Eugenio M. di San Lio, Maria Rosaria Vitale, Francesca Aliffi, and Sebastiano Macca, "De Grunenberg's Fortifications in Augusta: Knowledge and Conservation of a Neglected Heritage," in *Defensive Architecture of the Mediterranean: XV to XVIII Centuries*, vol. 2, ed. Pablo Rodríguez-Navarro (Valencia: Universitat Politècnica de València, 2015), 121.

118. Valeria Manfrè, "Sicile: L'architecture militaire pendant la vice-royauté de Claude-Lamoral prince de Ligne (1670–1674)," *Nouvelles Annales Prince de Ligne* 19 (2012), 81; Nicoletta Maioli Urbini, "La cinta fortificata di Orbetello e lo Stato dei Presìdi: Vicende costruttive e notizie storiche," *Bollettino d'Arte* 70, nos. 31–32 (1985), 140.

119. Maioli Urbini, "La cinta fortificata di Orbetello," 127.

120. On the fortification of Orbetello, see Alessio Cartei, Marco Giorgio Bevilacqua, Caterina Calvani, Roberto Pierini, and Domenico Taddei, "Orbetello, a Fortress on the Water: A Research for the Valorization of the City and Its Bastioned Front," in Rodríguez-Navarro, *Defensive Architecture of the Mediterranean*, 2:49–56; Francesco Divenuto, "Lo Stato dei Presìdi: Alcune tipologie di architettura militare," in *Fortezze d'Europa: Forme, professioni e mestieri dell'architettura difensiva in Europa e nel Mediterraneo spagnolo*, ed. Angela Marino (Rome: Gangemi, 2003), 129–38.

121. Rosa López Torrijos, "Imágenes, textos y personajes en torno a la propuesta de una ciudad ideal presentada a España en el siglo XVI," *Anuario del Departamento de Historia y Teoría del Arte* (Universidad Autónoma de Madrid) 11 (1999), 95–96. De' Marchi also took up the subject of Monte Argentario in his late sixteenth-century treatise and, like Cataneo, emphasized the defensive potential of artificial waterways: "When one finds promontories or peninsulas that enter in the sea by narrow means and then widen, as does Monte Argentario in Tuscany, and if the isthmus is of such material that you can carve wide and deep canals, drawing the water of the sea around [the land], I say that these sites will be extremely strong to establish settlements." De' Marchi, *Della architettura militare*, bk. 3, 133–34, 257–58.

122. On Giovanni Battista Antonelli's involvement in the Americas, see Cámara, *Fortificación y ciudad*, 69–71; Juan Manuel Zapatero, "El ingeniero militar Bautista Antonelli en las 'Indias Occidentales,' 1581–1616," in Viganò, *Architetti e ingegneri militari italiani*, 1:121–33.