FORTIFICATION RENAISSANCE: THE ROMAN ORIGINS OF THE *TRACE ITALIENNE*

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Thesis Prepared for the Degree of

MASTER OF ARTS

UNIVERSITY OF NORTH TEXAS

May 2013

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Vigus, Robert T. <u>Fortification Renaissance: The Roman Origins of the *Trace Italienne*</u>.

Master of Arts (History), May 2013, pp.71, 35 illustrations, bibliography, 67 titles.

The Military Revolution thesis posited by Michael Roberts and expanded upon by Geoffrey Parker places the *trace italienne* style of fortification of the early modern period as something that is a novel creation, borne out of the minds of Renaissance geniuses. Research shows, however, that the key component of the *trace italienne*, the angled bastion, has its roots in Greek and Roman writing, and in extant constructions by Roman and Byzantine engineers. The angled bastion of the *trace italienne* was yet another aspect of the resurgent Greek and Roman culture characteristic of the Renaissance along with the traditions of medicine, mathematics, and science. The writings of the ancients were bolstered by physical examples located in important trading and pilgrimage routes. Furthermore, the geometric layout of the *trace italienne* stems from Ottoman fortifications that preceded it by at least two hundred years. The Renaissance geniuses combined ancient bastion designs with eastern geometry to match a burgeoning threat in the rising power of the siege cannon.

ACKNOWLEDGEMENTS

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CHAPTER I

THE MILITARY RENAISSANCE

Fortifications have been a part of the defense of towns and cities for millennia. The

most basic type of design consisted of a small wall and gate, maybe with a watchtower or two.

As time passed and methods for taking fortified cities became increasingly effective, those

behind the walls adapted their fortifications to meet these threats. This, in turn, meant that

those laying siege developed better weapons and so on. The introduction of the effective use

of artillery gunpowder in Europe rendered the older walls on the continent relatively useless.

However, the fort did not die. Brilliant minds developed novel methods of designing and

building walls that could withstand a cannon barrage for quite some time; these fortresses are

known today as *trace italienne*.[1]

According to the theory advocated by those that subscribe to the military revolution

thesis, the time, effort, energy, and resources needed to build, arm, and besiege such

fortifications was on such a scale that it led to a wholesale change in the financing of military

campaigns. This idea, first posited by Michael Roberts, is that between the years of 1560-1660

CE, there was a shift away from the feudalism that defined the middle ages toward a more

centralized government.[2] The *trace italienne* comes into prominence with the extension of

Roberts's original thesis by Geoffrey Parker. Parker asserts that the new style of fortification

led to fielding increasingly larger armies in the early modern period. The armies that defined

the period consisted of well-trained and disciplined conscripts in linear formation coordinated

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[1] John A. Lynn, "The Trace Italienne and the Growth of Armies: The French Case." *Journal of Military History* 55: 3 (July 1991): 301.
[2] Michael Roberts, *The Military Revolution, 1560-1660* (Belfast: M. Boyd, 1956).

on such a scale that it altered the scope and structure of the European states. These large

armies were so expensive to raise and maintain that only a central authority, could levy the

necessary taxes to pay for them. The large armies were so costly that neither regional

aristocrats nor individual communities could easily challenge them, thereby solidifying the

central government's authority over the entire region, leading to the beginnings of the modern

nation-state. To some, the key factor spawning this military and bureaucratic revolution in the

early modern period lay in the emergence of the *trace italienne* and the angled bastion.[3]

Parker's thesis on the military revolution has met with extensive criticism. Some of this

criticism extends from Parker's assessment of a timeframe for the military revolution between

1500-1800 CE. Clifford Rogers notes that scholars have primarily examined aspects of the

military revolution stemming from the invasion of Charles VIII of France into Italy in 1494 CE.

This invasion showed the true power of the new siege cannon that spurred on what Rogers calls

the "artillery-fortress revolution." Rogers, however, dates the artillery-fortress revolution

portion of his "punctuated equilibrium evolution" model as beginning around 1520 CE.[4]

However, he does point out that the effects of siege cannon are prevalent as early as the 1420s

CE.[5] Other authors debate the effectiveness of the *trace italienne* in weakening lesser, regional

powers.[6] Further, even more authors debate the entire existence of a military revolution as an

event and many historians use the label of a military revolution as an "accepted and useful label

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[3] Geoffrey Parker, *The Military Revolution: Military Innovation and the Rise of the West, 1500-1800* (Cambridge: Cambridge University Press, 1988), 10.

[4] Clifford Rogers, "The Military Revolutions of the Hundred Years' War," *Journal of Military History,* 52: 2 (April, 1993): 274.

[5] Rogers, "Military Revolutions of the Hundred Years' War," 265.

[6] Thomas F. Arnold, "Fortifications and the Military Revolution: The Gonzaga Experience, 1530 – 1630," in *The Military Revolution Debate: Readings On The Military Transformation Of Early Modern Europe*, Clifford Rogers, ed. (Boulder, CO: Westview Press, 1995), 206.

for a field of scholarly inquiry."[7] In other words, even detractors of the military revolution

theory still use the term as a generally accepted point of reference.

Fort design in the era of the military revolution was influenced not only by engineering

necessities in the age of gunpowder, but also by architectural conventions rooted in the late

Roman period. The Roman author Vitruvius played a large role in influencing some of the

designs of the Renaissance architects. In particular, many architectural designs during the

Renaissance, including fortifications, used the "harmony of proportions" of the human body.[8]

The elements of the "Vitruvian Man" are seen quite frequently in the *trace italienne,* as well as

many other artistic representations. There were even fortifications shaped roughly like a man

in very anthropomorphic and relatively absurd designs. For the most part, they took the form

of a pentagon when the Vitruvian elements were applied.[9] Vitruvius was not the only Roman

author to influence the Renaissance architects. The Renaissance architect Francesco di Giorgio

regarded the Roman author Vegetius very highly and referenced him in his own treatise, as is

covered in more detail in the next chapter.

What is clear is that from the sixteenth century CE, there was a dramatic change in the

complexity of the architectural layout of fortresses and a widespread increase in the consistent

use of the angled bastion. While it is true that the designs of the *trace italienne* fortresses were

more complex than anything that had been previously created, the basic ideas behind the

angled bastion can be traced back to Greek and Roman writings and late Roman fort

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[7] John F. Guilmartin, Jr., "Military Revolution: Origins and First Tests Abroad," in *The Military Revolution Debate: Readings On The Military Transformation Of Early Modern Europe*, Clifford Rogers, ed. (Boulder, CO: Westview Press, 1995), 300.
[8] Parker, *The Military Revolution*, 41; John Rigby Hale, *Renaissance Fortification: Art or Engineering* (London: Thames and Hudson, 1977), 21-36.
[9] Hale, *Renaissance Fortification*, 41.

construction. Additionally, the geometric principles used in the complex layout of the *trace italienne* style of fortress are also not novel and originate from Ottoman fort designers. The military architects of the early modern period were actively engaged in learning and exchanging ideas with their Eastern counterparts, as detailed in the fifth chapter. They also witnessed, or at least heard of, the ancient and Ottoman designs that could be seen on major trade routes and pilgrimage routes. The Renaissance military architects credited with creating the *trace italienne* had combined ancient towers with eastern calculations to produce a confluent structure, spurred on by the new challenge of the cannon, and made possible by economic and cultural shifts in Europe.

Military revolution historians, even those that disagree with the entire concept, typically view the *trace italienne* as something new that sprang from creative minds of artistic genius. However, as brilliant as these architects were, the principles behind the *trace italienne* were not a novel creation of Renaissance architects. As with the advances in science, medicine, and mathematics that were the result of a rediscovery of ancient sources, the *trace italienne* was a product of the resurgent Roman and Greek culture that defined the Renaissance. The angled bastion, which was the key to the effectiveness of the *trace italienne* stemmed from ancient writings dating back as far as the third century BCE. Fortification builders of the Roman and Byzantine eras were increasingly active in deploying angled towers in the construction of their fortifications. Angled towers had become key features of many Byzantine strongholds, which had a significant influence on Western European powers such as the Venetians and Normans. What historians have presumed to be the novelty of the creation of the *trace italienne* was not

rooted in the need to defend against the threat of gunpowder artillery, but in the culture of

rebirth that was characteristic of the Renaissance.

CHAPTER II

THE ANGLED BASTION OF PARKER'S MILITARY REVOLUTION

The most defining features of fortifications in the early-modern period were the angled

bastions protruding from the polygonal-shaped forts. Leon Batista Alberti in the 1440s CE in his

work, *De Re Aedificatoria*, wrote, "parts to expand the battery should be made semi-circular or

rather with a sharp angle like the head of a ship." The need for the angled bastion was not a

reference to the need for defense against guns. Instead, Alberti makes no mention of guns, but

places flanking fire as the most important feature of any fortification, above even a high wall.[1]

The bastions were not merely pointed, however, but polygonal. They typically consisted of two

faces and two flanks. The faces followed an obtuse angle with regard to the outer curtain of

the fortification, which is the main wall between the bastions.[2] The flanks of the bastion were

either perpendicular to the curtain, or followed a reentrant angle, thereby tucking the flank

further back behind the walls of the face for greater protection.[3] This setup would give the

bastion a sort of "arrowhead" appearance.
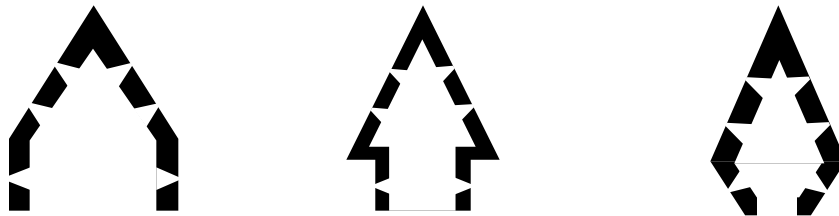
Figure 1. Basic examples of angled bastions with loopholes or arrow slits shown.

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[1] John Rigby Hale, "The Early Development of the Bastion: An Italian Chronology, c. 1450 – c. 1534," in *Europe in the Late Middle Ages*, J. R. Hale, J. R. L. Highfield, and B. Smalley, eds. (London: Faber and Faber, 1965)*,* 477.
[2] Alexandre-Pierre Julienne Belair, *The Elements of Fortification,* Translated by John Ward Fenno, (Philiadelphia, 1799), 19.
[3] Belair, *The Elements of Fortification,* 15.

Historians traditionally have seen the arrowhead shape as an improvement on the fortifications of the medieval period, which typically consisted of round or square towers. These medieval towers created "dead spots" in front of them. These spots could enable besieging forces to hide away from the missile weapons of the defenders and undermine or scale the wall of the tower. Ordinarily, the defenders would attempt to drop objects on the heads of the attackers, which was not always effective, as the besiegers would often build their own protective structures. The change in configuration to the angled bastions of the early-modern period eliminated the dead spots because the bastions were covered from firing positions along the inner curtain and flanks. The angled construction of the bastion allowed for a clear line of sight and fire to all parts of the outer wall from the nearest fortified flank.[4] This does not just mean firing on attackers from the top of a tower, but also from loopholes, small slits or holes in the side of the fortification wall that allow defenders to rain fire on attackers from a protected position. The interior of the loophole was angled in such a way that the defenders would be able to produce a larger field of fire than they ordinarily would from firing through a straight hole. Shooting from the protection of loopholes significantly reduced the line of sight of one particular defender since he was not able to turn fully outside of the restrictions of the loophole angle. However, the compatriots of each shooter, firing from adjacent loopholes, enhanced the efforts of one another in their defense of the fortification. The key to the use of the angled bastion was the capability to produce dense zones of crossfire, or enfilading fire.[5] With enfilading fire such as this, defenders could strike attackers on all sides

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[4] Lynn, "The Trace Italienne and the Growth of Armies," 301; Parker, *The Military Revolution,* 10.
[5] Arnold, "Fortificaitons and the Military Revolution," 210.

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whether they were attacking towers, or the curtain as shown below (Figure 2) with overlapping

fields of fire from the loopholes.

The need for enfilading fire stemmed from typical siege technique of mining, which,

with the exception of the new ability to use explosives, was a technique as old as the siege

itself. In the early days of the use of the cannon, walls were typically thinner and susceptible to

cannon fire, making mining decreasingly necessary. To counter this, the walls, of course got

thicker and lower to withstand the firepower of siege cannon.[6] One of the most effective ways

to take a fortification became, once again, mining. As mining techniques became more

advanced, bombs were also introduced to siege techniques, causing devastating effects by

taking down walls even quicker than before. The return and improvement of mining as a siege

technique increased the need for flanking fire along the walls. The flanks did not only cover the

bastion; more important, they allowed for the defense of the curtain wall.[7] The flank positions

aligned the soldiers in such a way that they would be able to fire upon the exposed flanks of a

charging enemy between the foremost end of the next bastion and the curtain wall.[8]

Figure 2. Angled bastions, or pentagonal towers with loopholes from which gunners, archers, or artillerymen could fire from a concealed position and provide covering fire for the adjacent tower.

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[6] Parker, *The Military Revolution,* 10.
[7] Belair, *The Elements of Fortification,* 14.
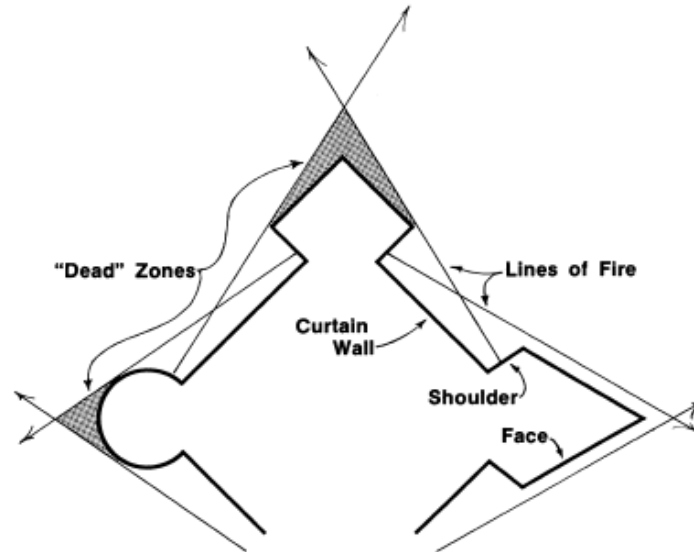[8] Lynn, "The Trace Italienne and the Growth of Armies," 304.

Figure 3. Depiction of dead zones in front of square and round towers, as well as the elimination of those dead zones in the angled bastion. *Source:* John Lynn, "The Trace Italienne and the Growth of Armies: The French Case." *The Journal of Military History* 55, 3 (July 1991), 303.

The position of the bastions themselves was also of great importance. The angle of the bastions would be of no use if the shots from the covering walls and adjacent bastions could not reach them. Therefore, the outermost point of the bastion had to be within a musket shot range of the covering flanks on either side. Conversely, the bastions could not be too close together, either. This was not for any tactical reason but was a matter of cost. The closer the bastions were to one another, the more that were needed for the total enclosure, thus driving up the cost of the fortress.[9]

Even by the traditional view of early modern fortifications by historians, the bastion was not an overnight creation that was suddenly thrust upon the battlefield and achieved ultimate success against cannon. It, too, was a product of evolution. Christopher Duffy points out several early examples of the angled bastion. The first is the outer enceinte, or curtain wall, of

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[9] Belair, *The Elements of Fortification,* 17-20.

the Castle of Lucera in Southern Italy, the second is a northern tower of Mont Saint Michel in

Normandy, the third is the wedge-shaped designs of Francesco di Giorgio, the alleged father of

the angled bastion.[10]
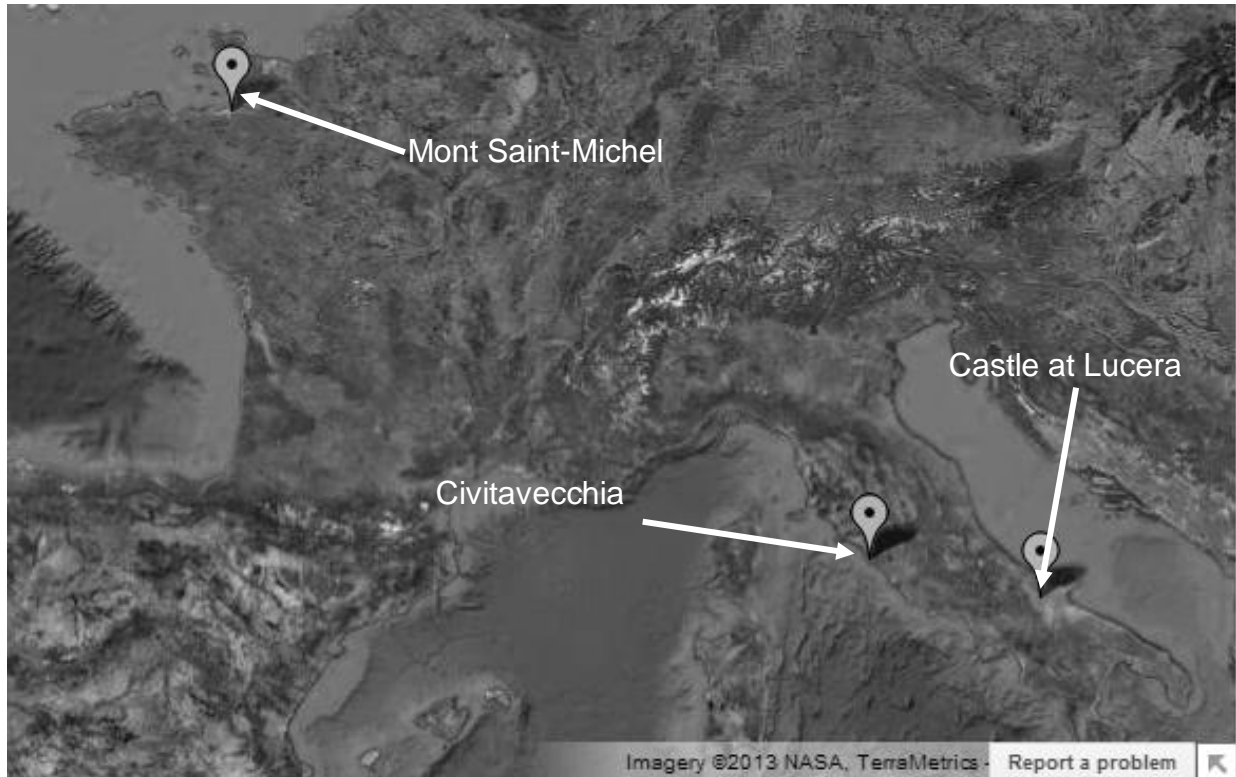
Figure 4. Locations of early examples of the angled bastion according to Hale and traditional scholarship about the angled bastion. *Source:* Google Maps.

The Castle of Lucera (+41° 30' 31.61", +15° 19' 22.22") was built by the Holy Roman

Emperor, Frederick II (1220 – 1250) in 1233 CE.[11] Shown below, the shape of the pentagonal

towers clearly follows the principles of that are seen in the angled bastion of being able to

cover the entire tower from any point of the curtain and the towers being able to reciprocate.

The flanks of the towers were also specifically designed for firing on the flanks of an attacking

enemy at the curtain.

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[10] Christopher Duffy, *Siege Warfare: The Fortress in the Early Modern World 1494-166* (New York: Routledge, 1979), 25.
[11] Paul H. D. Kaplan, "Black Africans in Hohenstaufen Iconography," *Gesta,* 26, 1 (1987): 32.

Figure 5. Castle of Lucera, southeast wall. *Source*: Google Maps.

The northern tower of Mont Saint Michel (+48° 38' 11.16", -1° 30' 34.64"), commissioned by Charles VI (1368-1422 CE), is not at first glance, a particularly striking example since it is only one tower in a greater structure.[12] The most intriguing part is the location in Normandy, far away from the Castle of Lucera and the traditional origins of the *trace italienne* in Italy. This design could have been brought about by alliances and trade with the Holy Roman Empire, or by Norman contact with the effectiveness of such structures, as is shown later.

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[12] Siméon Luce, *Chronique du Mont-Saint-Michel, 1343-1468* (Paris: Société des Anciens Textes Français, 1879), viii.

Figure 6. Mont Saint Michel northern tower. *Source:* Google Maps.


Figure 7. Mont Saint Michel 3D rendering. *Source:* Google Maps.

The last of the examples mentioned by Duffy are the wedge-shaped designs of Francesco di Giorgio Martini in the 1470s CE, which are found in his written works, two pages of which are shown below. Modern historians regard di Giorgio as the father of the angled bastion, or at least the artist that put it best into practice. Little is known of his early life, except that he was Sienese. However, as with many of the architects of Renaissance fortifications, di Giorgio was not just a military engineer, he was trained primarily as a painter and sculptor in his early life. Much of his work as a military architect was spent working for Guidobaldo, the Duke of Urbino between 1482 and 1502 CE.[13] Francesco himself was well versed in the writings of Roman authors such as Vitruvius and Vegetius. His own treatise includes references to angular forms recommended by Vegetius.[14] Already it is clear that the seeds of the designs of di Giorgio were sown from studying texts of the ancients.

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[13] Allen S. Weller, *Francesco di Giorgio, 1439-1501* (Chicago: University of Chicago Press, 1942), 1-2.

[14] Lynda Fairbairn, *Italian Renaissance Drawings from the Collection of Sir John Soane's Museum* Vol. 1 (London: Azimuth Editions, 1998), 53-55; Francesco di Giorgio's *Treatise on Architecture,* vol.120, fol.2v. There are two primary versions of his treatise that exist, one is referred to as the Soane manuscript at the Sir John Soane Museum in London, referenced above and found in Lynda Fairbairn's book, the other is in the Magliabecchiano held in the National Library at Florence. Neither of these is an original copy of his actual treatise but are copies that were in the possession of other architects that were studying his work.
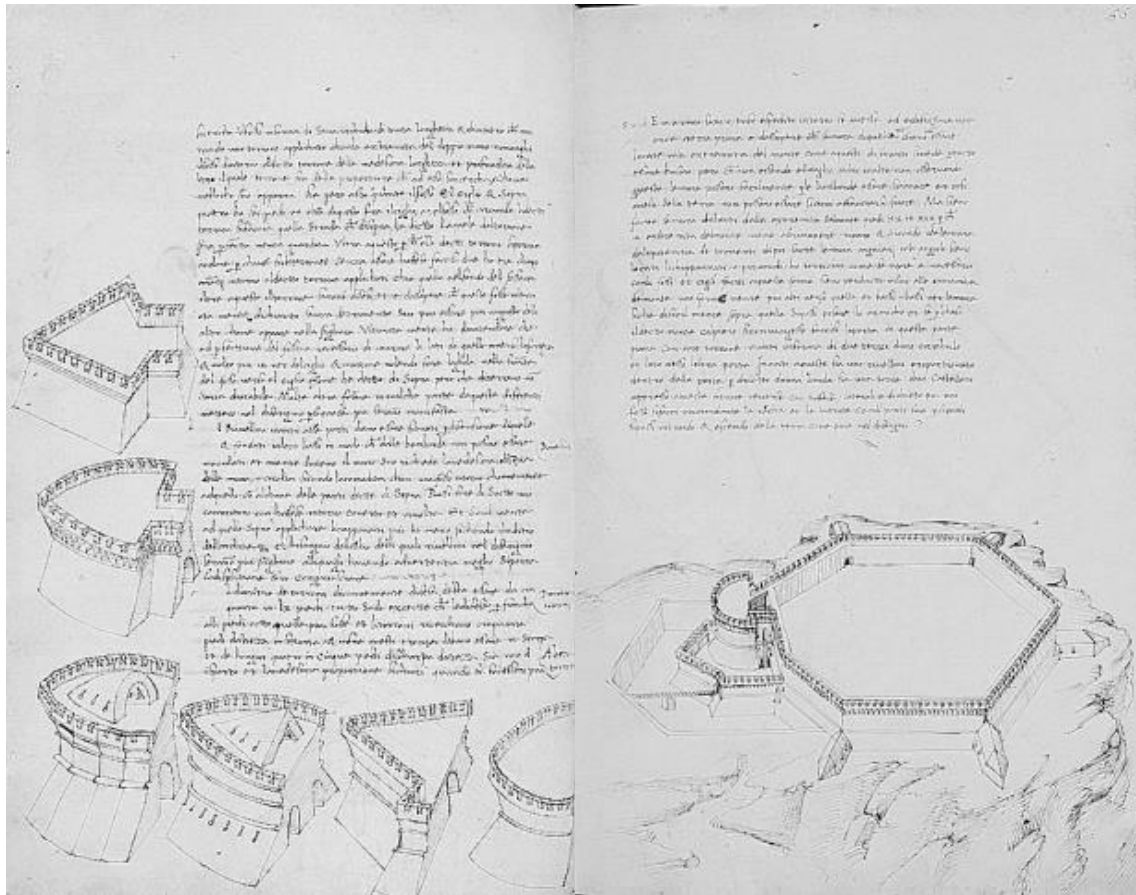
Figures 8a, 8b. *Source:* Francesco di Giorgio Martini, *Treatise on Architecture*, National Central Library of Florence (http://www.bncf.firenze.sbn.it/Bib_digitale/Manoscritti/II.141/ main.htm), 49, 72.

In Guicciardini's *History of Italy* (published 1536-1540 CE), he specifically cites the rapid success of the new siege cannon of Charles VIII as the reason for making the changes to the fortifications. Machiavelli also remarks at how "feebly and slightly we used to fortify our towns and castles before Charles VIII, king of France, came into Italy."[15] Guicciardini also hints that the Turks showed the angled bastion to the Italians during their raid in Otranto in 1480 CE when they "dug themselves in." While some of Guicciardini's contemporaries rejected this

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[15] Niccolò Machiavelli, *The Art of War*, Neal Wood, trans., Ellis Farneworth, ed. (Cambridge, MA: Da Capo Press, 2001), 188.

claim, the idea that the origins of the angled bastion came from the east lies closer to the truth, as will be discussed further.[16]

As can be seen from the drawings of di Giorgio, the angled bastion took on a new form and complexity. The use of polygonal towers to eliminate dead zones was used in many different locations such as the Forte Michelangelo in Civitavecchia. The military architects of the early sixteenth century CE were engaged in an open exchange of ideas. Naples, in particular appears to have been a major location for travel among renaissance architects. Between 1485 and 1495 CE, architects including Francesco di Giorgio, Giuliano da Maiano, Giuliano da San Gallo, Benedetto da Maiano, and a few others resided at Naples for some time.[17] This intellectual exchange, coupled with the high regard in which Italian rulers held military architects, allowed the angled bastion to become a key feature of every new fortification or refit of existing ones.[18] This enabled the angled bastion to evolve from a key feature of some fortifications to the dominant and most important structure of the any proper stronghold. Giuliano da Sangallo, one of the architects that resided in Naples for some time, is considered to be the first to fully employ the angled bastion in fortification design on a large scale.[19] Eventually, the use of the angled bastion ushered in a rapid and expanded deployment of Renaissance style fortifications with numerous angled bastions, culminating in what some call the "age of fortifications," with military architects such as the famed Vauban of France (1633 – 1707 CE). Vauban was responsible for many of the fortifications built in the reign of Louis XIV, as well as many of the sieges undertaken by Louis's armies, sometimes of forts he had designed

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[16] Hale, "The Early Development of the Bastion," 468.
[17] Hale, "The Early Development of the Bastion," 473.
[18] Hale, "The Early Development of the Bastion," 472.
[19] Hale, "The Early Development of the Bastion," 483.

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himself. Many of the burgeoning nations had their own contemporary to Vauban to make their

own great fortifications in the *trace italienne* style.[20] The fortification style developed and

refined in the sixteenth and seventeenth centuries were effective enough to last well into the

nineteenth century. Military treatises expounding upon the same pre-existing engineering

principles were written by authors already mentioned, such as Guilano da Sangallo, his brother

Antonio da Sangallo the Elder, their nephew Antonio the Younger. Among them was also

Niccolò Machiavelli, Michelangelo, Antonio di Piero Averlino, also known as Filarete (the

designer of the "ideal city" or Sforzinda plan)[21], and many more writers even up to the end of

the eighteenth century when Belair wrote his own treatise and history on fortifications.[22]

Figure 9. Forte Michelangelo, Civitavecchia, Italy. The polygonal bastion on the northern end of
the fort bearing the name of one of its architects, Michelangelo, exemplifies the trend toward
what would become the *trace italienne*. However, the round towers show a lack of full
deployment of an angled bastion and still result in dead zones. *Source:* Google Maps.

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[20] Hale, "The Early Development of the Bastion," 466.

[21] Richard Kagan, "Spiritual Walls in Colonial Spanish America," in *City Walls*, edited by James D. Tracy (Cambridge: Cambridge University Press), 140.

[22] Christoph L. Frommel, Nicholas Adams, eds., *The Architectural Drawings of Antonio, da Sangallo the Younger and His Circle* (Cambridge, MA: MIT Press, 1994); Machiavelle, Nicholas, *The Art of Warre, written first in Italia,* Peter Whitehorne, trans. (London, 1562).

The angled bastion may have been the key to the early modern fortifications, but it was by no means the only important part. Another important aspect of the fortification was the not only the distance between the bastions but the overall visual distance of the entire fortification. According to Belair, the stronghold should "command the country" around the fortification as far as the distance of a cannon shot. The phrase "command the country" did not refer to sending out sorties from the fort or being able to see valleys or houses. Rather, the ability to command the country meant that there was nothing within the range of cannon shot that enemies could use to conceal themselves. There were to be no hills, no valleys, no sort of building whatsoever in which an opposing force could hide. [23] Machiavelli recommended that there should be neither farms nor buildings within at least a mile of a fortification.[24] If attackers were able conceal themselves, they could dig to undermine the fort or fire on the fort from a protected position.[25]

The outworks of the fortification were also crucial to its effective defense. These included works such as ravelins, hornworks, crownworks, and ditches. Ravelins were triangular works pointing away from the fort with a slight flanked angle.[26] The Dutch in particular used ravelins and placed one in front of each curtain wall of the fortification to add to its defense. The ravelins were themselves protected by both the bastions and the flanks on either side.[27]

Hornworks and crownworks were significantly more complicated types of outworks. They came close to being a stand-alone fortification. Hornworks consisted of two half bastions

[23] Belair, *The Elements of Fortification,* 18.
[24] Machiavelli, *The Art of War,* Neal Wood, trans., 190.
[25] Belair, *The Elements of Fortification,* 18.
[26] Belair, *The Elements of Fortification,* 26.
[27] Martin Hubert Brice, *Forts and Fortresses: From the Hillforts of Prehistory to Modern Times, the Definitive Visual Account of the Science of Fortification* (New York: Facts on File, 1990), 97.

with a curtain wall between them. The other sides of the half-bastion were straight lines that

drew back to the fort behind it, thereby resembling straight horns. Crownworks consisted of a

bastion in the middle, with a curtain wall on either side of it and a half bastion on either side of

the curtain walls. As the name implies, crownworks resembled a portion of a crown.

Additionally, crownworks would have ravelins protecting the two curtains. These particular

outworks were built either on the far side of rivers or directly in front of the main enclosure.

The main enclosure would be a full level higher than the crown or hornworks, thereby keeping

the line of sight open and giving command of a greater surrounding area.[28]
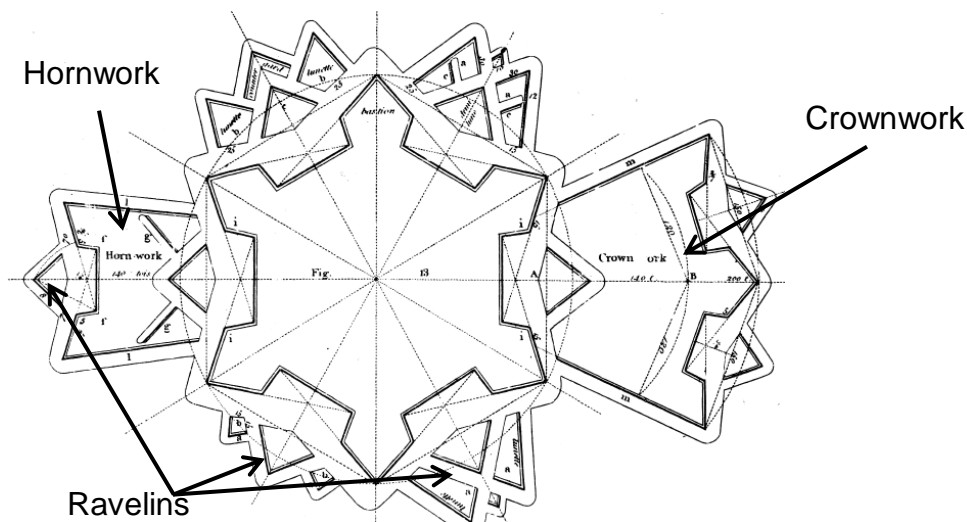
Figure 10. A depiction of fortification following the *trace italienne* style. *Source:* Alexandre-Pierre Julienne Belair, *The Elements of Fortification,* John Ward Fenno, trans. (Philiadelphia, 1799), 19.

Another key to the fortress was the defensive ditch, or moat (when filled with water),

which was more than a simple trench at the base of the fortification wall. In the *trace italienne*

style of fortress, the ditch was an extremely wide, deep, flat plain dug out in front of the wall.

On the far side of the ditch, away from the wall, lay a sudden embankment, creating a

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[28] Belair, *The Elements of Fortification,* 28.

prohibitive drop for an invading force. It was typically about 18 feet deep and between 90 to 120 feet wide, however this would vary significantly.[29] At Deal Castle in Kent, which still stands today, the ditch is 50 feet wide and 16 feet deep.[30]

The final and most critical component of the defenses was, of course, the wall. During the Roman and medieval periods, the walls were understandably high. Not only did the walls have to tower above offensive siege towers, ladders and enemy arrows, but higher walls also increased the range of the defending archers and other artillerymen. These walls also had to be thick enough to withstand the hurling siege machines that could be brought to bear against them. As the machines became more powerful, the walls got thicker as well.

As mentioned above, the advent of gunpowder cannons led to the construction of walls much thicker than even the thickest medieval walls. Walls that were thicker also meant that they had to be shorter.[31] This reduced construction costs, which was always a major factor. More importantly, tall walls grew progressively thinner as they ascended in order to maintain structural integrity. The thinner sections were not able to withstand a cannon bombardment and, if fired upon, would fall on the soldiers the wall was intended to protect.[32] In addition to withstanding the enemy barrage, the walls also had to withstand the defensive fire or, more accurately, the recoil from the cannon fire coming from the fortress. Large enough cannons to repel invaders would shake and threaten to dismantle the very walls they were meant to defend.[33]

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[29] Belair, *The Elements of Fortification*, 10-11.
[30] J. Forde-Johnston, *Castles and Fortifications of Britain and Ireland* (London: Dent, 1977), 177.
[31] Parker, *The Military Revolution,* 10.
[32] Lynn, "The Trace italienne and the Growth of Armies," 301.
[33] Brice, *Forts and Fortresses,* 94.

Many military historians view the fortresses of the early modern period as something entirely new, born out of the minds of men who encountered a new threat in the cannon. They responded with equally innovative and novel defensive measures, refining them to the point that the threat was largely neutralized. However, fortifications of the late Roman Empire had some very similar elements to them as those described above. The Romans constantly experimented with different designs and methods of fortification in the late Imperial era. In particular, they modified the towers or bastions of their fortifications in a multitude of ways. Some of the more basic principles date back before the era of Roman dominance in the Mediterranean to the writings of Philo of Byzantium in the third century BCE. That these principles were prevalent nearly 1800 years before the first drawings of a *trace italienne* calls into question much of the accepted convention regarding the origins and causes for the prevalence of the *trace italienne*. Angled bastions were in use centuries before the advent of gunpowder artillery. The invention of the artillery fortress was a rediscovery and rebirth, or renaissance, of ancient engineering forms and eastern geometric design, prompted by some cultural factors and by the new military technological threat of cannon in the fifteenth and sixteenth centuries CE.

CHAPTER III

THE LITERARY AND ARCHAEOLOGICAL EVIDENCE FOR ANCIENT FORTIFICATIONS

Vitruvius was a writer in late first century BCE who was an architect during the reign of

Augustus. He was the architect of a basilica in Fano, Italy, which unfortunately does not survive

today. Prior to his architectural work and his more important writings on the subject, he served

as part of an artillery crew for *ballista* or *scorpiones.* The *scorpio* was similar to a large version

of what we would call a crossbow today, firing either bolts or small stones.[1]

Vitruvius wrote that from the face of the walls of a city, towers may be projected to

better attack the flanks of the attacking enemy.[2] However, in practice, these protrusions were

not particularly effective. Archaeological evidence indicates that until the second half of the

second century CE, towers projected only slightly from the walls.[3] The reasons for this are not

known, but it is possible that construction methods until that time did not permit the towers to

project farther from the curtain. It is also possible that greater protrusions of the towers were

not necessary for a strong defense until roughly the middle of the second century CE. What is

evident is that the Romans were not strangers to the benefit of flank attacks from a fortified

position on the besiegers. Vitruvius specifically advised that the roads leading to a city expose

the largely undefended right flank of the invading forces on that road. He also wrote that the

distance between such towers should not exceed that of the flight of a projectile, specifically

from a *scorpio*. Vitruvius also made a recommendation as to the shape of the enceinte. He

suggested that the fort should be round or polygonal, but not square or in sharp angles since

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[1] Vitruvius *De Architectura,* 5.1.6, 1.preface.2.
[2] Vitruvius *De Architectura,* 1.5.2.
[3] Harald Von Petrikovits, "Fortifications in the North-Western Roman Empire from the Third to the Fifth Centuries A.D.," *The Journal of Roman Studies* 61 (1971): 197.

the wall could potentially block the line of sight of the defenders, thereby hiding the attackers.[4]

As mentioned, the shapes of most structures of the early modern period were polygonal, most

notably pentagonal in order to follow the "harmony of proportions" as well as protect the line

of sight of the curtain wall and bastions of the fortress. It would appear that even in the most

basic layout of the city, the early modern architects were paying heed to the words of Vitruvius.

Vitruvius was not the only Roman author to write about construction. While there

were many authors that wrote about one type of building or another, very few wrote much

about fortifications. Published around 560 CE, Procopius' *Buildings* recounts the many building

projects completed in the time of Justinian I, the Byzantine Emperor who reigned from 527-565

CE. Procopius was the author of several works on Justinian; *The Wars of Justinian* (against the

Persians, Vandals, and Goths), *The Buildings of Justinian*, and *The Secret History*.[5] The primary

text of Procopius that is of concern here is *The Buildings of Justinian.* In *Buildings*, he gives a list

of some of the strongholds either built anew or restored by Justinian. Among them was the city

of Thessaloniki (Therma), was among those that were restored by Justinian.[6] There are also a

few of Justinian's buildings that earn a more detailed description, such as the fortress of

Sergiopolis. Since this fort still stands today, it will be covered in greater detail in a later

chapter.

Also noted by Procopius were parts of the fortifications at Episcopia in Thrace. The

description of the fortification built there is difficult to follow. The fort contained a wall, and at

regular intervals from this wall protruded structures, which started very narrow. From there,

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[4] Vitruvius *De Architectura,* 1.5.2-5.
[5] Procopius, *De Aedificiis, Loeb Classical Library Series,* H. B. Dewing, trans. (Cambridge: Harvard University Press, 1940), Introduction.
[6] Procopius, *De Aedificiis*, 4.4.3.

this structure increased greatly in width and a tower was built on each of these protrusions.

Judging by the description, these structures may have been fan-shaped, something which will

be seen again a little later. The fan shape could minimize the amount of space in which a "dead

zone" could exist depending on the details of these structures. What is clear, according to

Procopius' account, if it is to be trusted, is that it was impossible for enemy soldiers to approach

the wall without being shot at from both sides. Additionally, Procopius mentioned that the

gate to the fort was built in an angle in the part of the projection closest to the wall, thereby

masking the entrance.[7] More important, this also meant that the gate could not be approached

without significant flanking fire and fire from the rear, making that point of attack very unlikely.

Procopius wrote about a couple of occasions in which Justinian sought to better control

the area around a fort. He did this in the same manner employed by engineers in the early-

modern period, by removing hiding places within shot of the enemy. At Daras in Mesopotamia,

he had a mound cleared away within reach of the walls that would obstruct the view.[8] In

addition, at Theodosiopolis, or Erzurum, Turkey, he had a deep ditch dug all around the walls

and sliced off all of the elevated ground.[9] One notable difference between the leveling done by

the late Romans and those in the early-modern period was the size of the area leveled. Since

cannon had a greater range than archers or *scorpiones*, the distance that needed to be cleared

in order to ensure lines of sight was also greater. However, the ancients recognized the need to

eliminate any obstructions for effective artillery fort defenses.

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[7] Procopius, *De Aedificiis*, 4.8.21-26.
[8] Procopius, *De Aedificiis*, 2.1.26-27.
[9] Procopius, *De Aedificiis*, 3.5.

Procopius also noted several occasions in which Justinian had outworks constructed for added protection of fortifications. However, these outworks were not described in detail. The only outwork that was documented sufficiently in ancient sources was a ditch. Already mentioned above is that at Theodosiopolis, Justinian had a large ditch dug around the walls.[10] Additionally, at Daras he had a wide ditch dug around the walls and filled with water.[11]

Roman fortifications during much of the Principate normally featured one or two ditches outside the forts. These ditches were intended to merely slow down attackers. However, these smaller ditches were eventually replaced in the late Roman Empire by wide, flat-bottomed ditches, just like those found around fortifications in the early-modern period. These ditches were between about 5 and 16 meters wide (16 to 52 feet), shorter than the typical ditches of the Renaissance forts, but still proportionate to the distance of fire.[12] Since the early Principate ditch had changed by the late Imperial era, it is possible that the purpose of the ditch had changed as well. Running across an open, flat ditch is much easier than running up and down ditches and hills so impeding the advancement of troops does not appear to have been the purpose any longer. Instead, the ditch would act as a sort of killing ground for troops while serving the more important purpose of impeding the advancement of siege machinery.

At first thought, the walls of the late Roman Empire should have little in common with the immensely thick and complicated walls of the *trace italienne*. After all, each type of fortification was intended to fend off a completely different type of attack. Ancient walls primarily fended off men with ladders, towers, and siege weapons, whereas the primary

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[10] Procopius *De Aedificiis*, 3.5.
[11] Procopius *De Aedificiis*, 2.1.25.
[12] Von Petrikovits, "Fortifications in the North-Western Roman Empire," 197.

attacker of the *trace italienne* was initially the cannon. However, mining was a common threat

to both types of fortification. Yet they shared basic similarities in relation to function.

Vitruvius wrote that fortification walls should be thick enough so that two soldiers could

pass by each other with ease (that is roughly two meters thick).[13] This reflects a recognition

that fortifications needed to allow rapid and unencumbered movement of soldiers. This

suggests that the walls in the time of Vitruvius (late first century BCE) were intended possibly to

repel invaders without much experience in siege techniques or powerful siege weapons.

This changed significantly by the late Roman Empire. Procopius indicates that the

Byzantine emperor Justinian had the walls at Martyropolis (Sylvan, Turkey) remade to be three

and a half meters thick and twelve meters high.[14] While this may be an exaggeration to some

degree, it indicates recognition of the need for thicker walls. Archaeological evidence

corroborates the writings of Procopius to some degree. Walls of the late Roman Empire were,

on average, about three meters thick.[15]

The most influential of the late Roman military authors on those of the Renaissance was

Vegetius.[16] For having such a great influence on Renaissance military authors, the works of

Vegetius are criticized often by scholars today since he appears to actually have had little to no

military experience himself. However, Vegetius's work was more of a reflection of his desire for

the Roman Empire to return to the virtues of a better time. His work, *De Re Militari*, was

written sometime between the death of the emperor Gratian in 383 CE and 450 CE. This

treatise contained topics such as the use of missile weapons, entrenched camps, the disposition

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[13] Vitruvius *De Architectura,* 1.5.3.

[14] Procopius *De Aedificiis*, 3.2.10-13.

[15] Von Petrikovits, "Fortifications in the North-Western Roman Empire," 193.

[16] Horst de la Croix, "The Literature of Fortification in Renaissance Italy," *Technology and Culture* 4, no. 1 (1963): 32.

of cavalry, and the drilling of the troops. More significant, there was some mention of principles on building fortifications. Vegetius mentioned that the walls of a fortification should not be made straight, but angular. He actually specified a purpose for the angular nature of the walls in that they would have been less susceptible to attack by rams since there was not a large, flat surface to strike.[17]

The writings of Philo of Byzantium were the most striking in the prescriptions of fortification building. Philo was often a source for many of the treatises described above and made recommendations that round or polygonal towers project from the walls of a fortification.[18] Philo was more specific in his recommendations in that he specified that hexagons be used at gateways and seemed to prefer the use of pentagonal towers because he recommended that a fortification be made exclusively with them. While the primary reason for the use of polygonal towers was as a defense against ramming, Philo also makes a point to emphasize the need for the towers to provide mutual defense of one another.[19]

The above sources were not merely theoretical in their recommendation of polygonal towers. The ancient Greeks, Romans and Byzantines built fortifications adhering to these philosophies. There are archaeological records that clearly show that the Romans and Byzantines utilized these principles since the third century BCE.

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[17] Vegetius *Epitoma Rei Militaris,* 4.2.
[18] J.E. Lendon, *Soldiers and Ghosts: A History of Battle in Classical Antiquity* (New Haven, CT: Yale University Press, 2005), 286.
[19] Philo of Byzantium, 79.21, 83.7-12, 84.13; E. W. Marsden, *Greek and Roman Artillery: Historical Development* (Oxford: Oxford University Press, 1969), 112, 121, 148.
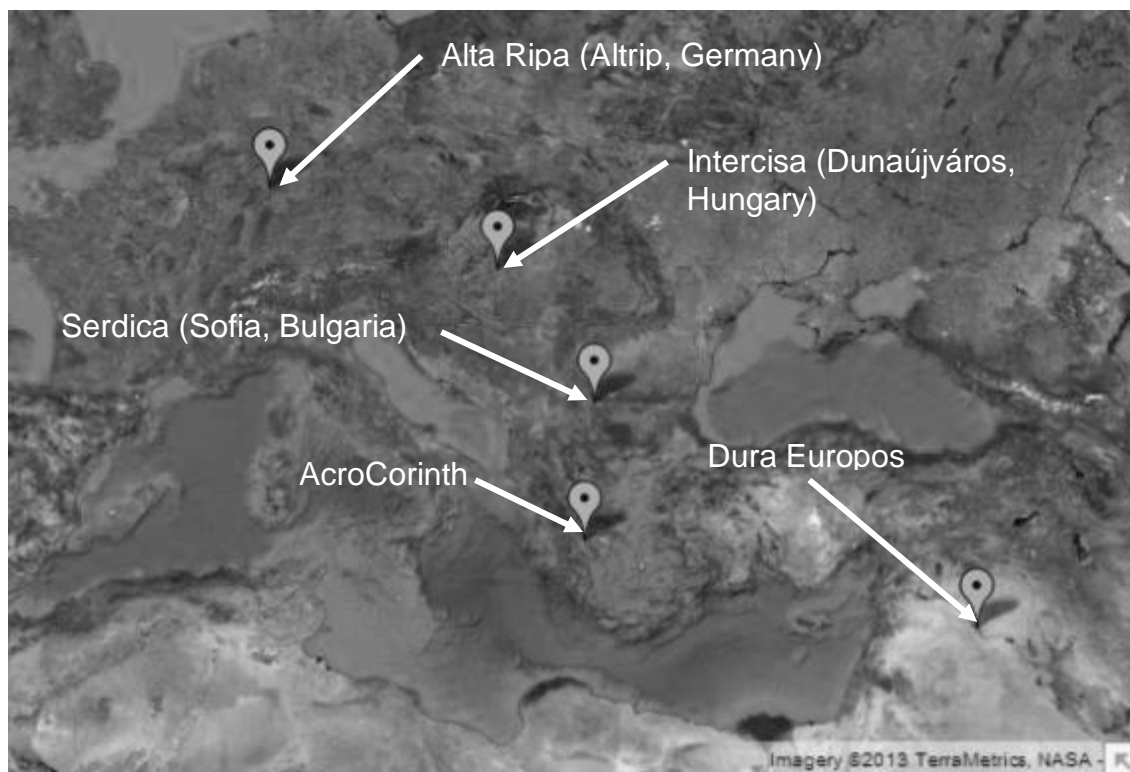
Figure 12. Archaeological examples of Roman fortifications that exemplify angled bastions, angular wall construction, or tower experimentation. *Source:* Google Maps.

One such archaeological example is in the ancient acropolis of Corinth, known as AcroCorinth. This section of the wall was built in the late third or early fourth century CE. There are several points on the northern wall that follow a triangular pattern found at the following locations: +37° 53' 35.16", +22° 52' 33.38"; +37° 53' 31.57", +22° 52' 23.24"; and +37° 53' 30.15", +22° 52' 26.66" (shown below). The latter two triangular protrusions appear to be part of the wall itself, and not an outcropping from the outer wall. Upon further inspection, these sections followed the topography of the area in such a way that their shape was more of a function of the rocky cliffs of the Acropolis rather than a planned out tower.[20]

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[20] Rhys Carpenter, Antoine Bon, A. W. Parsons, "The Defenses of Acrocorinth and the Lower Town," *Corinth*, 3:2 (1936): Plate II.

Considering that the Venetians, following the fall of Constantinople in 1204 CE,

eventually ruled the city of Corinth, there is a fair chance that they saw these structures. What

is not likely is that they made a connection as to the effectiveness of the shape, given the

topographical circumstances in the creation of these wall sections. The first location

mentioned, however, is a triangular protrusion outside of the wall that was not a result of the

general topography, it stood alone as a single bastion.[21] This bastion was simply triangular with

no flanks and was the only one of its kind on this wall.[22] Today, it does not stand that high,

although it may have taken a more severe beating in later sieges of the city, such as in 1458 CE,

during a siege by the Turks in which the walls were badly damaged and never rebuilt.[23] At

some point, the triangular tower fell and was later replaced with a square tower for unknown

reasons.[24]

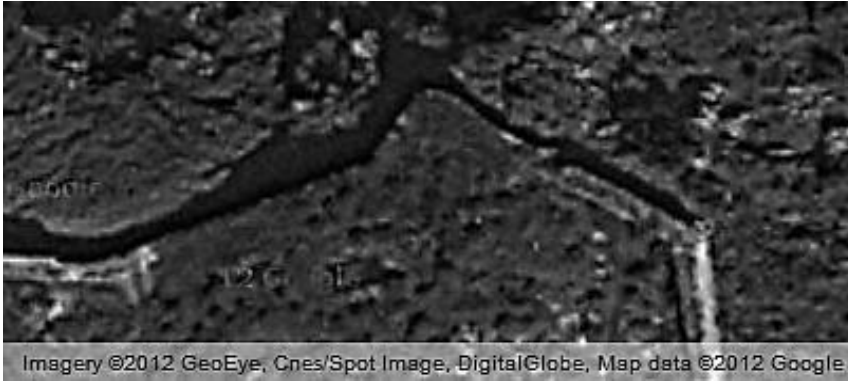Imagery ©2012 GeoEye, Cnes/Spot Image, DigitalGlobe, Map data ©2012 Google

[21] Carpenter, "The Defenses of Acrocorinth, 225.
[22] Timothy E. Gregory, "The Late-Roman Walls at Corinth," *Hesperia: The Journal of the American School of Classical Studies at Athens* 48, no. 3 (1979): 266.
[23] Carpenter, "The Defenses of Acrocorinth, 148.
[24] Gregory, "The Late-Roman Walls at Corinth," 280.

Figures 13a (top), 13b (middle), 13c (bottom). Sections of the northern wall of Acrocorinth. Triangular bulwark that appears to be a predecessor to the early modern angled bastion (9a). Sections of the wall made into triangular form that somewhat follows the topography of the rock surroundings (13b, 13c). *Source:* Google Maps.

Still, the idea of a triangular tower itself was not completely abandoned by the Romans. After a particularly destructive attack by the Huns in the fifth century CE on the town of Serdica (modern day Sofia, Bulgaria), the walls were rebuilt. However, the designers of the new wall decided to make a change that would better protect the inhabitants of the city. They used a number of towers surrounding the fortress at regular intervals and alternated each one between triangular shaped and U-shaped towers.[25] The benefits of alternating such show thought regarding flanking and dead spots. The triangular towers were angled in such a way to naturally allow the defending archers to shoot in on attackers in front of the U-shaped towers,

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[25] Gregory, "The Late-Roman Walls at Corinth," 272.

thereby eliminating, or at least significantly reducing the dead spots on the towers and cover

the curtain. These triangular towers did not have any flanks. However, the flat sides of the U-

shaped towers also allowed defenders to shoot along the curtain and provide flanking

protection of the curtain and the triangular towers. Every point of the triangular towers was

covered by the neighboring U-shaped towers. The goal was to reduce or eliminate the ability of

the attacking army to get close to the walls and use ladders or undermining techniques. The

image below illustrates that while there were still dead spots on the rounded towers, they were

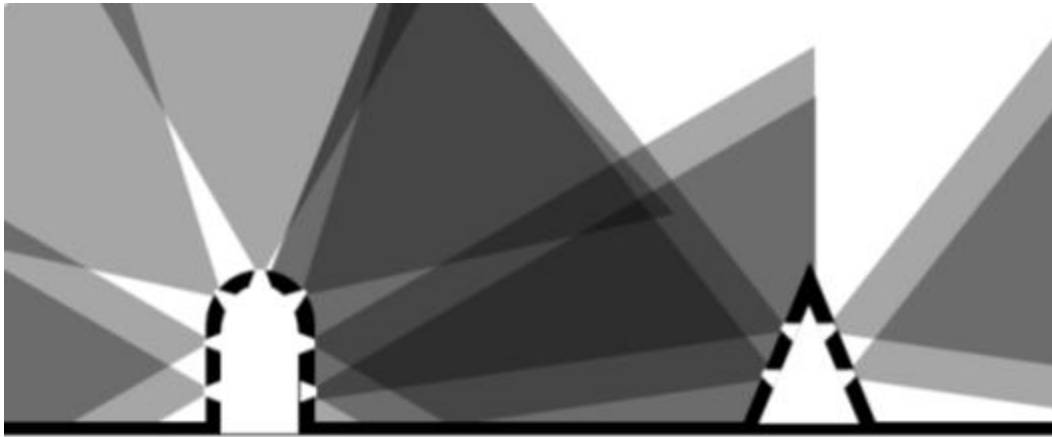reduced while the triangular towers were completely covered.

Figure 14. A depiction of layout of the towers of Serdica, note that even the dead spot in front
of the U-shaped towers is greatly reduced or eliminated. The only remaining dead spots would
have depended upon the towers in the corners of the fortification.

There was also a peculiar set of towers in a fort at Intercisa, or Dunaújváros, Hungary,

dating from the early fourth century CE. These towers were fan-shaped, but actually look a bit

more like a cross between a fan and a funnel. As mentioned earlier, these may have been the

types of protrusions mentioned by Procopius. These towers were placed on each corner of the

walls, which were 200 meters (about 656 feet) apart from one another.[26] Since these towers

projected and were centered on the diagonal of the fortification, the flat part closest to the wall

allowed for the ability to provide flanking defenses. However, the rest of the fan-shape sides

wound up being perpendicular to the curtain. Therefore, the curtain and towers allowed

mutual protection, provided, of course, that the 200 meter distance between the towers was

not too great a range for the missile weapons of the time. Unfortunately, examining the line of

sight from the curtain to the towers and between the towers leaves even greater dead zones

than any of the other typical round or square tower shapes. These towers serve to illustrate an

understanding of the need to protect the curtain, as well as experimentation with different

tower designs.
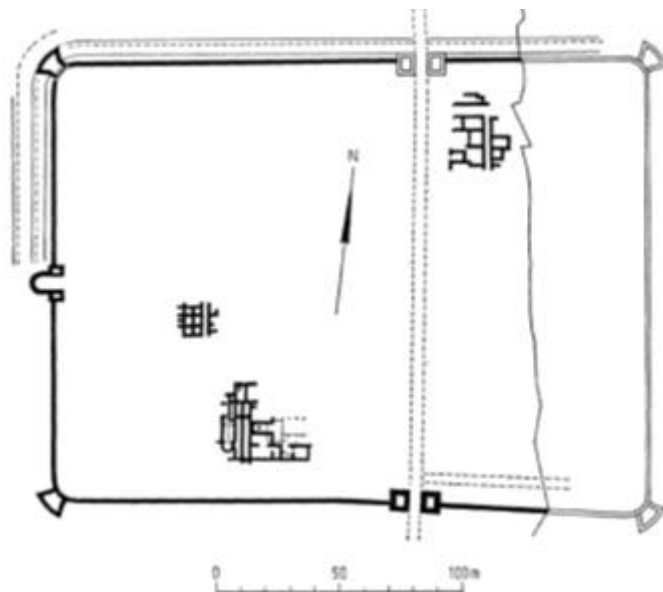
Figure 15. Flanged towers of Intercisa demonstrating a willingness of the Roman architects to experiment, albeit with mixed results in this case as the line of sight of the outer portions of the towers would have been greatly obscured. *Source:* Harald Von Petrikovits, "Fortifications in the North-Western Roman Empire from the Third to the Fifth Centuries A.D.," *The Journal of Roman Studies* 61, (1971), 187.

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[26] Von Petrikovits, "Fortifications in the North-Western Roman Empire," 187, 198.

Another example is that of Dura Europos (+34° 44' 37.97", +40° 43' 50.69"), which is in eastern Syria today. It was built in the reign of Seleukos I, around 300 BCE, and those original walls still stand today.[27] The Romans gained control of Dura Europos around 164 CE.[28] The site was abandoned after the Sassanid Sharpur I defeated the Romans there in 257 CE. In addition to a great wealth of knowledge about Roman military equipment that was left behind, Dura Europos also yields details on a typical siege in the late Roman empire.[29] The details of the final siege there include two mines that were constructed in order to bring down two towers at the site and corresponding countermine.[30] The fall of Dura Europos stands as an example of the effectiveness of mining a wall in ancient times. The walls of the city also exemplify the principles in practice laid out by ancient authors, specifically those of Philo of Byzantium. The south end of the city contains a pentagonal tower, and the entire southern wall follows a zigzag pattern that some would describe as "saw-toothed," as laid out in Philo's writings.[31]

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[27] Simon Anglim, et al., *Fighting Techniques of the Ancient World, 3000 BC ~ AD 500: Equipment, Combat Skills, and Tactics* (New York: St. Martin's Press, 2002), 216.

[28] M. C. Bishop and Jon C. N. Coulston, *Roman Military Equipment from the Punic Wars to the Fall of Rome* (Oxford: Oxbow, 2006), 128, 149.

[29] Anglim, *Fighting Techniques of the Ancient World*, 216.

[30] Anglim, *Fighting Techniques of the Ancient World*, 217; Bishop, *Roman Military Equipment,* 149.

[31] Frederick E. Winter, *Greek Fortifications* (Toronto: University of Toronto Press, 1971), 118.

Figure 16. The southern wall of Dura Europos. The pentagonal tower, highlighted and expanded in red, as well as the jagged wall itself that stands in contrast to the straight wall seen on the eastern side of the fortification with square towers. *Source:* Google Maps.

The most striking example is at Alta Ripa, or Altrip in modern day Germany. This small fort, built in the middle of the fourth century CE, was shaped like a trapezoid. Its longest side no more than 140 meters (about 492 feet) in length and the other sides are roughly 75 meters (about 246 feet) long. Each corner of the fort was protected by a pointed tower that pointed directly away from the diagonal of the fortification. Not only did the towers have pointed faces, they each had two flanks that lay perpendicular to the curtain wall to better strike the invaders on their unprotected sides as prescribed by Vitruvius and later replicated greatly in the early modern period (shown below).[32]

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[32] Von Petrikovits, "Fortifications in the North-Western Roman Empire," 185.
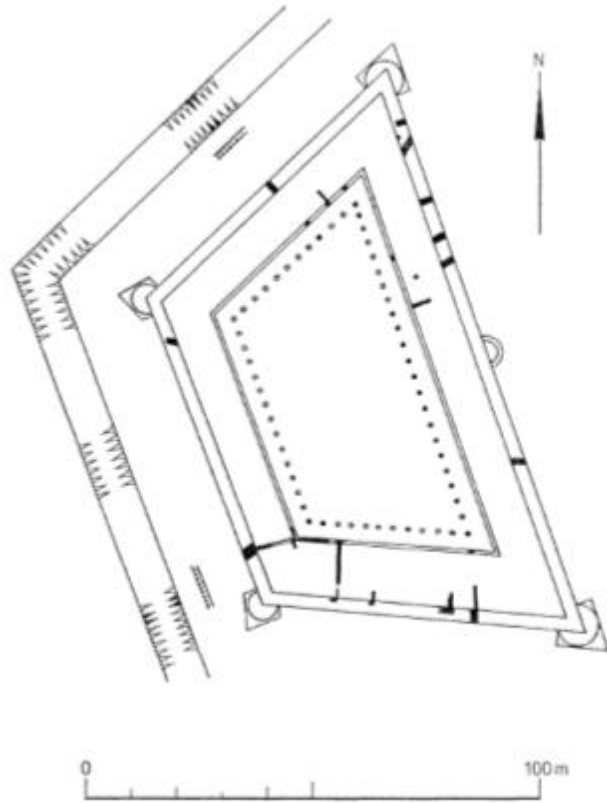
Figure 17. Walls and bastions of the fort at Alta Ripa that demonstrate that late Roman military architects designed forts that reflected engineering principles and logic later utilized by Renaissance architects, but did put their ideas into practice. *Source:* Harald Von Petrikovits, "Fortifications in the North-Western Roman Empire from the Third to the Fifth Centuries A.D.," *The Journal of Roman Studies* 61 (1971), 185.

It is clear that the angled bastion that was crucial to the development and effectiveness of the *trace italienne* had been developed in the late Roman Empire. It was not a new idea. However, these findings are based solely on archaeological evidence, which would have been buried or not otherwise easily visible to military architects of the early modern period. There are also many fortifications that still stand visible and prominent today that exhibit clearly the traits necessary for the effective defense of such a stronghold by use of salient angles. Moreover, these strongholds are located in such places that Europeans, particularly Italians, were in position to see the defensive works through conflict and through trade and even hold

some of these fortified positions while studying their construction. These examples are

exemplified best in the late Roman or Byzantine strongholds of Ravenna, Sergiopolis,

Dyrrachium, Ankara, and Thessaloniki.

CHAPTER IV

CASE STUDIES AT RAVENNA, SERGIOPOLIS, ANKARA, DYRRACHIUM, AND THESSALONIKI.
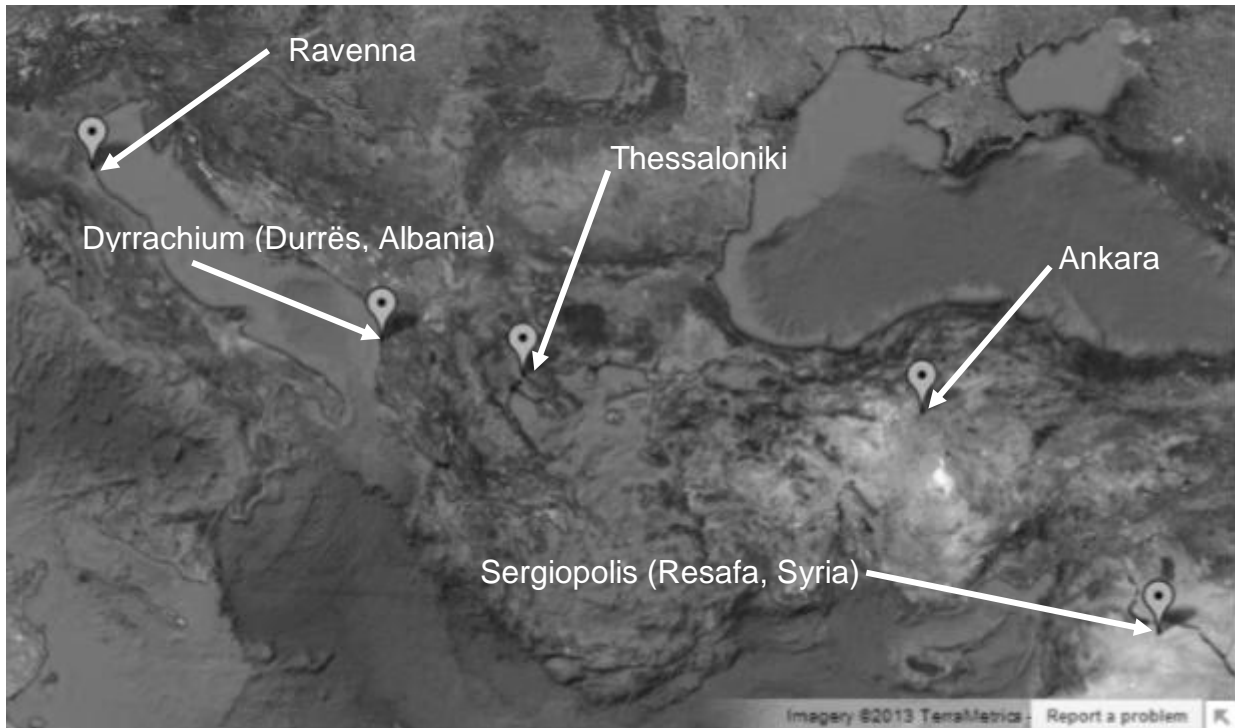

Figure 18. Extant examples of fortifications exemplifying the angled bastion. *Source:* Google Maps.

The first example of Ravenna (+44° 25' 21.69", +12° 11' 54.36") is important because it was a Byzantine stronghold in Italy for several centuries. Once the Byzantines retook the city from "barbarian" hands in the sixth century CE, it formed the capital of the Byzantine Exarchate. By about 600 CE, the walls of the city were complete and had taken their final form for nearly a thousand years.[1] However, by the middle of the eighth century CE, the Lombard King Aistulf had wrested away Byzantine power in Italy, including Ravenna.[2]

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[1] Neil Christie and Sheila Gibson, "The City Walls of Ravenna," *Papers of the British School at Rome* 56 (November 1988): 160.

[2] David Harry Miller, "Papal-Lombard Relations during the Pontificate of Pope Paul I: The Attainment of an Equilibrium of Power in Italy, 756-767," *The Catholic Historical Review* 55, 3 (October, 1969): 360.

The walls of Ravenna were built in several stages, in particular, the northern wall was completed during the reign of Valentian III (425-455 CE).[3] This wall clearly has an angled outcropping that is very indicative of a pentagonal angled bastion. Given the size of this bastion (approximately 100 meters wide) it is not likely that this structure was used to reduce the area which a battering ram could effectively strike. It was designed for an effective line of sight and enfilading fire, allowing other portions of the fortification to cover all facets of the northern wall.

Figure 19. A section of the northern wall of Ravenna showing a pentagonal outcropping. *Source*: Google Maps.

The northeastern section of the Ravenna's walls, referred to as the *Murus Novus,* was either completed during the time of the Byzantines or prior to their re-conquest of much of Italy while it was controlled by Ostrogoths, possibly under Odoacer (476-493 CE). The term *Murus Novus* stems from a ninth century CE reference to the walls in this area and could have any number of meanings from actual newly built walls, to a reinforcing of existing walls from the time of Valentian III. It is difficult to tell which one, since there is no timeframe reference to

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[3] Christie, "The City Walls of Ravenna," 161-2.

accompany the phrase *Murus Novus*.[4] What is clear, however, is that at one time, up until the

fifteenth century CE, there stood a peculiar tower in the northeast section of the city's

enceinte. This tower was pentagonal in shape, but the outer angle was more obtuse than any

other angle. The reason behind the nearly flat surface was that it allows for mutual defense of

the faces of the tower. The tower does not stand today since the Venetians built a fort in this

corner of the city walls known today as the Rocca Brancaleone and reinforced part of the wall,

while tearing down this tower. Knowledge of this tower survived, and it was recorded in a

drawing by Antonio da Sangallo the Younger in his sketch of the city walls in 1526 CE.[5] The

tower provided a surface that allowed for mutual defense from nearby towers to cover the

faces. This shows that the tower was created to allow for line of sight in defense of the tower

and walls.
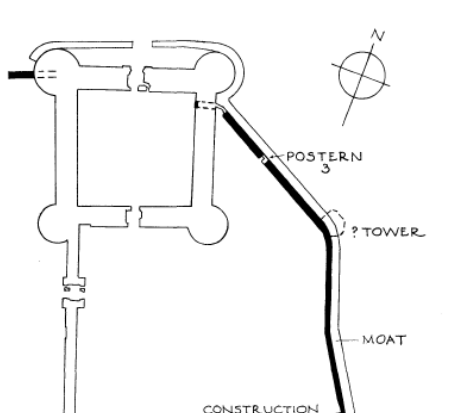
Figure 20. A view of the Rocca Brancaleone with the tower as outlined by Antonio da Sangallo
the Younger. *Source:* Neil Christie and Sheila Gibson, "The City Walls of Ravenna," *Papers of the
British School at Rome* 56 (November 1988), 172.

A second example at Sergiopolis, also called Resafa, in modern day Syria, (+35° 37'

45.32", +38° 45' 27.96") was mentioned in Procopius' writings about the buildings of Justinian.

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[4] Christie, "The City Walls of Ravenna," 194.
[5] Christie, "The City Walls of Ravenna," 175-177.

Sergiopolis was named after a Roman soldier who converted to Christianity and was martyred under the reign of Maximian (286-305 CE).[6] Not much was documented about the actual construction of the walls of Sergiopolis, but it was written by Procopius that originally, Sergiopolis was surrounded by what had become an insufficient wall. Those who created the wall did not apparently believe the *Sarakenoi* (Saracens) capable of storming even a token wall. However, Justinian recognized the need to protect the treasures found within the church, surrounded the church with what Procopius called a "most remarkable wall."[7] The effectiveness of these new walls were soon tested when Chosroes, the Persian king (531-579 CE) besieged the fort and was repelled after making a "great effort to capture the city."[8]

Procopius does not mention the details of this new wall, but it is something clearly visible still today. Found below is a rendering of what stands today at Sergiopolis. As one can see, there are a variety of different towers projecting from the wall. More important, four of these towers were of unusual shape by comparison to the other typical square towers. These four towers had two faces that came to an obtuse angle with two flanks between these faces and the wall. The flanks were perpendicular to the wall, allowing an easier flanking strike on the portions of the wall protected by these towers. Why these towers were different from the others and why they were not replicated, one can only guess. They clearly indicate that the Byzantines were experimenting with fortification designs to better repel or destroy would-be assailants.

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[6] Alexander A. Vasilev, "Notes on Some Episodes concerning the Relations between the Arabs and the Byzantine Empire from the Fourth to the Sixth Century," *Dumbarton Oaks Papers* 9, 10 (1956): 314; Procopius, *De Aedificiis,* 2.9.3-9.

[7] Procopius, *De Aedificiis, Loeb Classical Library Series,* Translated by H. B. Dewing, (Cambridge: Harvard University Press, 1940), 2.9.6; τείχει τε ἀξιολογωτάτῳ ἐν τοῖς μάλιστα περιβέβληκε.

[8] Procopius, 2.9.9; Χοσρόης ἀμέλει ὁ Περσῶν βασιλεὺς ἐν σπουδῇ πεποιημένος τὴν πόλιν ἑλεῖν στράτευμά τε αὐτῇ ἐπὶ πολιορκίᾳ πολὺ ἐπιστήσας ἄπρακτος ἐνθένδε ὀχυρώτατος ἰσχύϊ τὴν προσεδρείαν διέλυσε.

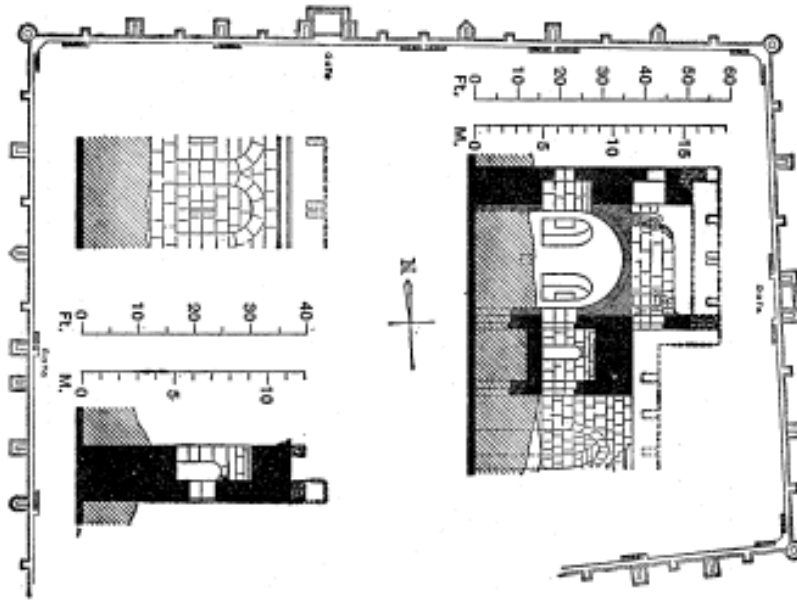Figure 21. Plan of the walls of Sergiopolis, *Source:* Procopius, *De Aedificiis, Loeb Classical Library Series,* H. B. Dewing, trans. (Cambridge: Harvard University Press, 1940), 104-105.

Figure 22. Sergiopolis as it stands today. *Source:* Google Maps.

However, Sergiopolis was lost after the battle of Jabiya-Yarmuk (636 CE) forced what

remained of the armies of the Byzantine Emperor Heraclius (610-641 CE) to withdraw from

Syria in an effort to protect Mesopotamia.[9] For the large part, Syria, and specifically

Sergiopolis, has remained in Muslim hands ever since. At first glance, there does not appear to

be a strong case for influencing the European creators of the *trace italienne.* Simply put, it was

not something that they were likely to have encountered often, nor had much time to study.

However, there was a continued influential Christian presence in the church originally built

there.[10] Additionally, the tomb of St. Sergius was site of visitation for pilgrims, possibly even

during the Crusades.[11] This continued Christian presence would have maintained some degree

of communication with their European counterparts, possibly keeping the unusual style of

fortifications in mind.

Another example is that of Ankara, the modern capital of Turkey. The city walls consist

of two primary parts: the outer wall and the inner stronghold. Many of the walls of Ankara

were built around 220 CE and are described as a relatively common development of the

period.[12] The outer wall of the city contains mainly square-shaped towers that are built roughly

40 meters apart from one another. This wall was obviously peppered with dead zones and

would serve to have been less effective at mounting a solid defense. The inner wall (+39° 56'

26.70", +32° 51' 48.72"), however, was built during the reign of Constans II (641-668 CE) with

pentagonal towers that were closer together (30 meters apart) and "look out over the city like

the prows of a ship."[13] The phrase in reference to the head of a ship should seem familiar since

that was nearly the same phrase written by Alberti in the fifteenth century CE in his *De Re*

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[9] Walter Kaegi, *Byzantium and the Early Islamic Conquests* (New York: Cambridge University Press, 1992), 141.
[10] J. M. Jan. "Kersuzan, Francois Marie," *New Catholic Encyclopedia* 8 (Detroit: Gale, 2003), 156-157.
[11] Pierre Maraval, "The Earliest Phase of Christian Pilgrimage in the Near East (before the 7th Century)", *Dumbarton Oaks Papers* 56 (2002): 69.
[12] Clive Foss, "Late Antique and Byzantine Ankara," *Dumbarton Oaks Papers,* 31 (1977): 60.
[13] Foss, "Late Antique and Byzantine Ankara," 73-74.

Aedificatoria. Separated by more than 500 years and over 2,000 miles Clive Foss, the author of

the paper detailing the walls of Ankara, used a remarkably similar expression as Alberti's in

describing walls that were built more than 700 years before Alberti wrote his treatise.

Figure 23. A section of the western facing walls of Ankara, Turkey looking out over the area outside the walls like the head of a ship. *Source:* Google Earth.

More than just the similarity of the principles applied to the creation of the angled

bastion, the walls proved an effective defense in Constans II's own lifetime. By 661 CE, Arabs

resumed their attacks on Byzantine territory, even setting up winter camps in Anatolia in order

to resume attacks in the spring more quickly. These attacks continued for another 20 years and

may have penetrated as far as Ankara. As a testament to the importance of Ankara and the

effectiveness of the fortifications, it was made the capital of the new Bucellarian theme in the

reign of Leo III (717-741 CE). In 776 and 797 CE, Arab forces twice attempted to capture

Ankara, but failed. Eight years later, the walls were repaired, not redesigned, having received

heavy damage in a previous attack. The effectiveness of the bastion defense must have been

remembered well by the Arabs since in the following year, Caliph Harun withdrew from Ankara

without attempting a siege. It appears as if Harun returned to Ankara with a larger army to

mount a stronger siege and was successful this time in capturing the city. The city was

destroyed by two Islamic forces around 838 CE and dispersed the population.[14] However,

Ankara had become a major center for trade and commerce, particularly joining trade between

the Danube and Euphrates Rivers.[15] The Byzantines in 859 CE once again retook the city and

rebuilt the walls, this time including crosses as an engraved form of added protection. Again, in

931 CE, a Muslim expedition launched an assault on Anatolia to plunder, raid, and enslave.

However, Ankara was not touched since the fortifications proved to be too daunting for such a

raiding party. Details are sparse, but at some point after the Battle of Manzikertz in 1071 CE,

Ankara fell to the Seljuk Turks. As noted above, even the *trace italienne* fortresses could not

withstand the siege of a determined enemy, so too was the fate of Ankara when it was

captured by the Seljuks.[16] However, it was not lost to the Byzantines forever.

During the Crusades, there were many groups of Europeans that traveled to retake

Muslim held lands in order to come to the aid of their "Greek brethren."[17] Ankara was one

such place due to its strategic importance literally at a major crossroads. In 1100 CE, Italian

Lombards were planning to enter Mesopotamia (Iraq). Their path took them on a march from

Izmit to Ankara on their way to Cankiri.[18] As per their original agreement with Alexios I

Comnenus (1081-1118 CE) in exchange for his support, the Crusaders were to retake Ankara,

from the small Seljuk garrison and hand it over to the Byzantine Emperor, which they did,

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[14] Foss, "Late Antique and Byzantine Ankara," 73-83.

[15] Everett L. Wheeler, "The Army and the Limes in the East" in *A Companion to the Roman Army,* Paul Erdkamp, ed. (Malden, MA: Blackwell, 2007), 246.

[16] Foss, "Late Antique and Byzantine Ankara," 73-83.

[17] Thomas Asbridge, *The Crusades: the Authoritative History of the War for the Holy Land* (New York: HarperCollins, 2010), 47.

[18] Jonathan Riley-Smith, *The Crusades: a History* (New Haven: Yale University Press, 2005), 46; Ralph-Johannes Lilie, *Byzantium and the Crusader States, 1096-1204,* J.C. Morris, trans. (Oxford: Oxford University Press, 1993), 67.

according to the Emperor's daughter and chronicler Anna Comnena.[19] However, the victory

was short-lived, within a few years, the Byzantines lost Ankara for good.[20]

That the city itself was lost does not mean that the principles and ideas behind the

design of the interior wall were lost. The struggle for Ankara was not simply a conflict between

the Byzantines and Muslims. Other Europeans, such as the aforementioned Lombards were

involved heavily in the Crusades and were capable of witnessing, studying, remembering, or

even documenting the seemingly odd pentagonal towers of the inner stronghold. The

Lombards, in particular, even though their Ankaran encounter was brief, may have had a great

influence on the continuity that resulted in the later angled bastion. The Lombards controlled

much of Italy at the time of their venture to Mesopotamia. However, Normans eventually

conquered many of their Italian holdings. It is noteworthy, then, that although Charles VI

commissioned the northern bastion at Mont Saint Michel, it was built in Normandy during the

Hundred Year's War. There was clearly some remnants of the angled bastion still in the minds

of the Europeans a few centuries after Ankara was lost.

The walls of Dyrrachium, or modern day Durrës, Albania, also stands as a testament to

the spread of the angled tower design to the Italians. At Dyrrachium, there are three towers

standing today that are left over from the original four (+41° 18' 40.84", +19° 26' 42.91")

towers were built by the Byzantine Emperor Anastasius I, (491-518 CE). The city had a

particular interest to Anastasius not just for strategic purposes, but also since it was the place

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[19] Harris, *Byzantium and the Crusades,* 55-59; Asbridge *The Crusades,* 48; Amin Maalouf, *The Crusades Through Arab Eyes* (London: Al Saqi Books, 1984), 64.
[20] Foss, "Late Antique and Byzantine Ankara," 83.

of his birth.[21] In this location, he built a wall that consisted, as mentioned, of four pentagonal

towers. The angles of these towers are much more obtuse than those found at Ankara or

Sergiopolis, thereby keeping a wide field of fire from the tower itself, along with allowing the

angled faces to be covered from the nearest tower flanks. The slanting faces are eleven meters

long each, with a height of between thirteen and fourteen meters and the base of the tower

connected to the wall being sixteen meters long. The small windows, or loopholes, that were

meant to allow defenders to fire on attackers from behind the wall were tall in order to

accommodate the catapults used on either side of the flank.[22] These structures clearly show

that the principles that made the *trace italienne* so effective were relatively commonplace by

the fifth century CE. Additionally, the building of these effective towers was considered a

monumental feat as far as the treasury was concerned. Lawrence makes the comment that no

one but Anastasius could have afforded to build such towers. [23] According to the Suda,

Anastasius was known for having an "insatiable desire for money." He emptied local coffers

and a great deal of land to slake his greed but he was also responsible for building the Long

Walls of Constantinople so he clearly had the funds to expend on such new fortifications.[24]

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[21] A. W. Lawrence, "A Skeletal History of Byzantine Fortifications," *The Annual of the British School at Athens,* 78 (1983): 187.
[22] Lawrence, "A Skeletal History of Byzantine Fortifications," 187.
[23] Lawrence, "A Skeletal History of Byzantine Fortifications," 187.
[24] Jennifer Benedict, trans., "Anastasius I," *The Suda Online* (accessed: January 20, 2013).

Figure 24. Three towers of Dyrrachium (Durrës, Albania). Note the remarkable similarities between these towers and those found at the Castle of Lucera. *Source:* Google Maps.

The walls of the city were so impressive that Anna Comnena felt need to mention them in her chronicles of the deeds of her father. She described the walls as being "flanked by towers, standing up above it all around."[25] These walls were also incredibly thick, being able to hold four horsemen riding side by side without any problem.[26]

Europeans were quite familiar with Dyrrachium. It was more than a waypoint to adventures and trade *en route* elsewhere, as Ankara was for much of its history. Dyrrachium was an important city and was considered by some to be the "western gate of the Greek

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[25] Anna Comnena, *Alexiad,* 1148. Elizabeth A. S. Dawes, trans. (New York: Barnes and Noble, 1967), 13.3
[26] Anna Comnena *Alexiad,* 13.3

empire."[27] Dyrrachium was a city that was constantly in the center of conflict, particularly

between the Byzantine Empire and the growing Norman power in Southern Italy that was

pressing into the Balkans. Dyrrachium had largely been under the control of the Byzantines

since the walls were built. However, the Normans, led by Robert Guiscard and his son

Bohemond, defeated Alexios I in October of 1081 CE. Alexios was forced to flee the battle on

horseback and Dyrrachium briefly became a Norman stronghold.[28] As a testament to the size of

the walls, George Palaeologus, in preparation of the siege before Alexios would arrive, fortified

the city and rebuilt some of the bulwarks and placed stone-throwing counter-siege engines on

the walls.[29] However, the Byzantines were not kept out of such a strategically important city.

Enlisting the aid of the powerful Venetian fleet to attack the Norman supply lines between

Apulia and Dyrrachium, Alexios was eventually able to drive the Normans out of the Balkans

altogether by 1083 CE.[30]

The two years that the Normans spent at Dyrrachium was not their only contact with it,

nor would it be the longest span of time in which the Europeans ever held the city. In 1107 CE,

Bohemond once again set out to take on the Byzantines. After landing at Aulona to the south

of Dyrrachium, he sought to retake the city he and his father once held.[31] Despite the apparent

immense skill of Bohemond in siege methods, the walls of the city held out against his siege, or

at least well enough. Bohemond constructed siege machines and moveable sheds with towers

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[27] Asbidge, *The Crusades,* 144.
[28] Harris, *Byzantium and the Crusades,* 34, 40; Riley-Smith, *The Crusades,* 119; P. M. Holt, *The Crusader States and their Neighbors* (Harlow, UK: Pearson, 2004), 21.
[29] Anna Comnena *Alexiad,* 4.1.
[30] Harris, *Byzantium and the Crusades,* 40.
[31] Helen Nicholson, *The Crusades* (Westport, CT: Greenwood Press, 2004), 104.

in order to protect the diggers and sappers in the primary attack of the city.[32] As is the point of

most fortification walls, even those of the *trace italienne*, Dyrrachium was able to hold out long

enough for reinforcements to arrive. Alexios I arrived at Dyrrachium in 1108 CE and was able to

surround the Norman forces, thereby forcing their surrender and signing of the Treaty of Devol.

The defeat at Dyrrachium was enough to cause Bohemond to abandon any further attempts to

expand his territories, even in the Levant, and retire to Southern Italy.[33]

It was not until 1185 CE that the Normans sought to take Dyrrachium again under

William II. This time it was not an outright aggression against the Byzantines, but as a target of

opportunity. At this time, the Byzantine empire had fallen into disarray during the reign of

Andronicus I.[34] The Normans must have known that internal disarray would be beneficial to

their interests since they laid siege to Dyrrachium again. This time, the defenses did not hold

out and the city was taken quickly.[35] That the Normans knew the challenge posed by the walls

of the city is evidenced by the fact that they had not attempted another siege until there was a

significant opportunity. They suspected that the city might have fewer defenders, or be more

susceptible to subterfuge, given the internal disarray, and they were probably right. More

important, there was no effective fighting force that could have taken them on to relieve the

city, as Alexios I had done seventy-seven years prior.

The Normans were not the only Italian power familiar with Dyrrachium's defenses.

After the Fourth Crusade resulted in the resounding defeat and sack of Constantinople in 1204

CE, the Latin Empire was established. The Latins essentially divided what remained of the

[32] Anna Comnena *Alexiad*, 12.9, 13.2
[33] Harris, *Byzantium and the Crusades,* 78; Riley-Smith, *The Crusades,* 119.
[34] Asbridge, *The Crusades,* 317.
[35] Harris, *Byzantium and the Crusades,* 129.

Byzantine Empire amongst the participants of the Fourth Crusade. Among them were the

Venetians, who were not interested in controlling large tracts of land since they lacked an

effective land army, but instead had a substantial naval force. The regions that Venice seized in

1204 CE were all strategic ports or islands to maintain their trading networks.[36] Venice would

continue to hold onto Dyrrachium until the resurgent Byzantine Empire under John III (1221-

1254 CE), pushed the Latins out of the Balkans by 1246 CE.[37]

The connection between the angled towers of Dyrrachium, built in the late fifth or early

sixth centuries, and the early angled bastion designs seen at the Castle of Lucera, built in 1233

CE, is much clearer in the case of Dyrrachium. Recall that Frederick II, who had just finished his

conquest of Sicily, built the Castle of Lucera in southern Italy, which was formerly Norman

territory. It is very likely that the Normans, in their many dealings with the Byzantine

fortifications at Dyrrachium, retained knowledge of the design of those four relatively simple,

yet very effective towers. The architects of Frederick II's Castle of Lucera picked up this

knowledge at some point and incorporated into the southern wall.

The final example of Thessaloniki serves to reinforce that there is a connection between

the development of the *trace italienne* angled bastion and the fortifications of the Roman

empire (+40° 38' 39.18", +22° 57' 23.36"). Thessaloniki was a very important city in its time; it

had a large population, was a major trade route, and was considered the "second city" of the

Byzantine Empire.[38] Yet, the city was also essentially near what could be called the frontier

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[36] Harris, *Byzantium and the Crusades,* 164; Brian Todd Carey, *Warfare in the Medieval World* (South Yorkshire, UK: Pen & Sword Military, 2006), 39.
[37] Harris, *Byzantium and the Crusades,* 173.
[38] Harris, *Byzantium and the Crusades,* 147.

with nothing separating it and so-called barbarian lands.[39] The walls of Thessaloniki in modern

day Greece are the same walls that date back to the fifth century CE.[40] However, the unusual

wall goes back even further back than that. The western wall was built between 361 and 363

CE, in the reign of Julian the Apostate (361-363 CE). This wall comprised of a series of triangles,

closely spaced.[41] The implications of these triangles are obvious in that they allowed a wider

field of fire from the towers, while archers from the curtain wall and adjacent towers were able

to cover the towers directly. There were no flanks to these walls; they lacked the critical

component that is seen a little later in other cities and extensively in the angled bastion.

Figure 25. Wall of Thessaloniki that stands today. When the Byzantines, Normans, and
Venetians ruled the city, the triangular structures seen above covered most level areas of the
city enceinte, even the walls near the Heptapyrgion (below). While there are no flanks to the
towers, lines of sight and elimination of the dead zones is apparent. *Source*: Google Maps.

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[39] Michael Vickers, "The Late Roman Walls at Thessalonica," in *Roman Frontier Studies 1969; Eighth International Congress of Limesforschung* (Cardiff, Wales: Wales University Press, 1974)*,* 249.
[40] Michael Vickers, "Hellenistic Thessaloniki," *Journal of Hellenistic Studies,* 92 (1972): 166.
[41] Geōrgios Gounaris, *The Walls of Thessaloniki* (Thessaloniki: The Institute for Balkan Studies, 1982), 12.
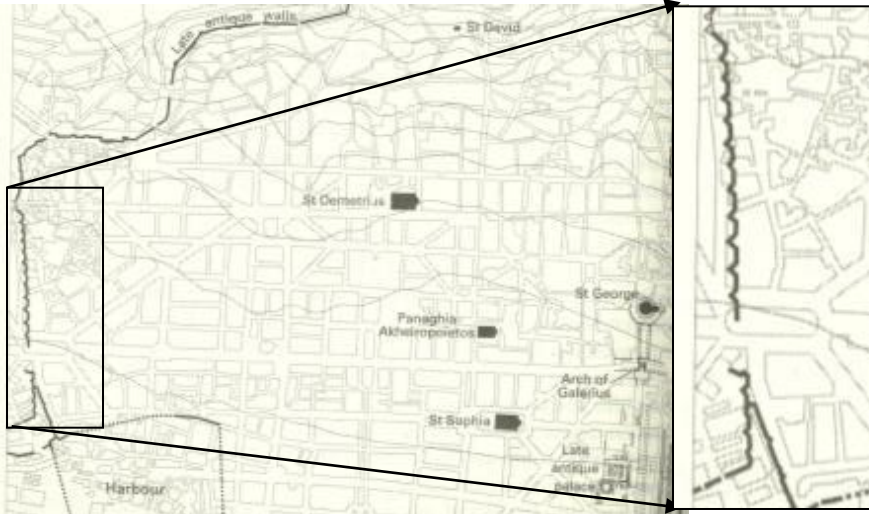
Figure 26. Plan of the city of Thessaloniki with many of the sections of the wall that are not readily visible today even though they were still standing during the Crusades. Note how the side of the city focused on shows a consistent deployment of the triangular bulwarks where possible. *Source:* Averil Cameron, Bryan Ward-Perkins, and Michael Whitby, *Late Antiquity: Empire and Successors, A.D. 425-600,* (Cambridge: Cambridge University Press, 2000), 710.

The walls that stand today were built either in the reign of Theodosius (375 – 395 CE) or in the mid fifth century CE, as evidenced by an inscription stating that "Hormisdas completed the city with impregnable walls."[42] Hormisdas, being the prefect of Illyricum, which at the time had Thessaloniki as the seat of the prefects, in 448 CE.[43] Whether it was built in the reign of Theodosius, or by Hormisdas, the wall showed a few differences in its construction. It also consisted of triangular towers. However, these were spaced further apart from one another than the original construction. It is important to note that the triangular towers on the western wall were only found in the flat plain on the western side of the city. The more hilly or mountainous areas were covered by the traditional square towers. Some authors claim that these triangular fortifications offered the enemy less of a surface area to attack and were

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[42] Gounaris, *The Walls of Thessaloniki,* 12; Vickers, "The Late Roman Walls at Thessalonica," 251.
"Τειχεσιν αρρηκτοις Ορμισδας εζετελεσσε Τηυδε πολις"
[43] Vickers, "The Late Roman Walls at Thessalonica," 254.

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therefore more difficult to damage.[44] While there is no record of the true reasoning behind making the use of triangular towers instead of square ones, it is clear that the builder of the second phase of the wall saw a significant advantage in the older triangular towers and replicated them to some degree. These walls were maintained in decent condition until the Ottomans began dismantling the walls in 1873 CE.[45]

However, the western wall was not the only remarkable aspect of the fortifications of Thessaloniki. The citadel within the city, known as the Heptapyrgion fortress for its seven towers (+40° 38' 39.40", +22° 57' 44.71"), was also a rather unique construction. The fortress consists of two very distinctive triangular towers facing the outer enceinte of the city walls. These towers provide an excellent line of sight to be able to provide covering fire for the adjacent square towers, as well as being covered completely by other towers as well. This citadel is of much later construction than the western wall. The Heptapyrgion fortress was built some time in the Palaeologan era of the Byzantines.[46] For the purposes of Thessaloniki, this is some time between 1259 and 1423 CE.

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[44] Gounaris, *The Walls of Thessaloniki,* 25
[45] Gounaris, *The Walls of Thessaloniki,* 28.
[46] Gounaris, *The Walls of Thessaloniki,* 12.

Figure 27. Heptapyrgion at Thessaloniki. Note the triangular towers that provide a flanking defense of the wall and potentially the square towers while allowing. Also note that the triangular towers are covered from multiple angles from adjacent towers and the curtain. Additionally, the triangular towers on the outer wall over on the right hand side of the image show the continuation of the same pattern on the rest of the walls. It is probable that the triangular towers of the Heptapyrgion are based on the pattern seen in the triangular bastions of the outer city wall. *Source:* Google Earth.

What makes Thessaloniki a prime example of the ancient origins of the angled bastion is that there was much more extensive contact between the powers in Italy and the city. As mentioned, Thessaloniki was a major trade and population center and even hosted an annual fair that brought people from all over the Mediterranean.[47] Among many of the visitors to Thessaloniki was Conrad III of Germany, who had come to meet the Byzantine emperor Manuel I between 1148 and 1149 CE, as Manuel I was seeking an alliance with the Holy Roman Emperor against the Norman threat as previous Byzantine emperors had done before him successfully.[48]

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[47] Harris, *Byzantium and the Crusades,* 2.
[48] Asbrisdge, *The Crusades,* 216; Harris, *Byzantium and the Crusades,* 101.

The Normans were a constant thorn in the side of the Byzantine emperors and Thessaloniki was

no exception.

As with Dyrrachium, the Normans under William II knew opportunity when they saw it,

and seizing upon the instability of the reign of Andronicus I (1183-1185 CE), they took

Thessaloniki in a short siege shortly after they took Dyrrachium.

Not long after the sack of Thessaloniki in 1185 CE, Constantinople itself fell and the

Byzantine Empire along with it after the fourth crusade in 1204 CE. The taking of

Constantinople and the establishment of what is called the Latin Empire involved the Normans

and Venetians, along with others. They divided the remains of the Byzantine Empire amongst

them while some of the ruling elite Byzantines of Constantinople managed to flee to Nicaea and

form what we would call the Nicaean Empire. The city of Thessaloniki, along with much of the

area surrounding it, fell under the governance of the Norman Boniface of Montferrat in the

Kingdom of Thessaloniki.[49] The Normans would hold Thessaloniki for forty-two years until the

Nicaean Emperor John III Vatatzes (1222 – 1254 CE) re-conquered the city in 1246 CE.[50]

The eventual successor to John III was Michael VIII Palaeologus (1259-1282 CE), who

would restore the Byzantine Empire by reconquering Constantinople and initiate the

Palaeologan dynasty.[51] Recall that it was during this dynasty that the Heptapyrgion fortress

was built using the same principles of line of sight, covering fire, and dead zones that was seen

on the western wall and in the previously discussed strongholds. Thessaloniki was once again

taken by a European power. The city was under the control of the Venetians for seven years

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[49] Geoffrey of Villehardouin, *The Conquest of Constantinople*, M. R. B. Shaw, trans. (New York: Penguin Books, 1963), 109, 112, 146; Harris, *Byzantium and the Crusades,* 164.

[50] Harris, *Byzantium and the Crusades,* 172-3.

[51] Harris, *Byzantium and the Crusades,* 173; Nicholson, *The Crusades, xxxv,* 13.

from 1423 to 1430 CE, when the Ottoman Empire had expanded far enough to finally take the city.[52]

Conquest was certainly not the only contact that Europeans would have had with many of these sites. Already mentioned is that Sergiopolis was a Christian pilgrimage site, something that would have continued as long as there was an ecclesiastical presence there. Additionally pilgrimage to Constantinople and, more importantly, trade would have placed both Thessaloniki and Dyrrachium in a prime position to be visited by many people. Dyrrachium was the beginning point of the Via Egnatia, which continued on to Thessaloniki.[53] The Romans built the road in the second century BCE as a strategic route between the two cities and was later extended all the way to Constantinople.[54] The existence of Dyrrachium and Thessaloniki as "bookends" to the early Via Egnatia highlights their importance. Additionally, this would have been a very well traveled road by merchants, pilgrims, migrants and tradesmen all the way up to at least the sixteenth century.

The Normans were able to study the designs of the western wall at Thessaloniki. Later, the Venetians familiarized themselves with the angles of the same wall and of the Heptapyrgion Fortress. The plans for the different style of towers and the effectiveness of a clear line of sight to eliminate dead zones must have made a lasting impression on the Italians attacking or defending Thessaloniki. As with the other cases previously mentioned, the experience and knowledge gained from the occupation of Byzantine cities and strongholds was transferred either by direct application, by written accounts since lost, or by word of mouth. These

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[52] Simon Pepper, "Ottoman Military Architecture" in *City Walls: the Urban Enceinte in Global Perspective*, James D. Tracy, ed. (Cambridge: Cambridge University Press), 305; Gounaris, *The Walls of Thessaloniki,* 12; Riley-Smith, *The Crusades,* 270.
[53] Strabo *Geographica,* 7.7.4.
[54] Talbot, Barrington Atlas, 749, map 49 1995 compiled by J. J. Wilkes.

architectural principles made it into the designs of the early bastions and into the experiments

of Renaissance military architects.[55]

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[55] It is important to note that many of the secondary sources for these examples state that the above walls were built at certain times and have changed very little, or not at all, since then. However, this author has not actually inspected the walls in person to make certain from an archaeological standpoint that the walls and towers were constructed in the periods claimed by the secondary sources. This warrants further study.

CHAPTER V

OTTOMAN FORTIFICATIONS

The Greeks and Romans were not the only influence on the Renaissance military

architects; the Ottoman fortification engineers also influenced their Italian counterparts

significantly. The influence, however, is not in the form of any sort of sophisticated angled

bastion, but in the scientific, systematic, and geometric layout of a fortification. The typical

layout of Greek, Roman, and earlier Islamic fortifications generally followed no particular plan

with the exception of a solid rectangular pattern.[1] The trends began to turn during the

fourteenth century CE toward what can be called a "scientific" plan that looked similar to the

"ideal" city of Filarete's Sforzinda plan.[2] Three such examples are those of the Castle of Jalal al-

Din, Qasr al-Tina, and Kilid Bar, all built sometime in the fourteenth to fifteenth centuries CE.[3]
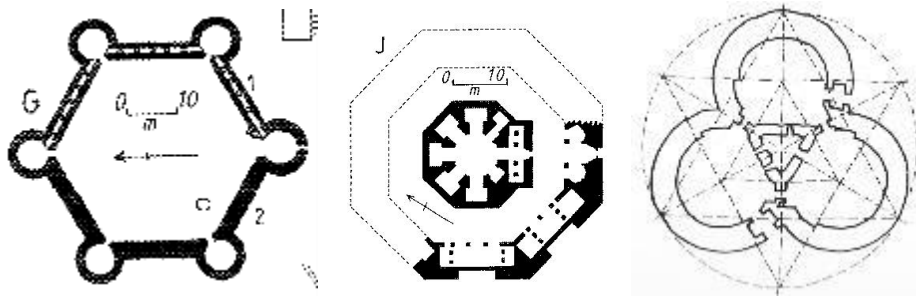

Figure 28a (left). Castle of Jalal al-Din. *Source*: David Nicolle, *Saracen Strongholds: 1100-1500*
(New York, Osprey, 2009), 32; Figure 28b (middle). Qasr al-Tina *Source*: David Nicolle, *Saracen
Strongholds: 1100-1500* (New York, Osprey, 2009), 45; Figure 28c (right). Kilid Bar. *Source*:
Simon Pepper, "Ottoman Military Architecture" in *City Walls: the Urban Enceinte in Global
Perspective*, James D. Tracy, ed. (Cambridge: Cambridge University Press), 298.

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[1] Winter, *Greek Fortifications*; David Nicolle, *Saracen Strongholds: AD 630-1100,* (New York: Osprey, 2008); T. E.
Lawrence, *Crusader Castles* (London: Michael Haag, 1986); Stephen Johnson, *Late Roman Fortifications* (Totowa,
NJ: Barnes & Noble, 1983).
[2] Pepper, "Ottoman Military Architecture," 299.
[3] David Nicolle, *Saracen Strongholds: 1100-1500* (New York, Osprey, 2009), 32, 45; Pepper, "Ottoman Military
Architecture," 298.

Another example is that of the Castle of Seven Towers at Constantinople, which was built to reinforce the defenses of the city after the Ottoman Emperor Mehmed II took the city in 1453 CE. The reinforcement included primarily the fortification built between four and five years later that follows a pentagonal general layout with the exception of one portion that follows the adjacent wall.[4] The only components missing to make the fortification the predecessor to the *trace italienne* are angled bastions on each of the corners of the pentagon. The stronghold does contain triangular and semi-circular towers, but still has significant dead zones in front of each of the round towers. The triangular towers were built wide and open to help support artillery emplacements. It is important to note that there were a number of Renaissance military architects that traveled to Constantinople after this latest addition to the fortifications. In particular, Filarete, the architect credited with designing the Sforzinda plan of the perfect city layout, at least planned on traveling to Constantinople as late as 1465 and he, or other visitors, were influenced by what they saw from the Ottoman stronghold, or learned from Ottoman architects.[5] The Ottoman Emperor Mehmed II was, in addition to being a formidable general, was also a great patron of the arts and invited some Italian architects to visit Constantinople.[6] This illustrates that there was a clearly a free and open exchange of ideas between the East and West at the same time that the *trace italienne* was being conceived of in the minds of the architects of the early modern period.

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[4] Pepper, "Ottoman Military Architecture," 291.

[5] Pepper, "Ottoman Military Architecture," 296 -7; Berthold Hub, "Filarete and the East: The Renaissance of a Prisca Architectura" *Journal of the Society of Architectural Historians* 70, 1 (March, 2011): 37n88. Letters from Filarete's friend Filelfo indicate he was planning a trip to Constantinople in 1465, however, another letter a year later that he was still in Florence.

[6] Julian Raby, "A Sultan of Paradox: Mehmed the Conqueror as a Patron of the Arts," *Oxford Art Journal* 5, 1 (1982): 3-8.
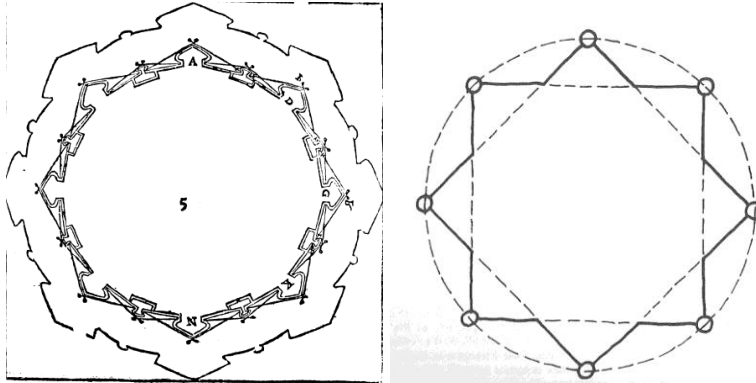
Figure 29a (left) and 29b (right). A top-view layout of a *trace italienne* (29a) and a rendering of the "ideal city" as conceived by Filarete (29b). *Source (29a):* Machiavelli, *Arte of Warre*, Plattes of fortification, Folio 20. *Source (29b):* Simon Pepper, "Ottoman Military Architecture" in *City Walls*, edited by James D. Tracy (Cambridge: Cambridge University Press), 299.

Figure 30. Yedikule, or The Castle of the Seven Towers, Istanbul. *Source:* Google Maps.

Already it is clear that Renaissance architects were exposed to the geometric layout patterns of the Ottomans just by the visits of a few to Constantinople. The possibility still exists that the Ottomans brought these designs themselves to Italy in their invasion of Otranto in

1480. One of the contemporary authors to Francesco di Giorgio, Bacile di Castiglione thought

that the origins of the angled bastion came from inspection of the Ottoman fortifications at

Otranto.[7] It may not have been the idea of the angled bastion that the Italians lifted from the

Ottoman encampment, but the geometric layout and low, earthen walls. The invasion of Italy

by the Ottomans in 1480 CE struck fear in the Italians as it was less than thirty years after the

fall of Constantinople. Before a counter-attack could be mustered, the Ottoman forces were

able to construct their own defenses. These defenses consisted of a deepened ditch, a palisade

to provide cover, and significant earthworks and timber bulwarks that could hold their artillery.

The Ottoman forces were driven out the following year, but their defenses stayed behind.[8] It is

not known exactly what shape the defenses took, but it would have had geometric influences.

Coupled with the information that architects learned from visiting Constantinople, and

conversing with Ottoman architects, the Italians had real world experience to study and

enhance their own fortification designs on scientific, geometric principles.

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[7] Michael S. A. Dechert, "The Military Architecture of Francesco di Giorgio in Southern Italy,"
 Journal of the Society of Architectural Historians 49, 2 (June, 1990): 165.
[8] Peter Purton, *A History of the Late Medieval Siege, 1200-1500* (Rochester: Boydell Press, 2009), 385.

CHAPTER VI

CONCLUSION

There are striking similarities between the towers shown in many of the late Roman or early Byzantine military structures and the angular towers of the designers of the early modern fortifications that would eventually become known as the *trace italienne.* Both types of structures show a thorough understanding and importance placed on an effective use of line of sight for defenders while using flanks to protect the curtain. Both designs seek to allow the defenders to easily rain missiles on the attackers. This is an important consideration since the projectiles were not simply intended to come from the top of the towers and bastions, but also from loopholes in the sides of the towers, thereby allowing the defenders to shoot from a less exposed position. The knowledge of attacking an enemy's flank from a fortification is also covered not only in the literature of Vitruvius, but is also shown in practice in the construction of the strongholds. The flanks of the towers cover the wall in such a way that any attacker would leave their own flanks widely exposed to attack. Likewise, if the attackers took on the towers directly, they would risk attack from the sides and rear.

The biggest difference between the two designs is the height and thickness of the walls. However, this difference is less a matter of military ingenuity and more a matter of practical necessity and simple physics. As cannon and guns became more frequently used in battle, the defenses had to be thicker to withstand the impact, withstand the recoil, and give enough room for the cannon to be placed. Lower walls were a matter of a lesser need as well as cost, since higher walls would mean more stone and more labor.

However, many of the earlier and some of the best examples of these fortifications, were buried, such as the forts at Altrip, Serdica, or the walls of Corinth. There was little chance of Renaissance architects or any others within living memory seeing these walls. The true evidence of continuity from the late Roman period, through the Byzantines, and to the Renaissance lies in the towers that still stand to this day and were known well to Italians. These examples are sparse, but cost was a contributing factor to their dearth in the Roman and Byzantine periods as well as their abundance in Renaissance Europe.

The great expense to design and build these towers anew could explain two major problems that has led to the belief that these designs were a new creation of Renaissance military architects. The first is that these designs do not appear to be widespread; if they were, little survives of them today. The second is that they were not as universally maintained during long periods of economic decline. While the Emperors of the late Roman Empire and the Byzantine Empire certainly needed new fortifications, funds were not necessarily allocated to building new fortifications, nor to redesigning existing ones. Procopius mentions that Justinian fortified Sergiopolis, a pilgrimage site, in that way because of the large amount of treasure that needed to be protected from raiders. Ankara, too was at a strategic crossroads in Anatolia. Dyrrachium and Thessaloniki were both major ports and major cities on the Via Egnatia. Thessaloniki itself was considered the second city of the Byzantine Empire.

Outside the scope of this paper, but something that warrants further examination, is that the ancient pentagonal towers apparently originated in the east, and slowly worked their way west. It is possible that this was a matter of funding, as already posited. The eastern portions of the Roman Empire were far wealthier that the western portion, particularly after

the collapse of the Western Roman Empire. The Byzantine Empire certainly had more wealth at their disposal than the individual states in the rest of Europe. There is also the possibility that the style of warfare in which the Romans were engaged in the east was far different than what was experienced in the middle ages in the west.

Renaissance Italy was a time and place of great wealth, extravagance, and conflict. Italians were also under threat from invaders external to the peninsula, best exemplified by the disastrous invasion of Charles VIII in 1494 CE. French invasions of Italy were not new, the effective use of siege artillery was, and this was what made the incursion so devastating to the Italians. Italy had the right mixture of ample need and abundant resources to be able to experiment with different types of fortifications. The angled bastion design of Francesco di Giorgio was something that did not spring forth from the mind of a genius, but it was the result of study and experimentation in practice and on paper. There is no doubt that di Giorgio's travels and work in Southern Italy helped to shape his vision of the angled bastion and refine his defensive architectural skills.

It is clear that the "Vitruvian" layout of the early-modern artillery fortress was not the only characteristic borrowed from the ancients. The principles of the functional aspects of the defensive walls were also rooted in late Antiquity. Specifically, the most important part of the defense, the angled, flanking bastion, was already a feature of Greek, Roman and Byzantine forts over 1,000 years before the constructions of Francesco di Giorgio. The Romans used a wide variety of ways to configure their defenses to cover the walls and adjacent towers better. They altered and changed the designs as they strove to eliminate the dead zones along the

towers to ensure that every section of their defenses could be covered by other parts of the fortification. For the most part, they had a great deal of success on this front.

The Romans also saw the need to control not just the fort and the walls, but the space around the fort and walls as well. They dug ditches wide and deep and as proportionally large as those around the *trace italienne*. They also modified the earth further away from the fort to deny assailants the opportunity to hide in range of their weapons.

Additionally, the overall layout of the fortifications was not a novel creation of the Renaissance architects. This, too, was transferred from knowledge of the Ottoman fortification builders and their creation of a geometric, scientific layout.

Conventional wisdom has led many historians to believe that the *trace italienne* was an original construction that was unique to the early modern fortifications. It is assumed to be a novel defensive response to the novelty of gunpowder artillery. Instead, it is clear that the designs that made the early-modern forts effective had their foundation in the fort designs of the late Romans. The design principles behind the construction of the Renaissance fortifications were not revolutionary. They were a confluence of ancient Greek and Roman design principles and Ottoman geometric blueprints. The angled bastion was simply a reflection and reapplication of late Roman engineering practices. As with other aspects of the Renaissance, the development of the *trace italienne* reflected the experience of the ancients, rather than a groundbreaking departure from the past into the modern age.

APPENDIX

GLOSSARY

Bastion – A low tower that is constructed to expand the range of defensive fire and defend the curtain of the fortification.

Curtain – The main wall of a fortification that typically sits between two towers.

Loophole – A small opening in the defensive wall that allows defenders to shoot at attackers from a protected position.

Mining – A siege technique that involves digging a tunnel under a part of a wall, normally a tower. The tunnel was occasionally used to bring troops behind the walls, but most often was itself collapsed with either fire or explosives, thereby bringing down the tower under which it was dug.

Reentrant angle – The part of an angled bastion that is tucked behind the faces of the bastion for better protection from the attackers.

Scorpio – A Roman artillery machine that was designed to hurl large darts.

Trace italienne – The style of fortification that became prevalent after about 1500 CE which involved the heavy use of geometric design and employed angled bastions at all corners and some in between.

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