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Defending Renaissance Italy: The Innovative Culture of Italian Military Engineers

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DEFENDING RENAISSANCE ITALY: THE INNOVATIVE CULTURE OF ITALIAN MILITARY ENGINEERS

by

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Under the Direction of Nick Wilding

ABSTRACT

The cultural and social effect of the Renaissance Italian military engineer is profiled within this thesis. It encompasses their vocational careers concerning the fluctuations in individuality, print censorship, and uneasiness attached to patronage and marketability. Their work and reputation directly coincided with the demand for *trace italienne* from numerous Italian city-states and entities throughout the cinquecento. As knowledge spread throughout the Italian peninsula, the individualistic demand for military engineers diminished, integrating their discipline with other professions. As the demand for patronage intensified, fears of fraudulence and plagiarism existed among printers and fellow engineers. This apprehension directly contributed to a lack of printed fortification treatises throughout the cinquecento and was escalated by foreign interventions (Sack of Rome, 1527). This thesis aims to tackle these issues met by Italian military engineers.

INDEX WORDS: Military engineer, *Trace Italienne*, Fortifications, Renaissance Italy, Print censorship, Individualism

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DEDICATION

To Alexandria: my love, dearest friend, and guiding light

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Success is like getting off an island, waiting to be discovered by the outside world. It is paramount to have faithful and dedicated individuals to venture away from such a scenario. I would like to thank all of my family for their continual support and love. I know it has been hard for them, especially with us living apart in Atlanta. The numerous trips they have taken have been truly wonderful and I wish that they could do so all the time. To my dearest wife for her support and advice throughout all the years we have been together. She has endured multiple trials with me being in graduate school, yet she has supported me every time. To my sweet Molly, the look and presence of her in our household has changed my life forever and I treasure the privilege and honor of being her father. Many thanks to Nick Wilding for his wisdom throughout the whole process of being in graduate school. His advice has been truly inspirational and foundational for my work on this thesis and I appreciate his friendship and hospitality. Also, to Jacob Selwood, Charles Steffen, Denis Gainty, and Robert Baker for being pedestals in my ever-changing process of being a better student and individual at Georgia State University. To the GSU graduate school for letting me have the opportunity to pursue a career in historical studies and letting me be able to do all things if given the opportunity. I would also like to thank the history department at Augusta State University for helping me gain the skills needed to survive in graduate school. I would like to personally thank Mark C. Fissel, Hubert van Tuyll, Ruth McClelland-Nugent, and Michael Bishku for their guidance during my five years at ASU. Lastly, to my Creator and Savior for giving me the life that I have. Thank you for continually showing me that my life was known before I was ever born into existence.

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CHAPTER 1: HISTORIOGRAPHY

Late-15th century architects were recognized by Italian society as a profession that could be employed for different purposes. As gunpowder weapons displayed their explosive power across the European continent, the roles of the High Renaissance architect changed drastically. Architects were employed to become engineers within the military. This new role encompassed advanced skills in mathematics, architecture, and newly integrated scientific knowledge. Many architects adapted to these new components within the profession but the question remained whether one needed to rely more on mathematics or architectural skill to be hired. Magistrates and governments hired certain military engineers of *trace italienne* based on how they viewed the arts and recent threats brought by gunpowder warfare. One that valued scientific accuracy and engineering, as displayed through geometry ranges and parabola angles in cannon fire, hired a military engineer with more mathematical precision. One that desired bastions of monumental grandeur hired military engineers who could re-create spectacular designs with their architectural hands, instead of with their mind's eye.[1] The purpose of this thesis is to dissect the individualistic vocation of the Italian military engineer as he engaged societal and cultural influences within the late fifteenth and mid-sixteenth centuries.

As technological theories were recognized over the course of the late fifteenth century, military engineers spread new forms of transferred intelligence across Italian city-states and borderlands. The undisputed point of origin for *trace italienne*[2], which is fortification designs

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[1] Christopher Duffy, *Fire and Stone: The Science of Fortress Warfare 1660-1860,* (Edison, NJ: Castle Books, 2006) and *Siege Warfare: The Fortress in the Early Modern World 1494-1660* (London: UK: Routledge & Kegan Paul Ltd., 1979). Duffy looks at the measures involved in constructing a star-based bastion and gives the best information to decipher which approach a military engineer took to construct their safe havens.

[2] The meaning of *trace italienne* will be further reflected upon within this introductory chapter. For this section, *trace italienne* deals with star-based bastion fortifications that resisted gunpowder assaults and ballistic weaponry. This development greatly increased defense for walled cities, thus giving them an "offensive" advantage.

shaped around stars and other geometric angles, was conceived in mid-fifteenth century Italy and this knowledge dispersed as travelers, merchants, and invading armies approached the northern peninsula. The influence of *trace italienne* was viewed throughout multiple European city-states and countries but furthermore across the African, American, and Asian world spheres. This research is possible thanks to historians like Geoffrey Parker, J.R. Hale, Jeremy Black, and Christopher Duffy.[3] The spread of *trace italienne* is hardly visible in early colonial North America. Except for sixteenth century Spain, hardly any colonizing European powers showed any direct cause to use this information in colonial North America until at least the mid-seventeenth century. Due to the scope of this thesis, the examination of *trace italienne* within the North American colonies will be reserved for a later endeavor. The second chapter will focus on the Italian peninsula as various city-states interacted with military engineers.

Problems concerning print ownership, plagiarism, censorship, and vocational prestige within Italian society will be addressed in my third thesis chapter. Military engineers produced models of their findings within written manuscripts and treatises that were constantly being reformed. In many scenarios, the designs of such working theories did not properly translate into real-time structural building. I believe that this frustration contributed to a lack of printed sources seen during the first half of the cinquecento. Preliminary fortification models were rarely good enough to give to potential publishers. Constant reform directly conflicted with the need to gain prestige and societal recognition among peers and aristocratic elites. Military engineers needed their theories and works to be published to gain credit and economic wealth. Scenarios concern-

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[3] These military historians have integrated multiple aspects of historical research through their works. A world history emphasis has been adopted to their particular arguments. For example, Geoffrey Parker has displayed how *trace italienne* has been transferred to the Asian continent in *The Military Revolution* (1988). Jeremy Black has looked at how warfare changed over the course of the world in the early modern age in *European Warfare in a Global Context, 1660-1815* (2007). These historians all try to involve non-European examples to their arguments of choice.

ing plagiarism and print censorship among military engineers will be questioned and brought to the forefront within the chapter. Printed treatises will be followed as they spanned the continental sphere and appeared in book fairs, like that in Frankfurt during the early modern era.

In summary, the points of this thesis will incorporate how the knowledge and intelligence of military engineering (whether mathematical, scientific, or both) was transferred and either accepted or rejected across Italian borderlines as new forms of warfare became apparent to multiple societies from the quattrocento to cinquecento. The individualism of the military engineer will be profiled as the demand for the vocation changed over the course of the sixteenth century. Issues concerning print ownership, censorship, and plagiarism among military engineers will finish out the thesis. All of these aspects will be incorporated into the thesis with the hopes of bringing new research and ideas about the profession and how *trace italienne* changed military engineers within the early modern era.

Over the past thirty years, military historians have written in new and inventive ways. The roles of individuals in warfare, like William the Conqueror, Napoleon Bonaparte, and Robert E. Lee have been written about for centuries but in the 1970s a new perspective was adapted. John Keegan's *The Face of Battle* brought new light to how mentally tasking it was to be involved in the military in the early modern period.[4] His work created a new desire to examine the role of individual soldiers and how they experienced warfare mentally, physically, and emotionally. Keegan's work no longer represented large armies as mere calculated numbers on a page but rather as innovative and independent soldiers with unique challenges given to them by warfare. By focusing on the Battle of Agincourt (1415), Keegan brought attention to the new transitions in

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4 John Keegan, *The Face of Battle*, (New York: Penguin Books, 1976), 78-80.

the art of warfare. Scenarios are vividly envisioned as the English longbowmen experienced anticipation and fear as the ground units of the French cavalry charged at their position. Victor Davis Hanson's 1989 work, *The Western Way of War: Infantry Battle in Classical Greece* described how individual citizens, like the Greek hoplite warrior, felt on the combat field.[5] This new perspective for military history was different from that of Sir Charles Oman and his foundational works on the Middle Ages and the sixteenth century. The status of the individual self in the military has emerged as one of the more innovative areas of research as of late. My thesis aims to follow the profession of the military engineer as his individual role transformed due to the demand received from war-stricken Italian societies, to protect themselves from gunpowder siege weapons. The demand was individualistic at first, with magistrates hiring sole candidates for the job. As the cinquecento progressed, the demand was extended to other foreign professions, like military generals and astronomers, to complete structures of *trace italienne*. In pursuing such topics, certain debates within the field of military history and technology must be examined.

1.1. The Debate concerning the *Trace Italienne* and the "Military Revolution"

The point of origin for the heated historical discussion about *trace italienne* was conceived within a larger debate that was coined by Michael Roberts in January 1955 as "The Military Revolution." This label came from his inaugural lecture in Belfast titled, "The Military Revolution, 1560-1660."[6] Over the past sixty years, military and social historians have professed to challenge Roberts' thesis and have created successful careers in doing so. Issues concerning historical time frame, the size of armies, increased amounts of warfare, new technological de-

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5 Victor Davis Hanson, *The Western Way of War: Infantry Battle in Classical Greece*, (Berkeley, CA: University of California Press, 1989), xxiii-xxix.

6 Clifford J. Rogers ed., *The Military Revolution Debate: Readings on the Military Transformation of Early Modern Europe,* (Boulder, CO: Westview Press, 1995), 37.

signs, and most importantly, the invention of gunpowder have all been addressed and challenged by military historians Geoffrey Parker, Jeremy Black, David Eltis, Brian Downing, David Parrott, and John Lynn.[7] Roberts claimed that warfare was revolutionized by the successful integration of gunpowder and therefore "created" a revolution in warfare tactics, strategy, and army size. Roberts' influential pioneers for such drastic change lied within the Swedishsixteenth and seventeenth century minds of Maurice of Nassau and Gustavus Adolphus. The thesis remained unchallenged until Geoffrey Parker's 1976 article, "The 'Military Revolution, 1560-1660'-A Myth?" appeared in *The Journal of Modern History.* It directly challenged and refined Roberts' thesis. The idea of army size was broadened by Parker and manifested with numerical evidence from the historical period. It was not until Parker's 1988 masterpiece, *The Military Revolution: Military Innovation and the Rise of the West 1500-1800* that *trace italienne* became an essential part of the debate at large.[8] *Trace italienne* was formulated, according to Parker, by the rise of gunpowder weapons in siegecraft. The major event that portrayed this drastic change in warfare was displayed through the French invasion of Italy by Charles VIII in 1494. Although the invasion caused Italians such as Francesco Guicciardini and Niccolo Machiavelli to despise the traditional systems in place, Italy recognized that their defense technology needed to be reformed and successfully integrated into preexisting professions, like that of the architect, to withstand a realistic shot against gunpowder weaponry.

The French invasion took the Italian peninsula by surprise and caused many city-states to evaluate their societal roles. Fortifications that had stood for decades, even centuries, fell in mere

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[7] Works include David Eltis' *The Military Revolution in Sixteenth Century Europe* (1995), Brian Downing's *The Military Revolution and Political Change: Origins of Democracy and Autocracy in Early Modern Europe* (1992), David Parrott's "The Military revolution in Early Modern Europe" (1992), and John A. Lynn's *Feeding Mars: Logistics in Western Warfare from the Middle Ages to the Present* (1993).

[8] Geoffrey Parker, *The Military Revolution: Military Innovation and the Rise of the West 1500-1800,* (Great Britain: Cambridge University Press, 1988), 10-13.

hours. The force of the siege weapons brought new threats to the art of warfare by changing how it was conducted and won. Sieges became more common, as shown by Geoffrey Parker in his examination of the Spanish Army of Flanders in the mid-sixteenth to early-seventeenth centuries. In *The Army of Flanders and the Spanish Road 1567-1659: The Logistics of Spanish Victory and Defeat in the Low Countries' Wars,* Parker followed the strategy of early modern armies as they conducted more sieges against bastions than open-field warfare.[9] No army did this better than the Army of Flanders. In conducting sieges, militaries integrated a stronger emphasis on new tactics involving defensive warfare. This transition is wonderfully constructed by Christopher Duffy in his two works on siege warfare and the science of bastion design. Duffy's 1979 work, *Siege Warfare: The Fortress in the Early Modern World 1494-1660* and his 2006 *Fire and Stone: The Science of Fortress Warfare 1660-1860* enabled military historians to better understand the idea of how sieges were employed. These two works profiled military architects and engineers who brought *trace italienne* across the European continent and beyond. Duffy was seen by his contemporaries as a definitive authority on how siege warfare was conducted and it is within this research that one can further understand the profession and their powerful influence on governments and city-states within the early modern period.

1.2. Progress of Science/Technology within Historiography of Military History

Within the context of the "military revolution" debate lies an emphasis on technology and science. This approach has recently brought new scholarship to the discipline, but more importantly, has enabled military historians to break out of their self-constructed "bugle and

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[9] Geoffrey Parker, *The Army of Flanders and the Spanish Road 1567-1659: The Logistics of Spanish Victory and Defeat in the Low Countries' Wars,* (London, UK: Cambridge University Press, 1972), 10-13.

trumpet" persona.[10] The ways in which the military has been transformed due to technological advances have been widely researched in multiple works by Michael Roberts, Geoffrey Parker, William Eamon, Brett D. Steele, Sir Charles Oman, and Jeremy Black.[11] Historians William H. McNeill and J.R. Hale focused in the 1980s on how far technology shaped early modern culture with warfare. J.R. Hale's *Renaissance War Studies* has become a foundational work in describing the angle bastion and the conspiracies surrounding the first inventors of *trace italienne*. The same work profiled the Tudor castle campaigns and showed its severe backwardness compared to Italy and the rest of sixteenth century Europe.[12] The historical scholarship in the 1980s laid the foundation for the integration of science and technology for historians in the early twenty-first century.

In 1994, William Eamon wrote *Science and the Secrets of Nature* which focused upon the spread of scientific theories and secrets within early printed sources. Nature and its secrets were evident throughout Europe and this caused innovators like Leonardo da Vinci, Leon Battista Alberti, and Francis Bacon to expand upon scientific discoveries through printed treatises. Eamon's work has questioned the evolution of science and technology as it was integrated to a mass audience through print.[13] Brett D. Steele and Tamera Dorland presented in 2005 a collection of thir-

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[10] David A. Bell, "Casualty of War." *The New Republic* (May 7, 2007): 16-17 and Justin Ewers. "Why Don't Colleges Teach Military History?" U.S. News & World Report (April 3, 2008). http://www.usnews.com/articles/news/2008/04/03/why-dont-colleges-teach-military-history.html. Ewers and Bell both wrote articles that describe the changing nature of military history and how it has been approached the last twenty years. The old approach was referred by academics as "bugle and trumpet" history.

[11] Works include Michael Roberts' *The Military Revolution, 1560–1660* (Belfast, 1956), Geoffrey Parker's *The Military Revolution, 1500–1800: Military Innovation and the Rise of the West* (1988), Sir Charles Oman's *A History of the Art of War in the Sixteenth Century* (1937), Jeremy Black's *A Military Revolution?: Military Change and European Society, 1550–1800* (1991) and "Was There a Military Revolution in Early Modern Europe?" (2008), and William H. McNeill's, *The Pursuit of Power: Technology, Armed Force and Society since AD 1000* (1982). All of these works are considered historical pioneers in the integration of military history and technology.

[12] J.R. Hale, *Renaissance War Studies*, (London, UK: The Hambledon Press, 1983).

[13] William Eamon, *Science and the Secrets of Nature: Books of Secrets in Medieval and Early Modern Culture,* (Princeton, NJ: Princeton University Press, 1994).

teen articles that gave a new scientific perspective to military history. Technology and science were brought to the forefront of military matters in *The Heirs of Archimedes: Science and the Art of War through the Age of Enlightenment.* Certain developments in early modern science are profiled in this collection featuring Newtonian science, fortifications, the adoption and rejection of gunpowder weapons, the schools of artillery, and the art of war itself. Within this collective work, Kelly Devries focused on the early development of fortifications and how particular improvements in the designs of bastions further translated into *trace italienne* for multiple countries.[14] An important work by Simon Pepper and Nicholas Adams named, *Firearms and Fortifications: Military Architecture and Siege Warfare in Sixteenth-Century Siena* brought the intelligence of *trace italienne* to war-torn Siena. The idea of scientific inquiry within design structures has been largely researched within the last ten years. My thesis aims to present how *trace italienne* was integrated within Italian societies as military engineering became more accepted and desperately desired in the early modern world.

With the integration of science and technology seen as a viable component of historical scholarship, more drastic and inventive work on military civilian professions, like the military engineer, can be explored. Jane Heine Barnett's 2009 article, "Mathematics goes Ballistic: Benjamin Robins, Leonhard Euler, and the Mathematical Education of Military Engineers" looks at how the profession of early modern military engineers was directed toward mathematics in their constructions.[15] Also in 2009, Pascal Brioist wrote an article titled, "'Familiar Demonstrations in Geometry': French and Italian Engineers and Euclid in the Sixteenth Century" which follows the

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[14] Brett D. Steele and Tamera Dorland, eds, *The Heirs of Archimedes: Science and the Art of War through the Age of Enlightenment,* (Cambridge, MA: The MIT Press, 2005), 37-39.

[15] Jane Heine Barnett, "Mathematics goes Ballistic: Benjamin Robins, Leonhard Euler, and the Mathematical Education of Military Engineers," *BSHM Bulletin* 24 (2009): 92-104.

early engineering school as they adapted to new geometric practices within the scientific realm.[16] Pamela O. Long has presented her stand on the evolution of the technical arts in 2001's *Openess, Secrecy, Authorship: Technical Arts and the Culture of Knowledge from Antiquity to the Renaissance.*[17] The world of Renaissance print and authorship is tackled and successfully defended through case studies including Vitruvius, Francesco di Giorgio, and Albrecht Dürer. All of these works focus upon the civilian aspects of the engineer and their basic composition within the early modern period. In 2010, Martha Pollak's *Cities at War in Early Modern Europe* collectively scopes early modern Europe as warfare evolved. One of her main sections includes several chapters on the conception of "The Geometry of Power," in relation to the internal structures and designs of citadels and fortifications.[18] It is implied in this section that grandeur structures and the individuals who live in them are considered powerful and aristocratic in nature. In addition, historian Horst de la Croix has pinpointed fortification literature produced in the early modern era within his article, "The Literature on Fortification in Renaissance Italy." It examines the authorities who exemplified these new designs of war. These secondary works lay foundations for further research on how the military engineer affected the scope of warfare in the early modern period.

1.3. Conducting Research through Primary and Secondary Sources

The availability of sources for this thesis are abundant, especially concerning secondary sources. A large amount of the primary evidence about Italian fortifications and architectural en-

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16 Pascal Brioist,"'Familiar Demonstrations in Geometry': French and Italian Engineers and Euclid in the Sixteenth Century," *History of Science* xlvii (2009): 1-27.

17 Long, Pamela O., *Openness, Secrecy, Authorship: Technical Arts and the Culture of Knowledge from Antiquity to the Renaissance,* (Baltimore, MD: The John Hopkins University Press, 2001), 175.

18 Martha Pollak, *Cities at War in Early Modern Europe (*Cambridge, UK: Cambridge University Press, 2010), 9-12.

gineering had been largely reprinted in London during the mid-17th century, which can be accessed through the digital database of *Early English Books Online* (*EEBO*). Some of these early modern documents have been directly taken from the United Provinces, France, and Italy but have been either translated by English printers or been left in their original language. Examples of this can be seen in Giacomo Barazzio da Vignola's *The Regular Architect: or the General Rule of the Five Orders of Architecture.* This work was originally written by an Italian architect but was translated by an English Civil War era printer named Joseph Moxon. Numerous documents found in my bibliography have similar formats. Italian treatises are within *LiberLiber*, an online Italian collective database. Other databases like *Museo Galileo* and *OPAC SBN* were of great help. I found relevant documents and treatises within these databases. Additional primary source materials were found through the *Calendar of State Papers,* containing letters, pamphlets, and messages from multiple areas like Venice, Milan, London, and Spain. Within these documents exists evidence of *trace italienne* at its inception, dating to the early fifteenth century. *The Medici Archives Project* provides detailed accounts of architects and engineers who were hired under the Medici. Their constructions provide a great look into how knowledge was transferred from the military engineer to the Medici. Pictures, ground-plans, building materials, and drawings brought physical insight into *trace italienne* designs. All of these databases contributed greatly to the thesis.

The use of secondary historiography encompasses Sir Charles Oman in the 1930s to most recent works by Deborah Howard, Matteo Valleriani, and Elisabeth Kieven. Despite such prevalent source material, several challenges appeared. The issue of language translation and revision was at the forefront. Italian works, like Guicciardini's *History of Italy*, have been revised multi-

ple times and English printers are not strangers to the process. Sidney Alexander's translation of Guicciardini's classic (1969) referred to the original Italian works to adequately portray Guicciardini's image of Italy. Alexander explained in his introduction that Sir Geffrey Fenton and Austin Parke Goddard fell short of bringing a definitive translation due to lack of language knowledge and use of pre-translated copies.[19] This is a common occurrence within the history profession.

Another issue dealt with the scope of material and timeframe. My overall aim was to establish a connection between military engineers and knowledge transfer across the early modern world but there were limits to how far a Master's thesis could encompass. Originally, my scope extended from Italy to the early Americas and showed how *trace italienne* was dispersed and established within early-17th century North America. An in-depth study of how this knowledge passed to the Americas has not been specifically done in showing how the military engineer was involved in these engagements. I have redirected this part of the thesis for a later endeavor, hopefully given within a Ph.d. dissertation. Focusing on strictly Italian, French, Spanish, and English source documents will be at the forefront of this thesis.

The distribution and handling of printed treatises and manuscripts among military engineers and the mass public caught my attention as well. Hand written letters and practical theories in engineering could be taken, printed, and distributed to a public audience. What about print censorship and the sanctity of "ideas" among professionals who strive to constantly improve their ground plans and structural theories concerning *trace italienne?* Did book fairs elevate a military engineer's theories to higher authorities and elites or expose them to fraud? Was the

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[19] Francesco Guicciardini, ed. & trans. Sidney Alexander, *The History of Italy* (Princeton, NJ: Princeton University Press, 1969), xxv-xxviii.

competition among military engineers respectable or did contemporaries steal and copy theories and designs? Was there a gap in printed fortification sources from 1500 to 1550 because of indecisiveness in theoretical thinking, fear of being plagiarized among peers, or/and not wanting prestige and fame for mere doodling and scribbles of fortification structures on paper? Why was there a need to print fortification treatises and engineering manuscripts around 1570 as opposed to the 1520s, when the Italian peninsula was overrun by foreign monarchs, religious leaders, political magistrates, and wealthy patrons? These questions are pursued in the second and third chapters of my thesis.

1.4. Method, Theory, and Thoughts

Handling primary sources requires diligence. My main problem arose in needing to categorize primary sources into workable evidence for the advancement of the thesis topic. The art of war has continued to be a popular enterprise among early modern writers, especially those from England during the Tudor reigns. Many of those documents hardly mentioned fortification design, military engineering, theories, and *trace italienne,* but it is mentioned nonetheless. Engineers and their fortification projects are mentioned within some of the letters from the *Calendar of State Papers* but additional research must be applied to see if these men were employed military engineers or recreational students of the practice. In dealing with fifteenth and sixteenth century Italy, J.R. Hale realized in his chapter, "The Early Development of the Bastion: An Italian Chronology c. 1450-c. 1534," that the sources available for such research were scarce and quite difficult to manage at times.[20] The ultimate solution in dealing with this problem is to look at the detailed ground plans and drawings produced by architects and engineers. By looking at draw-

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20 Hale, *Renaissance War Studies*, 4-5.

ings, one can assess whether a military engineer was more knowledgable in architectural and/or scientific-mathematical intellect. It is very important to view the completed structure when looking at these theoretical drawings. Since a trip to Italy would be inconceivable without proper funding, some of these bastions can be seen on the internet and in various forms of literature. The key to studying the military engineers of the Italian peninsula is to view how initial ground plans and methods were carried out successfully in a finite physical form.

Additionally, military engineers probably kept their ground plans secretly away from enemies and peers so that weaknesses could not be perceived on particular bastions. I would like to venture that not all engineers were completely loyal to their respected employers/patrons and occasionally distributed classified information to their enemies for profit and prestige. Christopher Duffy points out in *Siege Warfare* that many engineers chose to withhold knowledge of *trace italienne* to countries with mixed interests.[21] With such valuable information, enemy forces could bring down bastions with ease by concentrating ammunition fire on a weak spot. I look into how difficult it was for Italian military architects to decipher and translate fortress designs among peers. It is equally interesting to find if non-Italian architects could construct *trace italienne* without the proper schooling and humanistic instruction from Italian universities. If the proper evidence can be taken from primary sources, I will proceed with this component of the military engineer in this thesis or some future project.

This study has revolutionized my vision of how military history should be perceived. Together with studies in science and technology, military historiography can be successfully written in new perspectives. My goal is to add to this scholarship in furthermore directing my efforts to

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[21] Christopher Duffy, *Siege Warfare,* 40-42.

understand the societal challenges and promises attached to Italian military engineers. By focusing on this profession, a wider and more complex world appears. A world which holds individuals who can change the thoughts of higher entities through intellectual knowledge and skills unknown to most men throughout early modern society. This world produces men who can balance defense against attack.

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CHAPTER 2: MEN WHO COULD BALANCE DEFENSE AGAINST ATTACK: HIGH RENAISSANCE MILITARY ENGINEERS AND THE RECEPTION OF FORTIFICATIONS THROUGHOUT THE ITALIAN PENINSULA

The engineer of the High Renaissance endured drastic social and cultural changes to their profession. The powerful display of siege gun weapons at the end of the quattrocento caused Italian military establishments to desperately reform their warfare strategies. This threat made total victory, in a sense, a more impossible task to accomplish.[22] As artillery weapons destroyed Italian castles and walls during the chaotic days of 1494, the importance of defending strongholds and cities became a desperate fight for survival. A new warfare strategy emerged from the intellectual minds of Italian military engineers during the cinquecento. Early modern military engineers revolutionized their architectural foundation into an advanced and practical intelligence called *trace italienne*, known as the construction of star-based fortifications and bastions.[23] The engineer's desire to endorse *trace italienne* became more individualistic in nature as numerous Italian city-states sought them out. Faced with imminent destruction, these political entities either accepted or rejected the advice of military engineers, resulting in potential employment. Magistrates and aristocrats based their interpretations on how beneficial *trace italienne* was to their

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[22] Geoffrey Parker, *The Army of Flanders and the Spanish Road 1567-1659: The Logistics of Spanish Victory and Defeat in the Low Countries' Wars* (London, UK: Cambridge University Press, 1972), 5. Parker strongly makes the point that, "it became almost impossible to win a land war quickly" within the age of gunpowder siege weapons (15th-17th centuries).

[23] It must be noted that the construction of angle bastions and star-based fortifications was not called *trace italienne* during the Renaissance and the sixteenth century. The adoption of the name *trace italienne* came from historians of the "military revolution," namely Michael Roberts, Geoffrey Parker, and many other theorists. See Geoffrey Parker's *The Military Revolution: Military Innovation and the Rise of the West 1500-1800* (Great Britain: Cambridge University Press, 1988), 1-44. The word *trace* means "ground-plan" in French and *italienne* refers to the Italians. It is the French, under Vauban in the mid-seventeenth century, that fully adopted the name of *trace italienne.* Military historians of the mid-twentieth century adopted this name to describe the style and knowledge that the Italians invented in the mid-fifteenth century. For this chapter, and in further work on this topic, *trace italienne* will be used with this understanding in mind. For a more detailed explanation of the meaning of *trace italienne* see Mahinder S. Kingra,"The Trace Italienne and the Military Revolution During the Eighty Years' War, 1567-1648," *Journal of Military History* 57, no.3 (June 1993): 431-446.

particular culture and society. The intellectual reasoning and responses behind such scenarios will be addressed through case studies featuring Florence, Bologna, Rome, and Palmanova. The profession of the military engineer was individually responsible for spreading the new style of fortification design across these city-states and beyond the Italian peninsula. The education surrounding *trace italienne* created a new strata among Italian societies in labeling military engineers as "members of a cultural aristocracy."[24] As more city-states accepted the ideas of *trace italienne,* a deeper appreciation was given to the military engineer. That recognition was marginalized by Italian magistrates and governments by the end of the cinquecento. The role of the military engineer was amalgamated into a larger administrative system which consisted of professions that were not fit for the task of implementing *trace italienne.* Nevertheless, a new face of military engineering was acknowledged despite its altered nature. The evolution of such a profession will be documented throughout this chapter.

2.1. The Identity of the Military Engineer

Italian architectural disciplines in the High Renaissance underwent a transformation as siegecraft decimated existing structures into mere rubble. The first generations of military engineers during the quattrocento emerged as individuals who had knowledge and/or experience in multiple occupations. There were not many clear distinctions between architects and engineers during the early years of the Renaissance. Horst de la Croix complements this by stating that, "It should be remembered, however, that the Renaissance did not recognize so strict a separation of concepts and that, at that time, the terms 'art' and 'science' were practically interchangeable."[25]

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[24] Pascal Brioist,"'Familiar Demonstrations in Geometry': French and Italian Engineers and Euclid in the Sixteenth Century," *History of Science* xlvii (2009):17.

[25] Horst de la Croix, "Military Architecture and the Radial City Plan in Sixteenth Century Italy," *The Art Bulletin* 42, No. 4 (Dec., 1960): 264.

Artists, painters, sculptors, mathematicians, musicians, humanists, and architects were all involved in reformulating Italian pre-existing systems to further benefit the Italian peninsula against siege weapons.[26] Each profession listed above was able to contribute in some way toward the disperse of *trace italienne* across the Italian peninsula. Italian architects contributed significantly to this progression against siege warfare. The architect, according to Christopher Duffy, was considered a "jack-of-all-trades" individual.[27] Naturally, the architect adapted into the role of the military engineer. The architect was highly trained in architectural design, whether in civil or military architecture. When the French invasion of Italy took place in 1494, Italian architects concentrated more on the practical components of military architectural design. More employable architects attained conceptual wisdom in geometrical mathematics, and other forms of theoretical knowledge. Italian societies demanded and fabricated an engineering profession for their own benefit. Therefore, to be considered an effective and resourceful military engineer from the late-15th century to the cinquecento, a candidate had to procure a commanding grasp of theoretical (mathematical) and practical (military) knowledge. Pascal Brioist states:

> that the suspicion of being a mere scholar could jeopardize your credit. War had become a huge industry by the end of the sixteenth century, engineers had no difficulty in finding employment and their experience on the ground was important: they were both practitioners and theoreticians. Gentlemen themselves were highly trained and it was considered a shame not to be knowledgeable in mathematics. There was no room left for amateur geometers or architects.[28]

Military engineering received its base of knowledge from the school of architecture. As military engagements intensified after 1494, the profession split into clear and distinct disciplines. Before Charles VIII established himself as ruler of Naples, Italian architects mostly produced civil pro-

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[26] Horst de la Croix, *Military Considerations in City Planning: Fortifications* (New York: George Braziller, Inc. 1972), 41.
[27] Christopher Duffy, *Siege Warfare: The Fortress in the Early Modern World 1494-1660* (London: UK: Routledge & Kegan Paul Ltd., 1979), 40.
[28] Brioist, 19.

jects in constructing cathedrals, palaces, taverns, monuments, and numerous other structures of architectural design. Once the ruinous force of gunpowder was witnessed by multiple Italian chroniclers at the fortresses of Ostia, Serezana, and Pisa, the social and political intentions of Italian city-states radically transformed.[29] Francesco Guicciardini infamously accounted in his *History of Italy* the destructive nature of the French siege trains as they tested their new iron balls upon the enceinte of Italy.[30] As noted by J.R. Hale, "Radical changes in fortification only take place when there is a radical change in offensive weapons."[31] These experiences created a new intellectual desire for defense and military engineers fulfilled such aspirations.

Horst de la Croix stated that, "only toward the middle of the sixteenth century did indications appear of a breakup in the field of human knowledge and a segmentation of its rapidly growing bulk into a number of separate departments. In the field of architecture, this trend was expressed by the emergence of military engineering as a profession distinct from that of civilian architecture."[32] Few within the profession looked at civil architecture as discrete and irrelevant due to its decorative nature in design. Giovan Battista Bellucci (1506-1554) ridiculed his contemporaries that implemented civil architecture within their practice.[33] Despite Bellucci's discontent, two of the most influential sixteenth century Papal engineers, Michele di Sanmicheli and Antonio da Sangallo the Younger, both practiced civil and military architecture. On the Fortezza da Basso in Florence, Antonio da Sangallo the Younger applied his decorative knowledge of

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29 Francesco Guicciardini, *History of Italy*, I, 53, 58. Hans Delbruck writes in the fourth volume of his *History of the Art of War* how the casting of iron affected the overall impact of the cannonball. Hans Delbruck, *The Dawn of Modern Warfare: History of the Art of War-Volume IV*, trans. from German by Walter J. Renfroe Jr. (Lincoln, Nebraska: University of Nebraska Press, 1985), 33-35.

30 Enceinte is another word for "walls," which was mentioned by numerous French fortification chroniclers during the early modern period.

31 J.R. Hale, *Renaissance War Studies* (London, UK: The Hambledon Press, 1983), 6.

32 de la Croix, "Military Architecture," 264.

33 Ibid., 274.

civilian architecture to the sides of his gates and towers with distinct styles.[34] Architects who gained knowledge in both sub-fields were hired with open arms by multiple patrons, aristocrats, and court officials. It was not until the mid-sixteenth century when military engineers began to entirely dismiss civil architecture from its main school of knowledge.[35]

2.2. Italian Views on Fortification and Defense

Military engineers were hired fervently throughout the cinquecento. Although the ideal for the engineering role was highly trained Italian architects, some magistrates and patrons from the peninsula did not feel the need to expend such extravagant resources. The research of Bert S. Hall indicated that, "new fortifications were enough to make even the most ruthlessly bellicose rulers flinch."[36] Niccolo Machiavelli was a key philosophical figure in spreading the notion that new fortifications and designs were simply unnecessary and costly in the early-sixteenth century. In Book VII of the *Arte della Guerra* and Book II of *Discourses on Livy,* Machiavelli shared passionately that, "no wall, no matter how great," will be able to keep foreign gunpowder cannons at bay.[37] In declaring such statements, employable military engineers were perceived as utterly useless and dispensable to Machiavelli. Machiavelli found no purpose in city-states hiring engineers to create unstable structures at immense cost. According to Allan H. Gilbert, Machiavelli stayed

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[34] Ibid., 273. J.R. Hale's "The End of Florentine Liberty: The Fortezza da Basso" describes the development and organization of the Medici-inspired citadel Fortezza da Basso in his *Renaissance War Studies* (1983). In this chapter, Hale describes the growing animosity that the Florentines expressed toward the Medici and the engineers that were apart of the project. The attitude of the Florentines was largely in disagreement when they implied that citadels are for tyrants and walls for a free people. For further information, see Hale, *Renaissance War Studies,* quote on 32, 31-62.

[35] Ibid., 273. In perceiving this clash between civil and military architecture, see Roland Freart's *A Parallel of the Ancient Architecture with the Modern.*London: 1664. Obvious transformations within the school of architecture can be seen in detailed drawings of pillars, gateways, and roofs in Freart's manuscript.

[36] Hall, Bert S., *Weapons and Warfare in Renaissance Europe: Gunpowder, Technology, and Tactics* (Baltimore, MD: The John Hopkins University Press, 1997), 104.

[37] Allan H. Gilbert, "Machiavelli on Fire Weapons," *Italica* 23, No. 4 (Dec., 1946): 281. This article uses multiple quotes and citations from two of Niccolo Machiavelli's works, *The Art of War* and *Discourses on Livy.* These works are the best sources in revealing Machiavelli's views on fortifications and artillery.

true to his statements until a year before his death. Gilbert recalled Machiavelli being cordially invited by Pietro Navarro and other military engineers to view the newly constructed enceinte surrounding Florence in 1526.[38] Up to this point in Machiavelli's lifetime, *trace italienne* had taken precedence across the Italian peninsula. After intently viewing the walls, Machiavelli seemed to accept that *trace italienne* was advancing after all. Gilbert emphasized that this new revelation was not adequately revised in Machiavelli's works due to his death the following year.[39]

Machiavelli's openness to fortification tours, especially within his native city of Florence, presents a concrete example of the impact of *trace italienne*. The theoretical and practical work of the military engineer was infectious as it changed the overall perspectives of Italian city-states. The hiring of military engineers directly swayed particular entities, whether that be in social, political, or cultural interests. Certain conditions had to exist in order for military engineers to become influential in a given area of the Italian peninsula. John A. Lynn wrote that:

> For fortifications to multiply, the area in question must be populated by the cities, or at least large towns, that required fortifications. And the walled cities had to be rich enough to contribute substantially to the construction of their modern defenses. Even then, it would be *foolish* to invest in fortifications were the area not strategically open to repeated attack.[40]

Threatened urban cities and fortresses were given higher priority than those, for example, positioned in undesirable locations. Charles VIII's Naples campaign in 1494 was considered in many ways a bona fide invasion. Late-sixteenth century Naples was positioned geographically in

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38 Ibid., 281.

39 Ibid., 284-285. In the chapter "To fortify or not to fortify? Machiavelli's contribution to a Renaissance debate," J.R. Hale writes about Machiavelli's views concerning fortification based upon his knowledge of the Pisa and Padua sieges in 1509. Like Gilbert, Hale concludes that the experiences of Pietro Navarro did influence Machiavelli into having a more favorable view of *trace italienne* in the late 1520s. For more information, see Hale, *Renaissance War Studies,* pgs: 189-209.

40 John A. Lynn, "The Trace Italienne and the Growth of Armies: The French Case," *The Journal of Military History* 55, No. 3 (Jul., 1991): 320. The italicized words are of my doing and not in the original article.

southern Italy and the only way for France to conquer Naples without naval intervention was to push militarily on foot through the fractured city-states of Milan, Florence, and Siena. This was disconcerting, but Charles VIII's infatuation to acquire Naples drove his ambitions.[41] The French navigated through the Italian peninsula with minuscule resistance but it was evident that the re-invention of the siege craft helped redefine the art of defensive warfare for Italians.

Risky decisions were made concerning *trace italienne*. As mentioned before, architects were recruited and hired as military engineers for Italian city-states. The architectural works of Francesco di Giorgio Martini (1439-1501) were viewed by many of his contemporaries as the ideal model for constructing *trace italienne.*[42] Giorgio Martini's styles incorporated the triangular bastion that fired from numerous angles when faced with an offensive struggle. Although bastions were not conceived by Giorgio, angular reinventions of similar bastion designs appeared in mid-fifteenth century drawings but did not emerge in many printed treatises until about one hundred years later.[43] The lack of published works on fortifications illustrated the changing nature of *trace italienne*. Constant modifications were applied to existing structures and ground plans were scratched continuously. The expenditure to print such treatises was exceptionally high and many military engineers did not want to publish until their theoretical ideology was truly represented through physical structures. From 1492 to 1570, only nine works on fortifications were published

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41 Guicciardini, *History of Italy*, Book I, 34-43. Charles VIII was urged by multiple individuals to take Naples, even though it was not beneficial for himself to do so. One of those men was Ludovico Sforza, the Duke of Milan. His claim to Milan was being challenged, thus Sforza let Charles VIII pass unscathed into Italy to solidify his right to the Duchy of Milan. Over time, Charles VIII idealized his passage into Naples as a "birthright" of sorts.

42 Michael S. Dechert, "Military Architecture of Francesco di Giorgio in Southern Italy," *Journal of the Society of Architectural Historians* 49, no. 2 (June 1990): 161-162.

43 Horst de la Croix, "The Literature on Fortification in Renaissance Italy," *Technology and Culture* 4, no.1 (Winter 1963): 34-38.

in Venice. This is a startling discovery when considering that Venice accounted for more than half of the total published military works during this period.[44]

2.3. Case Study I: The Defense of Florence under Michelangelo

Due to the conglomeration of Renaissance disciplines, numerous employed military engineers retained skills outside of architectural schooling. One of the most criticized but gloried personas that contributed to Florentine continental defense was the architect Michelangelo. The employment of Michelangelo in 1528-29 by the Florentine Republic was considered impetuous and reckless by numerous Italian military engineers. The skills that Michelangelo possessed were considered humanistic by the mass populace and his architectural works were centered in painting and sculpting. His interest in fortifications was not viewed seriously by other engineers. The engineering profession was known among Florentine civilians as "a gentleman's education" in which the schools of architecture and humanist thinking intertwined successfully.[45] Michelangelo showed consistency in the art of mathematics but his ability to physically construct fortification designs caused many to question the motives of the Florentine government. According to William E. Wallace, the Florentine Republic made the right choice to hire Michelangelo during their greatest time of need.[46]

Despite Michelangelo's lack of engineering experience and skill, the Florentines experienced drastic changes due to the threat of siege warfare in the early sixteenth century. Rome was

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44 J.R. Hale, *Renaissance War Studies*, 429-430. This information was found in Hale's chapter, "Printing and Military Culture of Renaissance Venice." Additional published works are mentioned that deal with the art of war, artillery, chivalry, military character, military medicine, etc. All together there were 67 published works on warfare during 1492-1570 in Venice. There were hardly half that number of published military works throughout the rest of early modern Italy. For more information, see Hale, *Renaissance,* 429-470.

45 Duffy, *Siege Warfare*, 4.

46 William E. Wallace, "'Dal disegno allo spazio': Michelangelo's Drawing for the Fortifications of Florence," *Journal of the Society of Architectural Historians* 46, no.2 (June 1987): 120.

sacked on 6 May 1527 by the Imperial army and the Medici were cast out of Florence to live as "rebels."[47] When it came to military defense, the loyalty of native Florentines was considered essential over foreign prospects. In a time of betrayal, the Florentine Republic looked for possible military engineers to help refortify the enceinte and towers around the city. A passionate and loyal native of Florence, Michelangelo considered himself knowledgable to take on the work the city demanded. It would had been better to take any other military engineer than Michelangelo during the later years of the 1520s. More qualified engineers and artisans like Michel di Sanmicheli, Antonio da Sangallo the Younger, and Giovanni Battista Bellucci could had been hired instead of Michelangelo.The issue of protecting Florence with *trace italienne* was a highly demanding and tense situation for the republican officials and politicians. The amount of ducats to launch such a defensive endeavor were vehemently high and the candidate had to prove himself more than adequate to take on the project at hand. Nonetheless, Michelangelo proved through intense administrative meetings that he was ideal for the engineering job. Florence accepted allegiance over skill, in this scenario, in electing Michelangelo to the *Nova della Milizia* in January 1529 and employed him in April as the Governor and Procurator General of the defense of Florence.[48] The evidence for such confidence in Michelangelo was found within his creative and mathematical drawings on fortifications.[49] They are not as detailed as that of Antonio da Sangallo

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47 Calendar of State Papers: Venice, 23 May 1527. Sanuto Diaries, v. xlv. p. 193, 114. Venice did not receive news of the sack until fifteen days afterwards, according to these state papers. It is noted that the Charles V's commanding general, the Duke of Bourbon, was killed while taking the Imperial army into Rome. An account of the sack of Rome is detailed in Guicciardini, Book XVIII, 376-378.

48 Wallace, 119. The *Nova della Milizia* was a committee that organized and tackled the military affairs of the Florentine city-state. According to Wallace, this committee was responsible for repairing the "walls and towers, to construct bastions, and finally, to fortify when and whenever it appears necessary." The man chosen for this task was Michelangelo in January 1529.

49 Ibid., 121. These twenty drawings are preserved in the Casa Buonarroti and are considered by William E. Wallace as evidence for his role as a military engineer in the early sixteenth century. J.R. Hale also shows his appreciation for Michelangelo as a military engineer in his chapter, "The Early Development of the Bastion: An Italian Chronology c. 1450-1534," 25-27.

the Younger or Francesco da Giorgio Martini but do contain theoretical and practical insights. Michelangelo's drawings are viewed as premature and of leisure, but nonetheless, indicate the characteristics of a military engineer.[50] Michelangelo's drawings were presented to the *Nova della Milizia* and they were successfully evaluated for further practice.[51] Michelangelo's stint as Florence's military engineer proved the melding of the profession. The new role of the military engineer encompassed multiple occupations, disciplines, and fields that contributed to the growing nature of *trace italienne* across the Italian peninsula.

Even though great militaristic strides were seen through Michelangelo's fortifications, Florence experienced the force of the Imperial army in artillery sieges conducted by the Spanish monarch Charles V in 1527. In a desperate and exhaustive quest for land acquisition, Charles V conquered numerous Italian city-states in the 1520s-30s. The Italian peninsula was regarded by Charles V as a battleground for aristocratic conquest. With Rome sacked by Charles V's commanding general, the Duke of Bourbon, Florence became a desirable target for further aggression in the late 1520s. Michelangelo's engineering efforts were not efficient enough for Florence, as it was taken by foreign opposition in 1529. To be fair to Michelangelo, his time as the chief military engineer of Florence lasted less than a year; hardly enough time to adequately prepare Florence for mass invasion. Falling to foreign adversaries, the Florentine Republic faced multiple problems. To return the Medici to Florence, Pope Clement VII successfully allied himself with Charles V to conquer Florence. The Medici installed themselves again as powerful representative

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50 A database of Michelangelo's fortification drawings can be viewed at: http://lebbeuswoods.wordpress.com/2012/05/22/michelangelos-war/. This entry is entitled, "Michelangelo's War," (22 May, 2012).

51 Ibid., 132.

of Florence, despite their unpopularity among the mass populace. The successful siege of Florence established Charles V in February 1530 as the next Holy Roman Emperor.[52]

2.4. Case Study II: Bologna and the Rejection of *Trace Italienne*

The Papal ceremony was performed by Pope Clement VII in Bologna, which according to Guicciardini, was "the principal and most important city, excepting Rome, of the whole Ecclesiastical State."[53] The importance and sanctity of Bologna is unique in its correlation to military engineering. Despite the growing influence of *trace italienne* across the peninsula, some Italian city-states generally disagreed on how to defend their strongholds against siege weapons.[54] The city-state of Bologna directly refused to integrate a defensive plan that brought military engineers within its gates. On multiple occasions, sixteenth century Bolognese aristocrats and magistrates were convinced that refortifying their walls was not the solution to the siege problem. Their beliefs coincided with the Greek and Spartan ideals of the "citizen soldier." The townspeople of Bologna considered the adoption of defensive walls as a reflection of cowardice and weakness upon their sole identity. If war came to their gates, Bologna would equip its mass populace with weapons and shields to defend themselves.[55] Their collective army was excessively devoted to the cause of protecting its walls, but not in hiring military engineers to build

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52 Guicciardini, Book XVIII, 422-24, 426.

53 Richard J. Tuttle, "Against Fortifications: The Defense of Renaissance Bologna," *Journal of the Society of Architectural Historians* 41, No. 3 (Oct., 1982): 191.

54 Due to the length of this chapter, other disagreements against *trace italienne* and military engineers will be mentioned in this footnote. In June 1509, the citizens of Treviso issued mass rebellions to illustrate their displeasure of the hired military engineer Fra Giovanni Giocondo. His ground plans required the razing of all buildings and property within five hundred meters of the tentative defensive fortress. The citizens of Treviso were denied their rights and the construction was completed in November 1509. A similar instance took place twenty-five years later on Florentine soil. The Medici proposal of a citadel (Fortezza da Basso) was largely refuted by the citizens of Florence. In essence, the Florentine's status as people of a "free city" was in jeopardy. The construction of a citadel, according to Gianotti, was "evidence that a republic was being challenged by a tyranny." For documentation of these events see Croix, "Military Architecture," 42-43 and Hale, "The End of Florentine Liberty," 32.

55 Tuttle, 197.

fortifications. Early sixteenth century Bologna was a city-state that clenched its teeth against architectural technology, when it was evident to other Italian political powers that siege warfare would fracture every entity within its path.

Throughout the cinquecento, Bologna stubbornly resisted refortifying its city. This is amazing knowing the nature of siege weapons during this century. The approach taken by the Bolognese was not favored by other Italian city-states. In 1526, Pope Clement VII sent two of his most highly trained military engineers, Antonio da Sangallo the Younger and Michele di Sanmicheli, to investigate the fortifications surrounding the Pope's beloved Bologna.[56] With threats from the Spanish, French, Turks, and warring Italian city-states, Pope Clement VII formulated a campaign to successfully defend his Papal strongholds from siege warfare by hiring military engineers skilled in *trace italienne*. The process of recruiting Papal military engineers was extensive and difficult. Only the most skilled and adept engineers were hired by the Pope. Horst de la Croix points out that, "Along with and after Francesco di Giorgio, the greatest artist-architects were also the most sought-after military engineers of their time."[57] Rome was considered one of the most influential hubs of the High Renaissance and professional artists and architects were seen everywhere throughout the city. Their skills in geometry, architectural design, and economics brought them to the forefront of employment. Of all the military engineers that were hired by Pope Clement VII, Antonio da Sangallo the Younger and Michele di Sanmicheli were supreme.

Sangallo the Younger and Sanmicheli arrived to find Bologna in dire need of refortification. Sangallo drew two sheet drawings that required Bologna to invest in numerous bastions

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56 Ibid., 195.
57 de la Croix, "Military Architecture," 271.

across the city.[58] The Bologna government body remained adamant, refusing to fortify its walls on account of its devout and armed citizenry. Richard J. Tuttle remarked that it was:

> likely that the Duke of Bourbon bypassed Bologna because it could not be taken quickly. The city was defended by a force of Swiss guards, papal troops, and armed citizens-perhaps as many as 10,000 strong. A protracted siege was out of the question because it would have jeopardized plans to take Rome. When Bologna was defensively united, size became its greatest asset. Francesco di Marchi affirms this fact when, in a list of natural urban defenses, he wrote, 'Some cities are strong for having a great and armed populace, like the famous city of Bologna.'

Bologna was regarded as a naive city that could not defend itself militaristically. Even though Sangallo had drawn these plans, time was not on Bologna's side. The Imperial army of the Duke of Bourbon ravaged the Italian peninsula and by the time of Sangallo's visit, the Imperial army was only months away from Bologna's borders. The resources and labor needed for such engineering projects were insurmountable and therefore time became irrelevant in the wake of potential invasion. Nonetheless, Bologna was able to choose how they wanted to defend themselves against siege weapons. Bologna's firm stance directly challenged the Pope and the advice of his military engineers. The city was beloved by Pope Clement VII but the city decided to deny such counsel from the Pope. Nevertheless, as Francesco di Marchi mentioned above, Bologna stayed true to their strategies and was unified in the face of preeminent destruction from siege warfare.

In Bologna's favor, the Imperial army decided to sack Rome in 1527. In 1530, an alliance was manufactured with the Pope and Charles V, which solidified Bologna's protection from the Spanish army and the Holy Roman Empire. With new popes elected, new agendas arose in concern to military engineering and national defense. Pope Pius IV, who ruled the Papacy from 1559-1565, pushed Clement VII's inclinations to refortify Bologna in the 1560s.[59] Throughout

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58 Tuttle, 196. These sheet drawings were titled 727A recto/verso and 728A.
59 Ibid., 197.

the first half of the cinquecento, Bologna faced mass opposition from fellow Italian city-states for their decision not to implement *trace italienne* within their borders. Rome, Florence, Pisa, and multiple other cities fell to the gunpowder weapons of massive foreign armies, foreknowing that other aristocratic powers must realize the threat before them. In the early 1560s, the Ottoman Turks intensified their military presence across the Adriatic Sea and the lower half of the Italian Peninsula. With fear of being overcome by non-Catholic entities, the Pope raised a campaign to fortify the national defense of the Papal States.

In December 1561, Pope Pius IV sent his artillery commander Gabrio Serbelloni to investigate the fortifications of Bologna.[60] Serbelloni was met with massive opposition from the citizens of Bologna, according to Richard J. Tuttle, and his findings persuaded the Pope to send the Cortonese architect Francesco Laparelli to reinforce Serbelloni's observations. Similar recommendations are seen among the notes of Sangallo the Younger in the late 1520s and Laparelli's in the early 1560s. The city did not endure siege warfare as other city-states had in the past. The basic composition of the city's interior and exterior buildings were still intact but the need for fortification was advised highly by both military engineers. During the 1520s, Sangallo noticed the weakness of the enceinte and the need for refortification. Laparelli reemphasized Sangallo's instructions in not only refortifying the enceinte but for Bologna to issue a "complete and modern refortification" of its city.[61] In addition, both military engineers received harsh criticism and enmity from Bologna's mass populace. Quoting Laparelli:

Although it has those citizens who with a mirror to the past and with pride in their forces believe that there is no need of other fortification, I say that they greatly deceive themselves because if an army should come from behind with a little artillery, one cannot defend the part below the

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60 Ibid., 197.
61 Ibid., 199.

hills nor stop the breaching of the ditch in the first battle in that it will not be possible to defend another part."[62]

Even in the 1560s, Bologna continued to oppose military engineers and *trace italienne*. Florence, Siena, and other city-states had varied political and economic policies regarding military engineering and regarded it beneficial to their existence, unlike Bologna. With this in mind, not all military engineers were able to administer their knowledge to all Italian city-states. In Bologna's case, it is noteworthy that they used the influence and skills of the military engineer regardless.

To counterattack the Pope, Serbonelli, and Laparelli, Bologna hired a native military expert named Plinio Tomacelli. The Bolognese government and Tomacelli constructed a rebuttal titled, *Discorso sopra la fortificatione di Bologna di messer Plinio Tomacelli sotto l'anno 1565*.[63] According to Tuttle, Tomacelli's *Discourse* had three main arguments against the Papal scenario for refortifications. The economical spending, the defense strategy of the Pope, and the use of Bologna's military were all put forward as persuasive reasons for Bologna not to accept Papal intervention. The money needed was nonexistent and the *trace* plans of Sangallo and Laparelli were not realistic. The real military threat, according to Tomacelli, was from Naples and not from the Ottoman Turks. The Bolognese did not view the Turks as seriously as the Papal States did. The threat of Turkish invasion was a threat since the 1440s, as displayed through the hiring of Venetian architects to Ragusa in Sicily.[64] Lastly, if war came from the Turks or Southern half of

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62 Ibid., 198. These quotes are being provided by P. Marconi in his Italian text, *Vistia e progetti de miglior difesa in varie fortezze ed altri luoghi dello Stato Pontificio. Trascriziondei un manoscritto inedito di Francesco Laparelli architetto Cortonese (I521-I570)*, 42.

63 Ibid., 199. Tuttle has looked at the primary document of Plinio Tomacelli's *Discourse* but chose not to examine it in full detail because it is a "lengthy and often windy text." The main argument of Tomacelli can still be pulled from Tuttle's article.

64 Caplow, Harriet McNeal, "Michelozzo at Ragusa: New Documents and Revaluations," *Journal of the Society of Architectural Historians* 31, no. 2 (May, 1972):110-114. Michelozzo di Bartolomeo was hired as an engineer to Ragusa to prevent Turkish invasion in the 1460s. Michelozzo was one of the first converted architects to become a military engineer in pre-1494 Italy. Out of the architects hired, Michelozzo proved to be the best fit for Sicily.

the Italian peninsula, the citizens of Bologna would adopt the Machiavellian idea of mobilizing an army than have expensive enceinte.[65] Tomacelli reassured Rome that, "if attacked by a large army there will be time enough to raise earthen ramparts, collect troops, and arm the citizenry."[66] Despite the inconveniences from Bologna, Pope Pius IV passed away in December 1565 and was not able to directly challenge Tomacelli's *Discourse.* Fortunately for Bologna, the newly elected Pope Pius V (1565-1572) drew away from internal national defense strategies.

Bologna represents a clear deviation from Florence in 1527-29. The powerful influence of the military engineer could persuade entire cities to adopt *trace italienne*. Their skills in geometry and masonry helped persuade magistrates to fortify themselves against the destructive force of siege weapons. The mass populace of Bologna showed that the influence of the military engineer could be rejected by "common" citizens and specialists from other professional occupations. Tomacelli was a military expert but did not have the engineering expertise of Sangallo the Younger, Laparelli, and even Michelangelo. Victories coaxed by non-specialists were more apparent as the mid-sixteenth century progressed across the Italian peninsula. The knowledge of *trace italienne* was transmuted to military specialists, mechanics, humanist scholars, philosophers, astrologers, musicians, and mathematicians. Therefore, a mixture of talented professions were required when fortifications projects were undertaken after the mid-sixteenth century.

Due to the lack of printed fortification treatises in the early sixteenth century, the perception of military engineering fell in importance and grandeur. The individualistic nature of the profession was criticized and undermined by those who professed to be a part of it. Not all military engineers felt that their profession needed the help of other specialists to adequately take on

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65 Tuttle, 200. Tomacelli*, Discourse,* 391r.
66 Ibid., 200. Tomacelli, *Discourse,* 396r.

structural projects. Great engineers from the late-fifteenth to early sixteenth centuries like Francesco di Giorgio Martini, Antonio da Sangallo the Elder, and the Florentine Michelozzo di Bartolomeo considered their skills to be supreme and opposed the diffusion of other military and civilian experts.[67] As the technology of *trace italienne* was witnessed in multiple bastions, enceinte, and strongholds, certain military engineers began to form allegiances within their own profession.

New views emerged that contradicted the engineer's overall individual role within engineering projects. Giovan Battista Bellucci wrote in his *Nova Invenzione* (1554) that military engineers ought to specialize in speculative and operative knowledge to be considered an elite among peers.[68] A speculative master was to be both militaristic in nature and mindful of all things associated with siege weapons. An expert in operative knowledge had to be extremely cunning in mathematical precision and skill. Bellucci believed that one man could not encompass both these forms of knowledge. This predicament, according to Bellucci, could only be solved by having two specialists on a specific engineering project; one with speculative skill and the other in operative duties. The military soldier or general was the ideal candidate for attaining speculative knowledge, while a skilled mason was to be in charge of all matters dealing with operative comprehension.[69] Along with Bellucci's argument concerning the elimination of civil architecture in the field of military engineering, Antonio Lupicini commended the notion that all civil

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67 Caplow, "Michelozzo at Ragusa," 110.

68 de la Croix, "Military Architecture," 273. Giovan Battista Bellucci's treatise *Nova invenzione di fabricare fortezze di varie forme...*is mentioned within de la Croix's article. He has provided the Italian quotes within his footnotes and has summarized them with great detail. According to de la Croix's article, "Literature on Fortifications in Renaissance Italy," Bellucci's treatise was written in 1554 but was post-humanly published to a mass audience around 1598. de la Croix, "Military Architecture,"40.

69 Ibid., 273. Bellucci, *Nova invenzione,* Ch. 1

architects should be under close supervision by a speculative official.[70] In addition, Francesco di Marchi largely viewed the engineer having "a place in the building of fortresses, but only as one member of a group of experts and specialists."[71] The individualism that the High Renaissance gave to men of such vocation started to diminish in importance.[72]

It is intriguing that these military engineers had their treatises published posthumously around the last two decades of the sixteenth century. The desire for individual recognition and publicity was paramount for any profession. Plagiarism was highly suspected between military engineers and it was important for fortification ideas and models to be published in order to gain endorsements from patrons and magistrates across the Italian peninsula. It is noted that, "Particularly within the ranks of military architects, the concept of intellectual property took a firm hold, as various engineers jealously tried to guard, or at least to reap recognition for, inventions which they claimed to have made."[73] For some military engineers like Gabriello Busca, it was necessary to talk about new theories and ideas among contemporaries.[74] The idea of *trace italienne* became a widespread phenomenon but ownership over such an esteemed design ultimately caused military engineers to accuse contemporaries of plagiarism. Similar to the spread of hu-

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70 Ibid., 275. Antonio Lupicini explained a desire to have architects no longer take on a full engineering project without a military expert on hand. His treatise *Architettura militare libro primo* (1582) was published after his time.

71 Ibid., 275. Francesco di Marchi's treatise, *Della architettura militare,* was published post-humanly in 1599 by Gaspare dall'Oglio. It was written, according to de la Croix, between 1542 and 1565. Croix, "Literature on Fortifications," 42.

72 Jacob Burckhardt. *The Civilization of the Renaissance in Italy* (New York: Random House, Inc., 1954), 100-104. Burckhardt's vision of the 15th century individual during the Renaissance is powerful and sees that "change" within society creates the individual. Military engineers fall within this form of evolution. Burckhardt writes that, "the more frequently the governing party was changed, the more the individual was led to make the utmost of the exercise and enjoyment of power." (102). The birth of the individual was created through societal transformations.

73 de la Croix., 275. Plagiarism arose from a principle source for military engineers. Francesco di Giorgio, according to de la Croix, was considered the "first" in designing *trace italienne*. His designs and methodology were written in his *Trattato dell' architecttura civile e militare.* The Rome conferences (1530s-40s) were considered hazardous to most military engineers, mainly because of the intermingling of ideas and plans among the group as a whole. Respected engineers like Sangallo the Younger, Castriotto, Alghisi, and Michelangelo exchanged their strategies to the Pope but risked being plagiarized by contemporaries in the field.

74 de la Croix, "Literature," 43.

manism, the growing demand for *trace italienne* extended far beyond the peninsula to continental Europe, Asia, and the early Americas. This demand ignited a vicious battle for employability, which entitled Italians to become the masters of this new design in defensive fortifications. From the 1480s to late 1520s, military engineers were hired to take projects with an individualistic attitude. Their skills were viewed as supreme and not performed by other professions. The economical profit for the military engineer was not shared by other specialists and was considered a decent vocation of choice. This strata was eventually transmuted as print manufactures brought printed fortification treatises to a mass public after the 1550s.

2.5. Case Study III: The End of Individualistic Military Engineers: Palmanova

By the 1590s, Italian city-states did not hire individual military engineers as the sole representatives in fortification projects. Italian officials, patrons, and aristocrats became well-versed in the components of military engineering and hired employees based upon how they valued the profession. Duke Emanuel Philbert of Savoy (1528-1580) educated himself by reading the treatises of Leon Battista Alberti, Vitruvius, and Antonio da Sangallo the Younger. He hired groups of military engineers to construct *trace italienne* across Savoy and Piedmont. His notable employees were Giovan Maria Oligati from Genoa, the Milanese Gabriello Busca, and Francesco Paciotto da Urbino.[75] At the 1534 conference in Rome, Pope Paul III invited numerous soldiers and military engineers to refortify Rome.[76] It is important to mention that military soldiers were a direct part of this Papal meeting. Bellucci's arguments concerning speculative and operative disciplines were apparent even before his treatise was written in 1554. Rome denied the idea of *trace italienne* throughout multiple conferences in the 1530s and was reminded constantly of the

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75 Duffy, "Siege Warfare," 33, 36.
76 de la Croix, "Military Architecture," 277.

economic implications of adopting such a defensive plan. Great engineers like Laparelli, Sanmicheli, Castriotto, and Michelangelo tried to get the Pope to consider their *trace* plans but only Sangallo the Younger was able to construct one complete bastion at the cost of 44,000 ducats! It was perceived that, "The tremendous cost and time expended for this bastion's construction forced the Pope to realize that his original plan to fortify the entire city had been overly ambitious."[77] The Pope realized that one individual could not capture the spirit of *trace italienne* without help from other specialists.

The ultimate engineering project which solidified the adoption of having a mass group of specialists was found in the grand design of Palmanova.[78] Erected on the eastern frontier of the Venetian Republic in 1593, Palmanova's construction was led by Marc'Antonio Barbaro. Barbaro changed the role of the individualistic military engineer by leading an engineering project with virtually no military and architectural experience or skill.[79] Considered the Venetian "superintendent" of the Provveditori alle Fortezze in 1587, Barbaro investigated the Friuli with experienced military engineers Giulio Savorgnan and Bonaiuto Lorini.[80] It was decided that a *fortezza reale* should be constructed to prevent Turkish, German, or Austrian invasion. Military engineers hardly influenced the vote. A whole team of military experts, strategists, senators, ambassadors, advisors, councilors, civil architects, and military engineers agreed to construct Palmanova in

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77 Ibid., 278.

78 John Cruso, *The Art of Warre; or Militarie discourses,* London: 1642, 46-51. The construction of Palmanova was viewed as the ultimate design of *trace italienne* up to the end of the sixteenth century. Cruso's work was seen as a definitive source for other countries wanting to implement *trace italienne*. Fortunately, the hiring of Italian military engineers made the transition from medieval to bastion fortifications easier to withstand.

79 Deborah Howard, *Venice Disputed: Marc'Antonio Barbaro and Venetian Architecture, 1550-1600* (New Haven: Yale University Press, 2011), 193.

80 M.E. Mallett and J.R. Hale, *The Military Organization of a Renaissance State: Venice c. 1400 to 1617* (Cambridge, UK: Cambridge University Press, 1984),418. Savorgnan was recognized as the Venetian Republic's best military engineer, which had the official title of *Soprintendente Generale della Artiglierie e delle Fortezze Veneziane*. See Howard, *Venice Disputed,* 197.

October 1593.[81] The entire building process went through multiple disagreements and setbacks due to the plethora of opinions involved. Each contributing individual tried to get their certain agendas integrated into the Palmanova radial fortress. Military engineer Savorgnan and his assistant Lorini were not able to adequately bring their *trace* plans to fruition because of these conflicts of interests. Marc'Antonio Barbaro told the Venetian senate that, "it is not enough to surround the site with walls, but to arouse admiration you need inhabitants, industries, crafts, trades, and other provisions."[82] The civil and administrative demands of powerful individuals like Vincenzo Scamozzi and Barbaro changed the military fortress of Palmanova into a habitable radial city.[83]

The mixture of different professions and skills turned Palmanova into a monument of civil engineering, rather than a structure that could withstand artillery fire.[84] The voice of the military engineer was drowned out by more powerful individuals who had virtually no experience in the arts of *trace italienne*. Savorgnan's model and command of Palmanova was disregarded during the early process years and a new ground plan was adopted and furthermore approved by the Venetian Senate.[85] Barbaro was chosen to enforce the senate's new plan for Palmanova. The construction of Palmanova was a definitive turning point for the military engineer. The military engineer was regarded as a profession that was never questioned for its skill and

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81 Howard, *Venice Disputed,* 199.

82 Ibid., 203.

83 de la Croix, Military Architecture," 290. The idea of the "radial city" came from the research of Horst de la Croix. During the Palmanova era, civil architecture made its way back into the military engineering profession through the adoption of city streets and civil buildings inside the fortress. Even though civilian rights were being expressed through new ground-plans, there were still problems in how a citizen could operate in such a huge fortress.

84 It is ironic that Palmanova was not engaged in artillery warfare until Napoleon Bonaparte took it over in the early 1800s. In hindsight, the Turks were not as serious a threat as imagined by the Venetian Republic. The indulgence of economic resources used shows how much the Venetian Republic idealized the defensive strategy of *trace italienne* against foreign opposers.

85 Howard, 204.

method. Italian governments and administrative bodies no longer sensed the overwhelming demand for military engineers once their knowledge became available through printed treatises. Nevertheless, the knowledge of *trace italienne* was spread across the Italian peninsula because of the early modern military engineer.

2.6. In Conclusion: The Architect's Wit

Francesco di Giorgio Martini declared that, "The man who would be able to balance defense against attack, would be more a god than a human being."[86] This Machiavellian idea was evident through the intellectual evolution of the military engineer from the 1480s to the early 1590s. The city-states of the Italian peninsula endured the force of siege weapons in an age when the offense prevailed over defense. The reaction to such threats created the need for military engineers, in which the best plan for survival was unravelled. A sense of aristocratic power was given to the military engineer when he chose to distribute his knowledge to Italian city-states. The fifteenth century humanist scholar Leon Battista Alberti was not premature in declaring that, "you would go near to find that most of the Victories were gained more by the Art and Skill of the Architects, than by the Conduct or Fortune of the Generals; and that the Enemy was oftener overcome and conquered by the Architect' s Wit."[87] It can be argued that the intellectual mind of the engineer was relished as more powerful and valuable than military generals from the High Renaissance to the middle of the cinquecento. The demand for the profession changed from within as well. Great military engineers were no longer sought out individually after such debacles like the sack of Rome in 1527, the Bolognese rejection of *trace italienne*, and the neglect of

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86 Clifford J. Rogers, "The Military Revolutions of the Hundred Years' War," *The Journal of Military History* 57, No. 2 (April 1993): 275. Quote was taken from Felix Gilbert's "Machiavelli" in Peter Paret, ed., *Makers of Modern Strategy from Machiavelli to the Nuclear Age* (Oxford: Clarendon Press, 1986), 15.

87 Leon Battista Alberti, *Ten Books on Architecture*, 1452, Preface.

engineering counseling during the construction of Palmanova. The acceptance of social and intellectual groups of multiple designs were widely accepted, thus killing the ideal of professional individualism during the High Renaissance. *Trace italienne* was disseminated by the military engineering profession and its overall effect was contingent upon how societies in Italy principally absorbed the new knowledge into its societal framework.

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CHAPTER 3: CROWS DRESSED IN PEACOCK FEATHERS: PRINT CENSORSHIP AND APPREHENSION AMONG 16TH CENTURY ITALIAN MILITARY ENGINEERS

Sixteenth century military engineers endured challenges in trying to keep their work secure. As with all vocations that depend on print to establish a sense of prestige and credibility, unauthorized imitation presents as an extreme problem. In the early modern era, few military engineers wanted a shared culture among peers as many feared the stealing of intellectual theories and designs. Gabriello Busca deemed it necessary to talk about new theories and ideas among his contemporaries.[88] The idea of *trace italienne* was a widespread phenomenon, but ownership over such an esteemed design caused military engineers to accuse each other of plagiarism. Military engineers needed their theories and geometrical drawings to be printed to gain public credibility, vocational prestige, and economic wealth within Italian society. The desire for individual recognition and publicity was paramount to achieve aristocratic and patron benefits. Strong competition created suspected fears of plagiarism between military engineers, with some denying the public benefits of patronage to keep their works away from charges of fraudulence. Horst de la Croix noted that, "Particularly within the ranks of military architects, the concept of intellectual property took a firm hold, as various engineers jealously tried to guard, or at least to reap recognition for, inventions which they claimed to have made."[89] This presumed and mysterious un-

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[88] Horst de la Croix, "The Literature on Fortification in Renaissance Italy," *Technology and Culture* 4, no.1 (Winter 1963): 43. Gabriello Busca was not alone in his agenda but contemporaries found it troubling that he would want to "give away" the findings in his *L'architecttura militare* to others through groups and conferences. Alghisi, another engineer of the cinquecento, blamed men like Busca for distributing his "idea" of the stellated polygon, which proved very effective in ballistic warfare. The initial leak of his theory came at the cost of attending conferences in Rome throughout the 1530s-1540s, which were promoted by Busca, Antonio Sangallo the Younger, Pope Paul III, and numerous others. This situation will be addressed later in the chapter.

[89] Horst de la Croix, "Military Architecture and the Radial City Plan in Sixteenth Century Italy," *The Art Bulletin* 42, No. 4 (Dec., 1960): 275. This quotation was found within footnote 54.

easiness concerning fraudulence and print censorship among sixteenth century military engineers will be questioned and brought to the forefront in this chapter. Illicit

To understand plagiarism during this era, one must look at the distribution and handling of Italian printed treatises and manuscripts among the mass public. Print was vibrant in the early cinquecento, especially in Venice and Padua, but as *trace italienne* spread throughout the Italian peninsula an evident lack of printed material dealing with fortification theory has been witnessed. J.R. Hale and Horst de la Croix researched this gap concerning published fortification treatises and noticed that a dominant presence of fortification print was not seen until the last third of the cinquecento (1560-1598).[90] Multiple reasons for the print gap will be investigated throughout this chapter. In the last decades of the quattrocento (1470-1500), Francesco di Giorgio produced treatises that concerned *trace italienne* within *Trattato I* and *Trattato II.*[91] These two primary works were viewed as "guiding lights" for a profession that did not see extreme demand until the French invasion of 1494. Other military engineers, including Francesco di Giorgio, looked to Vitruvius' *De architectura* for foundational inspiration concerning architecture theorem. Written around 40 B.C, *De architectura* was printed and translated by numerous individuals like Giovanni Giocondo (1433-1515), Cesare Cesariano (1475-1543), and Francesco di Giorgio.[92] Vitruvius' *De architectura,* Leon Battista Alberti's *De re aedificatoria* (1452)*,* and Francesco di Giorgio's *Trattato I & II* (late 1470s) laid the groundwork in fortification literature

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90 J.R. Hale, *Renaissance War Studies* (London, UK: The Hambledon Press, 1983), 429-432. and de la Croix, "Literature," 37-44.

91 These two treatises by Francesco di Giorgio Martini (*Trattato di Architettura)* were written around 1480 according to *OMI-Old Manuscripts & Incunabula* located in New York City, NY. Editions can currently be bought at there at http://www.omifacsimiles.com/brochures/francesco.html.

92 Pamela O. Long, *Openness, Secrecy, Authorship: Technical Arts and the Culture of Knowledge from Antiquity to the Renaissance* (Baltimore, MD: The John Hopkins University Press, 2001), 134. The date of Vitruvius' work is diverse, yet I have decided to adopt Long's proposed date of circa 40 B.C. Additional information about Vitruvius' editions can be found in Pamela O. Long, *Artisan/Practitioners and the Rise of the New Sciences, 1400-1600,* (Corvallis, OR: Oregon State University Press, 2011), 63, 83, 84, 87.

during the first half of the cinquecento. Can historians be naive enough to claim that just these printed works provided the base for future work in *trace italienne*? Multiple reasons and questions surrounding the fortification print gap will be examined throughout this chapter.

Military engineers produced models of their geometrical findings within written letters, manuscripts and miscellaneous journals that were constantly being reformed. In many scenarios, the geometric drawings of such working theories did not properly translate into real-time structural fortifications. I believe that frustrations attached with editing contributed to a lack of printed fortification treatises seen during the first half of the cinquecento (1498-1558). Preliminary fortification models were rarely established enough to give to potential Italian publishers or *editori*.[93] Therefore, many publishers and printers would not take a hit on their budget for the whims of engineers to pursue a wealthy patron. Constant reformulation and illicit reproduction of works directly conflicted with the need to gain prestige and societal recognition among peers and aristocratic elites.

The body of this chapter will address certain questions: What about print censorship and the sanctity of "ideas" among military engineers who strive to constantly improve their ground plans and structural theories concerning *trace italienne*? Did book fairs and conferences elevate a military engineers' theories to patrons and elites or expose them to a mass populace that practiced fraud and counterfeiting? Was the competition among military engineers respectable or did contemporaries steal and copy theories and designs when made available? Was there a gap in

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[93] Brian Richardson, *Printing, Writers, and Readers in Renaissance Italy* (Cambridge, UK: Cambridge University Press, 1999), 28-31. *Editori,* according to Richardson, are any such investor(s) in the system of printing. This term means "publisher" in Italian but has multiple meanings. An *editori* can be anyone who supported financial printing but did not own an actual operating press. Anyone who owned a press and contributed to the financial debt of activities could be a part of the *editori.* Other printers who worked as artisans or had a "practical" purpose in the press could also be deemed worthy an *editori.* There are multiple other definitions attached to this Italian term and Richardson does a great job describing this in his book.

printed fortification sources from 1500 to 1550 because of indecisiveness in theoretical thinking, fear of being plagiarized among peers, or/and not wanting prestige and fame for mere doodling and scribbles of fortification structures on paper? Did the Sack of Rome of 1527 truly have any impact on the lack of print seen in the first half of the cinquecento? Why was there a need to print fortification treatises and engineering manuscripts in the 1570s to 1590s, as opposed to the 1520s, when the Italian peninsula was overrun by foreign monarchs, religious leaders, political magistrates, and wealthy patrons? Answers to these questions will be pursued.

3.1. The Need for Fortification Literature within Patronage and Print

Handwritten letters and practical theories in military engineering were taken, printed, and distributed to a public audience. After the 1494 French invasion, a growing need for fortification defense was seen among numerous aristocrats, patrons, and elites across the Italian peninsula. Similar to the spread of humanism, the growing demand for *trace italienne* extended far beyond the peninsula to Northern Europe, Asia, and the early Americas.[94] This span sparked a vicious battle for employability and recognition, which enabled the Italians to become the masters of this new design in defensive fortifications. From the 1480s to late 1520s, military engineers were hired to take projects with an individualistic attitude, as referred to by Jacob Burckhardt.[95] Their skills were viewed as supreme and not performable by other professions until the Venetian Pal-

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[94] Jeremy Black, ed. *War in the Early Modern World* (London, UK: UCL Press, 1999). Within this work, co-authors Peter Lorge and Armstrong Starkey address war in Asia and the North Americas in the early modern era. The culture of these geographic areas changed as weaponry spread through individuals, groups, and trade enterprises. Demand for the evolution of fortification design increased once these weapons were established in these areas.

[95] Jacob Burckhardt, *The Civilization of the Renaissance in Italy* (New York: Random House, Inc., 1954). Individualism in the Renaissance is an living being, although it is constantly being challenged by outside authorities. In the case of the military engineer, the invention of cannonry created a vocational opening for men who were masters of fortification. This threat of vulnerability to weaponry gave engineers the opportunity to be employed by patrons. Their skills were seen as individualistic and their decisions could affect, individuals, groups, aristocrats, magistrates, city-states, and entire countrysides. This demand for intelligence through military engineers proved that individualism within the Renaissance was very much alive. This interpretation goes against Fernand Braudel's meaning of individualism in *The Mediterranean* (1949), which views individuality nearing its end as the age of Philip II wanes into the modern.

manova project in the early 1590s.[96] Before Palmanova, the economical profit for the military engineer was not shared by other specialists and was considered a decent vocation of choice. This strata conglomerated as print manufactures brought printed fortification treatises to a mass public after the 1560s.

The struggle for patronage through print coincides with multiple vocations throughout the High Renaissance. Research on these endeavors has been profiled, but not within the confines of military engineering. Dealings with sixteenth and seventeenth century patronage have been mentioned in Mario Biagioli's *Galileo Courtier* and Henri-Jean Martin's *Print, Power, and People in 17th- Century France*.[97] To be more specific, numerous print and art historians have traced the evolution of print and patronage through relationships between sixteenth century musicians and printers.[98] Iain Fenlon's 1994 *The Panizzi Lectures: Music, Print, and Culture in Early Sixteenth-Century Italy* follows the transformation of how written musical notes and staffs were displayed on printed manuscript paper and woodcuts. Fortunately for musicians, the market demand for musical manuscripts was high and printers hardly ever declined printing music.[99] Military engineers faced difficulties of a different nature throughout the cinquecento. Printed treatises of forti-

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96 This statement is at the forefront of the first chapter in this Master's thesis. Military engineers were viewed as men of individuality until the construction of Palmanova, which brought together specialists in other educational fields to work on cohesive fortification projects.

97 Mario Biagioli, *Galileo Courtier: The Practice of Science in the Culture of Absolutism* (Chicago, IL: The University of Chicago Press, 1993). Henri-Jean Martin and David Gerald, trans. *Print, Power, and People in 17th-Century France* (Metuchen, NJ: The Scarecrow Press, Inc., 1993). These two works have laid great foundations for more in-depth works on the print industry, the culture and society it affected, and the particular individuals who engaged in it.

98 Some well-known art historians include Francis Haskell's *Patrons and Painters: Art and Society in Baroque Italy* (1962), Brian Richardson's *Print Culture in Renaissance Italy: The Editor and the Vernacular Text, 1470-1600* (1994), and Frederick Hartt's *History of Italian Renaissance Art* (7th ed. 2010).

99 Iain Fenlon, *The Panizzi Lectures: Music, Print, and Culture in Early Sixteenth-Century Italy (*London, UK: The British Library, 1994), 15-29. 16th-century music was recognized as a necessity and multiple groups of Italian society demanded it. Jane A. Bernstein writes that notable royal monarchs, aristocrats, dukes, patrons, ecclesiastical and secular institutions, academies, universities, individuals from professional and merchant classes, composers, and other printers wanted printed music in the cinquecento. Jane A, Bernstein, *Print Culture and Music in Sixteenth-Century Venice*. New York, NY: Oxford University Press, 2001, 93-94.

fication theories and structures were not viewed favorably by printers and editors across the Italian peninsula. Geometrical designs constantly changed as bastions were being constructed and this caused numerous frustrations for printers who needed definitive material to print. It can be stated that engineers were "reluctant to go into print if they felt that a text was not yet in the finalized state which was required for reproduction on a wide scale."[100] The cost of paper was always set at a high rate and waste was unacceptable.[101] Printers needed to produce material that could be replicated without refinement from military engineers. Musicians expected their work to be mass produced across Europe. Military engineers wanted this as well, but feared that their work could cause division and plagiarism among fellow artisans if given prematurely.

3.2. The Historiography of Print Culture and Its Importance

Jane A. Bernstein's *Print Culture and Music in 16th Century Venice* fleshes out how musicians engaged European book fairs, publishing markets, and respected printers. I believe that the research conducted by Bernstein can be equally applied to that of the military engineer. Although her book deals with sixteenth century musicians, the interactions and struggles of getting written works printed were pertinent for all artistic vocations of the High Renaissance.[102] Influential conductors of print, like Girolamo Scotto and Antonio Gardano, worked around Venetian lawmakers, senators, and Holy Office officials to get treatises and manuscripts to the public sphere.[103] These two publishers controlled just a few of the 150+ printing shops across the Venetian landscape around the early 1500s.[104] Bernstein proposes throughout her research that, "commerce played a crucial role in every aspect of music printing," and in the "role of the entre-

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100 Brian Richardson, *Printing, Writing, and Readers,* 78-79.
101 Fenlon, 29.
102 Bernstein, *Print Culture,* 4.
103 Ibid., 13-15.
104 Fenlon, 15.

preneur." She declares that print culture in Venice was a "business phenomenon."[105] Agreement with such a statement directly coincides with a larger argument made within a pioneering work written by Elizabeth L. Eisenstein. The two part volume, *The Printing Press as an Agent of Change,* marks the validity of the "advent of printing" as a critical and "most important event in the cultural history of mankind."[106] The desire for profit and wealth directly influenced military engineers to push publishers to print their treatises to gain recognition among elites and potential patrons. Did commerce influence the role of print and expand the system of patronage in the cinquecento? Absolutely. Comprehending this will help provide useful information on why anxiety existed among this group of engineers as more works became available to the mass public.

To gain credibility among *editori*, military engineers had to develop and maintain relationships of shared interests. It must be realized that military engineers and printers methodically thought in different ways. Each had their own agendas with attached preconditions. J.R. Hale describes this relationship in saying that,"the printer thought in terms of the market, the author [engineer in this case] in terms of a patron."[107] Fame, dedicating treatises to a potential patron, a reputation for expertise, employment, stipends, and commerce were benefits of getting manuscripts printed for military engineers. The hopes and demands from printers culminated in having a respectable reputation among fellow printers, artisans, and elites, a dependable income to sup-

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105 Bernstein, *Print Culture,* 4-5.

106 Elizabeth L. Eisenstein, *The Printing Press as an Agent of Change: Communications and Cultural Transformations in early-modern Europe Volumes I & II* (Cambridge, UK: Cambridge University Press, 1979), 167. To say that this work is controversial is an understatement. Jean-Francois Gilmont points out that, "Eisenstein attempts to prove that the introduction of printing led to deep divisions in the history of western culture. This viewpoint is not shared by all. Others scholars argue the opposite; that Gutenberg's invention, in the course of the long history of the book, was much less revolutionary than it might seem at first." Two notable scholars that share this opinion with Gilmont are R. Hirsch and Roger Chartier. Jean-Francois Gilmont and Karin Maag. trans. *The Reformation and the Book*. Aldershot, UK: Ashgate Publishing Limited, 1998, 13. For the sake of picking sides, my arguments in this chapter would be nullified if I did not see printing as somewhat revolutionary. The extent of how revolutionary can be questioned, but nonetheless, early modern printing has revolutionary aspects attached to it.

107 Hale, 432. Brackets are my own within the quotation.

port their family, gaining patrons to pay for printing expenses in paper, ink, and second editions, and spreading literacy among the city-states of the Italian peninsula.[108] Even though *editori* and military engineers had different goals, each had inclinations to gain the attention of patrons. Ultimately, the *editori* had control over the military engineers in this arena. Many engineers and artisans did not succumb to printers. Notable men like Alberti, Ghiberti, Copernicus, and Machiavelli, and Galileo either had intentions of printing their treatises themselves or delayed the printing of their works until their souls had left this world. Copernicus was not in a rush to publish his *De Revolutionibus,* therefore letting Rheticus publish his innovative yet controversial work on the universe.[109]

Galileo Galilei's view on printing directly affected his early career within academia and the technical/scientific field. His work on the military compass, *Operations of the Geometrical and Military Compass,* was not published until 1606 by Marinelli, in Galileo's forty-second year. Mario Biagioli notes that Galileo had been conducting mathematical work since 1587 but suffered as a published author due to disputes with his fellow Paduan student Baldassare Capra.[110] Galileo was content to use manuscript copies of his work as he taught his students the military arts of fortification and mechanics at the University of Padua from 1592-1610. His fears on plagiarism, if any during the early years at Padua, were only noticeable when his students claimed work that was not theirs. Traditionally, like some military engineers, mathematical scientists

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108 Bernstein, *Print Culture,* 102, 105.

109 Eisenstein, 252, 576. As mentioned, multiple authors decided to forgo print for personal reasons. Machiavelli saw only three of his works printed but had many works printed posthumously. A culmination of military engineers in the cinquecento had their works printed posthumously. Giovan Battista Bellucci, Giacomo Leonardi, Jacopo Fusta Castriotto, Antonio Lupicini, and Francesco di Marchi never saw their works printed. Croix, "Literature," 38-42.

110 Mario Biagioli, *Galileo's Instruments of Credit: Telescopes, Images, Secrecy* (Chicago, IL: The University of Chicago Press, 2006), 3-5. Also look at Matteo Valleriani, *Galileo Engineer* (London, UK: Springer, 2010), 27-29.

would communicate "their discoveries and theorems to other specialists through letters or personal visits.[111] Galileo was paid decently for being a professor and did not fit the economic constructs of military engineers of the cinquecento. Engineers needed patrons for employability, but Galileo was employed at the universities at Padua and Pisa. Despite his economic situation, it can be seen that Galileo's confrontation with Capra changed his nonchalant-views concerning printed material, plagiarism, and censorship. The control of intelligence was difficult, especially for the students within Galileo's classrooms. Biagioli sees the Capra quarrel as methodically changing Galileo, viewing print as a means "to control, not to communicate."[112] Numerous military engineers during the cinquecento saw print similarly, therefore seeing knowledge as a means to control Italian society.

3.3. The Complicated Relationship between Printers and Military Engineers

Engineers had to have confidence and mutual respect for printers, knowing that giving their work to print could result in fraud, unauthorized duplication, and plagiarism if undermined. *Editori*, like Scotto and Giorgio Vasari, established relationships and connections with numerous employers, artisans, and patrons. Market demand and flow of money were influential agents in the world of print and it would not be a stretch to conclude that some printers probably chose to print more demanding pieces of literature to achieve wealth and recognition. This resulted in more recognizable engineers getting their works publicly printed before lesser known individuals. For example, a treatise by Leonardo da Vinci and Michelangelo would be more appealing to a mass public than one by Giovanni Battista Bellucci (1506-1554) in the early years of the cinquecento. As the century progressed, Bellucci and other engineers would get their chance at

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111 Biagioli., 5, 7, 8.
112 Ibid., 4.

patronage but after death. Bellucci's *Nuova invenzione di fabricare fortezze di varie forme...,*was written before 1554 but not published until 1598 by Tommaso Baglioné, forty-four years after the author's fatal meeting with fire weaponry.[113] His works were echoed by Francesco di Marchi and Castriotto in the later years of the cinquecento, but the recognition he deserved was never credited to him while living. Another of his truly innovative works on earth centered fortifications, *Trattato delle fortificazioni di terra (1554),* was not published during the era of *trace italienne*. Bellucci is just one of many military engineers that did not establish credentials with *editori* during the cinquecento.

To be fair, Horst de la Croix mentions that numerous grammatical and structural problems existed within Bellucci's treatises and this may be the cause of why printed works by engineers were not abundant among the mass populace. Ideally, works by military engineers were not the most favorable to print during the 1500s. They contained multiple artistic designs, numerical and geometrical figures, and prolonged explanations of how to decipher their particular ways of thinking. Giovanni Giocondo's printed version of Vitruvius' *De architectura* (1511) required one hundred and thirty-six of his own woodcuts to be printed.[114] Additional hardships came with producing printed works of Vitruvius' *De architectura.* Cesare Cesariano's early-sixteenth century printed translation of Vitruvius was halted by his sponsors Agostino Gallo and Aloisio Pirova after disagreements, in which many details remain unknown. The sponsors stopped the supposed publication of 1,300 copies by "intercepting" Cesariano's materials and papers from him.[115] Giacomo Barozzi da Vignola (1507-1573) recognized the financial toll of printing archi-

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113 Croix, "Literature," 40. and Croix, "Military Architecture and the Radial City," 274. Giorgio Vasari writes that Bellucci was hurt multiple times throughout his career by weaponry. His encounters with harquebuses were painful. A harquebus ball found his thigh during a mining operation at Monte Alcino. His last venture ended with him suffering fatally from a harquebus ball in the head.

114 Long, *Artisan/Practitioners,* 84.

115 Ibid., 91.

tectural works during the cinquecento.[116] To help eliminate confusion and prolonged explanations of models, Vignola used numeracy instead. His drawings were explained through numbers and geometrical equations, thus cutting the amount of paper needed to print architectural treatises. Andrea Palladio's *Four Books of Architecture (1570)* and Vignola's *Regola delli cinque ordini d'architettura* (*Canon of the Five Orders of Architecture*, 1562) moved away from an Alberti-treatise style to gain a more favorable chance of employability through print. Nonetheless, military engineering works had to be the most difficult to print based on these components.[117] The pressure of getting employed was intense and military engineers had to overcome numerous obstacles to gain recognition for their artisan career.

One of the main obstacles between military engineers and the *editori* was the printing of illustrations and geometrical designs in paper for mass distribution. The mechanics of printing will not be discussed within this chapter, as works by Brian Richardson, Pamela O. Long, and Elizabeth Eisenstein have already detailed this intricate process.[118] Illustrations were rare during the early cinquecento and were mostly printed by Albrecht Dürer (1471-1528). A man of multiple vocations, Dürer converted to print production once he realized that being a painter, architect, and engineer was not a beneficial way to live. Dürer saw printing illustrations as the future after the height of the Italian Renaissance and produced 35 engravings and 90 woodcuts during his

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116 Mario Carpo, "Drawing with Numbers: Geometry and Numeracy in Early Modern Architectural Design," *Journal of the Society of Architectural Historians* Vol. 62, no.4 (Dec. 2003): 455.

117 Gilmont, *Reformation,* 233. Jean-Francois Gilmont presents the difficulties of the print industry at the rise of the 16th century. Additional details can be found in his synopsis named, "Printing at the dawn of the sixteenth century," 10-20. Ugo Rozzo and Silvana Seidel Menchi are the authors of the chapter, "The book and the Reformation in Italy." It focuses on the influence, if any, the Reformation had on printed material in Italy. 319-367.

118 Works to look up would be Brian Richardson's *Print Culture in Renaissance Italy: The Editor and the Vernacular Text, 1470-1600* (1994), Pamela O. Long's *Openness, Secrecy, Authorship: Technical Arts and the Culture of Knowledge from Antiquity to the Renaissance* (2001), and Elizabeth Eisenstein's *The Printing Press as an Agent of Change: Communications and Cultural Transformations in early-modern Europe Volumes I & II* (1979).

career.[119] His past vocational experiences gave Dürer the ability to print numerous fortification, geographical, and religious illustrations that reflected the ideologies of numerous occupations throughout the High Renaissance. Having a converted engineer produce fortification woodcuts and engravings brought hope to men like Michele da Sanmichele, Giulio Savorgnano, and Bartolomeo Campi that their geometrical works and designs could be successfully converted to printed treatises.[120] His woodcuts are intricate and it begs to wonder how a man could produce such vivid illustrations through a printing press. A few of his well-known prints are the *Knight, Death, and the Devil, St. Jerome in His Study,* and *The Apocalypse*. Dürer's fortification works are printed in his 1527 *Treatise on City Fortification* with the untitled, [*Design by Albrecht Dürer for 16th century fortification*]*, The Siege of a Fortress,*[121] and *On Fortification*. All of these woodcuts show designs of *trace italienne* and how they could be implemented to a mass public across the European continent. With his death culminating the next year (1528), Dürer's fortification prints were introduced during the chaos of the Sack of Rome by the Holy Roman Emperor Charles V. The treatise by Dürer was printed during a mysterious gap, in which only a few printed fortification treatises appeared throughout the first half of the cinquecento.

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119 Sharon Gregory, *Vasari and the Renaissance Print* (Surrey, UK: Ashgate Publishing Limited, 2012), 63. Albrecht Dürer was viewed by Italian society as an innovative force in the production of printed woodcuts and engravings. These fortification prints were some of the first to appear but some engineers like Gabriello Busca warned contemporaries of its legality. Busca called out Dürer's work as not capable of withstanding cannon fire. This was an opinion, of course. Discussion of the relationship of Dürer and Busca can be found in Horst de la Croix's book, *Military Considerations in City Planning: Fortification,* (New York: George Braziller, Inc. 1972), 44-45. Also look at Juergen Schulz's, "Jacopo de' Barbari's View of Venice: Map Making, City Views, and Moralized Geography," *The Art Bulletin* 60, no.3 (Sept. 1978): 425-428.

120 Mary Henninger-Voss, "Working Machines and Noble Mechanics: Guidobaldo del Monte and the Translation of Knowledge," *Isis* 91, no.2 (June 2000),242.

121 Library of Congress Archive. http://www.loc.gov/pictures/item/2006690453/. The prints of Dürer are viewable through these websites: htttp://www.davidrumsey.com/amica/amico1317878-53247.html.and http://www.museothyssen.org/microsites/exposiciones/2007/Dürero_Cranach/fundacion/fundacion13_ing.html.

3.4. The Gap in Renaissance Printed Fortification Literature

Was the gap in printed fortification treatises a result of the Sack of Rome or from a heightened sense of the threat of plagiarism amongst fellow military engineers and *editori* from 1527 to the 1560s? The answer to such a complex question could be yes, no, or both but more importantly: why? Any foreign invasion could freeze the manufacturing and distributing of printed materials within a particular city-state but would it halt the spread across an entire peninsula? In *Renaissance War Studies,* J.R. Hale has provided data that could possibly answer this. Before looking at this data, it must be noted that Venice was the most influential and productive city in the movement of printing literature across the Italian peninsula and Southern Europe. Only a few Italian city-states like Padua and Florence contributed to the massive fluctuation of print during the cinquecento. Rome, oddly enough, was not an influential center of print distribution, thus a foreign sacking would not entirely cripple the production of print throughout sixteenth-century Italy.[122] Rome's guidance on print culture was strong because of the influence of Popes Julius II and Leo X, but did not equal that of Venice. As mentioned before, Venice controlled up to 150 printing shops throughout its borders and many of the best *editori* like Giunta, Antico, Petrucci, Scotto, and Gardano resided there.[123] Iain Fenlon's *Panizzi Lectures* notes that the Sack of Rome disrupted many of the normalities there. The sack crippled the city and most of the printing equipment disappeared as Imperial troops pillaged shops, homes, and palaces.[124] The devastation affected Rome for years but printing quickly resumed once printer Valerio Dorico returned in 1529. His first printed work was Fabio Calvo's *Antique urbis Romae cum regionibus*

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122 Hale, 429-432. This statement can be made by looking at the graphs and tables from Hale's data concerning military print and its distribution throughout Venice and the Italian peninsula. There is no need for me to replicate. Actual numbers from this data are mentioned and discussed later in this chapter.

123 Fenlon, 15, 36.

124 Ibid., 39. A more comprehensive work on the Sack of Rome in 1527 can be found in F. Gregorovius, *The History of the City of Rome in the Middle Ages* (London, UK: 1894-1902).

simulachrum (1532), which was a Raphael-inspired diagram of a restored Rome.[125] The direction that Italian printers followed did not benefit engineers in their search for patronage and recognition. Not one fortification treatise was published out of Rome until 1569, which was titled, *Discorsi di fortificationi* under the Italian military architect Carlo Theti.[126]

Venice became the authority for printed works on military affairs from 1492 to 1570. From this timespan, up to one hundred and forty-five treatises were strictly on military dealings, engagements, and strategies. Fifty-three of the treatises were printed originally by 46 different Venetian writers and thirty-two other writers lived outside of Venice. Out of those one hundred and forty-five published works, only nine were original titles dealing with fortification theory. Four dealt with fortification by mentioning artillery strategies and designs.[127] To put this in perspective, Venice accounted for half of the total number of treatises and books that were produced in Italy, while Venetian printers produced half of the books in Italy.[128] Was there a reason why so few fortification treatises were published from 1492 to 1570 during the age of cannons and *trace italienne*? The Sack of Rome did not stop printers from publishing works to a mass public, as demand for literacy was still prevalent. Venice, despite the Imperial takeover of Rome, still conducted its print enterprise but chose not to focus its direct attention on military matters. By 1500, Venice had produced over two million copies of printed material over a population rate of fifty-

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125 Ibid., 40-41.

126 Hale, 452.

127 Ibid., 429. It is amazing to see how little the demand was for printed fortification works, knowing that constant warfare was seen everywhere across the Italian peninsula. Besides the treatise by Carlo Theti, Girolamo Cataneo's *Opera nuova di fortifcare...* and Giovanni Battista Zanchi's *Del modo di fortificar le citta'...*were the only Italian fortification works published after Dürer's 1527 *Treatise on Fortification*. Hale, 452.

128 Ibid., 430. Henri-Jean Martin traces this trend into early-17th century France in his *Print, Power, and People.* From 1601 to 1641, only three printed architectural works were present, with ten coming to prominence from 1642 to 1670. Mathematical works numbered fourteen in the first half of the 17th century and twenty-one in the other half. Numerical growth was seen through more printed works in France than architectural/fortification works in Italy. Martin, 347.

five to sixty-million.[129] Production might have been hindered due to the Sack of Rome but only slightly. The only fortification works by Venetian publishers were Galasso Alghisi's *Delle fortificazione libri tre* (1570), Jacomo Lanteri's *Due dialoghi...del modo di disegnare le piante delle fortezze secondo Euclide* (1557), and Girolamo Maggi and Fusto Castriotto's joint treatise *Della fortificatione della città libre tre* (1564).[130] The explanation for why Italian *editori* chose not to produce fortification treatises was due to engineers not being definitive in their theories along with a lack of demand from the mass populace.

3.5. Trust and Obey: Giorgio Vasari's Relationship with Military Engineers

The reasons why engineers did not get their work published was a reflection of the insecurities and changing nature of their profession. Military engineers needed theoretical and groundbreaking designs to be considered relevant. To be employed was a top goal for engineers, and many had to trust other individuals to secure such aspirations. This trust had to be shared with other engineers, *editori*, officials at book fairs, and *procuratori* (agents) to gain patronage amongst elites and patrons. Trust in publishers was evident through men like Giorgio Vasari (1511-1571), who wrote *Le Vite de' più eccellenti pittori, scultori, ed architettori da Cimabue insino a' tempi nostri* (*The Lives of the Most Eminent Painters, Sculptors, and Architects from Cimabue to Our Times*), also known as *Lives of the Artists*.[131] This multipart encyclopedia shares

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129 Fenlon, 15.

130 Croix, *Literature,* 48, 49. Provided here is a complete list of all military literature that was printed from 1300-1650 across Europe. Other notable works in fortification are not from the Italian peninsula during the gap (1520-1570). The works mentioned are printed in Venice and a couple in Brescia during the gap. Milan, Florence, Rome, and other Italian cities start publishing fortification works but after the 1570s. To be fair, some works of military art may include some mention of fortifications but are not strictly devoted to it like the works by Alghisi, Maggi,, Zanchi, Catameo, and Lanteri.

131 Giorgio Vasari, trans. Gaston Du C. de Vere. *Le Vite de' più eccellenti pittori, scultori, ed Architettori da Cimabue insino a' tempi nostri* (*Lives of the Most Eminent Painters, Sculptors, and Architects)*, (New York: Harry N. Abrams, Inc., Publishers, 1979). An online version of Vasari's 1568 *The Lives* can be found at The Library of Congress Archives: http://archive.org/details/livesofmostemine01vasauoft. Another online version is available at *The Medieval Sourcebook. http://www.fordham.edu/halsall/basis/vasari/vasari-lives.html.*

the relationships Vasari had with multiple artisans and engineers throughout the cinquecento. In many ways Vasari's *Le Vite* is still being explored, as new research about these artisans emerges. These three volumes contain printed works by numerous military engineers like Giovanni Battista Bellucci (referred to as Giovan Battista San Marino by Vasari), Michele da Sanmicheli, and Leonardo da Vinci among others.

Vasari's role among military engineers was complex, as his writing suggests. For engineers, having Vasari as a friend and confidant was troubling but necessary. Vasari was personally well-liked among multiple artisans but his job caused uneasiness and anxiety within the patronage realm. In knowing so many individuals, it must had been a daunting and exhaustive task to print treatises, woodcuts, and engravings to gain patronage for his fellow employees. Apprehension concerning fraud, plagiarism, and censorship haunted Vasari and his print enterprise. Self-promotion was a key factor seen in Vasari's prints as he helped escalate numerous artisans like Michelangelo, Michele da Sanmicheli, Giulio, and Rosso to employability among patrons and elites. *The Lives of the Artists* was another opportunity for engineers to gain publicity but at the discretion of what Vasari thought about them. For Bellucci, Vasari writes that:

> I have judged that it would not be well to withhold what I have to say of him,...particularly in order to show that men of fine intellect, if only they be willing, succeed in everything, even if they set themselves late in life to difficult and honourable enterprises; for study, when added to natural inclination, has often been seen to accomplish marvellous things.[132]

Bellucci was viewed as an inspirational figure by Vasari. Bellucci did not receive fame for published treatises but was viewed as a man of intellectual mastery among Italian society. Vasari continues to praise Bellucci by writing that he:

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132 Vasari, *The Lives,* 1566.

deserves to be highly extolled, for the reason that, besides having been excellent in his profession, it is a marvelous thing that, having set himself to give attention to it late in life, at the age of thirty-five, he should have made in it the proficience that he did make; and it may be believed that if he had begun younger, he would have become a very rare master. Giovan Battista was something obstinate, so that it was a serious undertaking to move him from any opinion.[133]

Vasari writes that Bellucci's life was plagued by downfall but rose to become someone great. His wife died in 1541, which led to his two boys being raised alone by their unmotivated father. In his thirties, Bellucci decided to become an architect dealing with fortification design. This new stage of his life welcomed a man named Signor Gustamante, an Imperial Spaniard who had come to the Italian peninsula after the Sack of Rome. His services brought him into employment under Duke Cosimo I. Over the next ten years Bellucci undertook numerous fortification projects, while writing his book on earth centered fortifications. His work remained unpublished, residing with a Florentine friend named Messer Bernando Puccini.[134] Bellucci gained creditability through his relationships, proving that engineers without publications can receive patron support during the cinquecento.

Engineers like Bellucci received opportunities for employment through individual relationships, not through printed material. Vasari's *Lives of the Artists* helped bring the story of Bellucci to an Italian society that knew very little of him in 1550, but Bellucci gained employability among aristocrats like Cosimo di Medici and Don Garza di Toledo before Vasari's encyclopedia was published.[135] Vasari's *Le Vite* helped engineers who lived after 1550, describing engineer's personal feelings and characteristics to patrons and elites across the peninsula. Michele San-

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133 Ibid., 1568.

134 Ibid., 1566-67. Bellucci's friendships with Cosimo, Puccini, and Vasari proves how important individual and intimate relationships were during the age of Italian patronage. Printed works helped bring attention and detail to a particular cause but sometimes lacks the ability to bring the reader closer to the author. Dedications do help bring patrons together but knowing individuals personally always makes scenarios closer to the heart.

135 Vasari, 1566-67.

micheli was viewed by Vasari as "a man of upright life, and most honourable in every action. He was a cheerful person, yet with an admixture of seriousness...He was very liberal, and so courteous with his friends, that they were as much masters of his possessions as he was himself."[136] These were attributes that dear friends could describe, not mere business partners. Descriptions like these were just as beneficial to gaining employment as dedicating a printed work to a particular patron or magistrate. It is relationships like these with Bellucci and Sanmicheli that make reliable trust with printers either an enjoyable enterprise or a nervous venture of backstabbing and perpetual anxiety.

It was important to establish relationships between *editori* and military engineers but some tensions between the two vocations were not entirely of their making. The Protestant Reformation and the Wars of Religion produced multiple tensions among *policentrismos* and print centers across sixteenth-century Europe. Henri-Jean Martin's *Print, Power, and People in 17th Century France* presents a short synopsis of how print became censured and inspected during the early cinquecento.[137] Huge amounts of printed works were distributed throughout the early sixteenth century but stagnated as original works began to wither and re-editions of classics emerged. Religious entities started to take over print in the mid-1550s and placed censures through the Council of Trent, the Ten "General Principles," and offices that oversaw the inspection of all books going through presses.[138] There were many city-states, territories, and principalities that viewed these regulations differently but focus will remain on Venice because of its influential role throughout the Italian peninsula.

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136 Ibid., 1584.
137 Henri-Jean Martin, *Print, Power, and People, 1-4.*
138 Ibid., 3-4.

3.6. Apprehension and Uneasiness amongst Military Engineers

Print censorship in Venice was demanding, frustrating, and daunting. Limitations on printing was reinforced through the Venetian Senate and the Holy Office, which made all printers own a license to publish. Privileges among artisans were revoked and in 1562 the Venetian State introduced its own procedures, which put censorship and prohibition at the forefront of the print enterprise. A list of banned books would circulate across the Venetian territories and owners of such works would be stripped of their licenses. To ensure legality of a new work, every manuscript had to be read by the clergy and two laymen. Each had to testify that the work did not have "anything against religion, or against princes, or any good customs."[139] Two manuscripts had to be printed for each legal work, which came out of the printer's budget if not under a patron. This process took one to three months and the *editori* had to pay the clergy and laymen to read their works before the printing process.[140] The exercise was exhaustive and many writers decided not to partake of print for fear of being punished. Despite the decision to print or not, "by the end of the sixteenth century, the idea of profiting directly from writing was widely accepted as perfectly natural and respectable."[141]

Heated engagements between engineers were few but mainly caused by disloyalty. J.R. Hale, Simon Pepper, Christopher Duffy, and Horst de la Croix have reiterated through their particular research that Francesco di Giorgio was the first to "engage" *trace italienne*.[142] Giorgio's

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139 Brian Richardson, 45-49.

140 Ibid., 45. Francisco Bethencourt's *The Inquisition: A Global History, 1478-1834* (Cambridge, UK: Cambridge University Press, 2009), 223. Bethencourt brings insight into the procedures of the Holy Office and the Roman Inquisition. Without notice, officials from the Holy Office would go into bookshops and presses to inspect certain works as counterfeit and unlawful. An Inquisitional seal was put on works for sale and redistribution. Bethencourt also feels that the study of print censorship is at a "level of hypothesis: studies of censorship practices are virtually non-existent, except for Venice and Naples..." Such topics are at the peak of early modern historical research in the 21st century.

141 Richardson, 101.

142 de la Croix, "Military Architecture and the Radial City," 275.

Trattato I & II claim him as the patriarchal leader of bastion design and presents counterfeit artisans as "crows dressed in feathers of the peacock." He claims that, "all which is contained in this my little work" is "of my own invention."[143] This defense by di Giorgio is very much like Vitruvius' back in Antiquity. His hopes were that, "his own lack of fame and reputation would be remedied by his treatise [*De architectura]*."[144] According to de la Croix, the 1570 controversial duel between Galasso Alghisi and Jacopo Fusto Castriotto was considered one of the strongest cases of print plagiarism and theft. In *Delle fortificationi libri tre,* Alghisi accused Castriotto of stealing his fortification geometrical "idea," which was the stellated polygon.[145] Resembling a starred-shaped structure, this fortification style was just an addition to Antonio da Sangallo the Younger's star based bastion design which came to prominence during the early years of the cinquecento.[146] Printers were unaware that Alghisi had come up with the "stellated polygon" at the presses. Honestly, most printers did not care about stolen "ideas" as long as they were paid and their chances at patronage were increased. It was not the job of the *editori* to find out who claimed ownership of particular fortification ideas.[147] In the harshest sense, engineers who gave their intellectual theories and designs to printers first were considered the authority on *trace italienne*.

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143 Long, *Openness,* 136. Found within Francesco di Giorgio's treatise, *Trattati di architettura ingegneria e arte militare* 2:425, footnote on 277.

144 Long, *Artisan/Practitioner,* 63.

145 Croix, "Literature," 41, and Croix, "Military Architecture and the Radial City," 275.

146 Michael S.A. Dechert, "The Military Architecture of Francesco di Giorgio in Southern Italy," *Journal of the Society of Architectural Historians* 49, no. 2 (June 1990): 162-163 and Richard J. Tuttle, "Against Fortifications: The Defense of Renaissance Bologna," *Journal of the Society of Architectural Historians* 41, No. 3 (Oct., 1982): 195.

147 William Eamon, *Science and the Secrets of Nature: Books of Secrets in Medieval and Early Modern Culture*, (Princeton, NJ: Princeton University Press, 1994), 110. Before print censorship was created in the 1560s in Italian peninsula, all works were open to be printed without discretion. It was a "free for all" culture in which competition was based upon who got their works to printers first. There was practically no way to prevent plagiarism or fraud before the age of censorship. *Editori* gained commerce through printed manuscripts and business was very good. See Eamon, Appendix, 361.

The written fight ended with Alghisi blaming the Rome conferences for letting so many minds come together to discuss their theoretical ideas amongst each other.[148] Multiple intellectual conferences were put together by Pope Paul III to help bring the best fortification theories to the service of Rome. Alghisi, Bellucci, Castriotto, di Marchi, Laparelli, Sanmichele, and many other military engineers were present at these conferences. Many of these military engineers viewed Giovanni Battista Bellucci's last years of his life as full of deception and lacking direction. Vasari mentions that Bellucci secretly took the fortification ground-plans of Siena and gave them to "the Lord Duke and to the Marchese di Marignano," so that they could easily invade the city.[149] His fraudulent actions were rewarded by the magistrates by naming him captain of three hundred foot-soldiers.[150] Bellucci and the Marchese used these men to siege Siena, which ended horribly for Bellucci. A harquebus ball ended the life of Bellucci in March 1554. The last acts of Bellucci did not represent the core of military engineers during the cinquecento. Vasari viewed him as an outstanding architect but realized that he let the pressures of employability get to him. He saw employability as a means to an end, even if it meant being a spy for the Imperial army. This scenario illustrates the extent to which engineers would go to be profitably employed.

3.7. In Conclusion: Swinging Doors

Except for a few military engineers, many decided to gain patronage and vocational prestige by having their written drawings and theories printed by the *editori*. One could either obey the rules and exhaustive measures to get their work published or create for themselves a reputa-

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148 Croix, 275. These conferences are explained in detail within my first chapter of the Master's thesis.

149 Vasari, 1567-68.

150 Ibid., 1568 and Simon Pepper and Nicholas Adams, *Firearms and Fortifications: Military Architecture and Siege Warfare in Sixteenth-Century Siena* (Chicago, IL: University of Chicago Press, 1986), 176. Bellucci's story is briefly mentioned in *Firearms and Fortifications* on page 176.Vasari's biography of Bellucci is quite amazing, putting in perspective how many artisans, painters, and sculptors are mentioned in *Le Vite.*

tion that would gain them credibility through intimate relationships. Roger Chartier describes this world of the military engineer by mentioning that, "authors do not write books: they write texts that become written objects."[151] Print censorship was a demand that could be taken by mortal individuals, *policentrismos,* institutions, and by God Himself. To lay claim to an "idea" was a difficult task, especially in a world which thrived off new and innovative directions and ideals. Many artisans faced unforeseen difficulties, resulting in apprehension, feelings of deception, and thoughts of betrayal by contemporaries, printers, and patrons. Italian society changed rapidly throughout the cinquecento, with new professions, inventions, and enterprises coming to prominence throughout the peninsula. Paths to vocational notability and prestige were unlocked for military engineers, depending on which doors they chose to venture through during their time on earth.

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[151] Roger Chartier, *The Order of Books: Readers, Authors, and Libraries in Europe between the Fourteenth and Eighteenth Centuries, , 1994.* 9-10.

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CHAPTER 4: CONCLUSION

This thesis focuses on military engineers who influenced the discombobulated city-states of the Italian peninsula. Italy is largely viewed by historians as the undisputed origin of *trace italienne*.[152] I strongly agree and do not wish to refute this statement in any way possible. It is in Italy where the first families of military engineers started to construct bastions of *trace italienne*. The introduction to this thesis lays out the groundwork for past and present scholarship on the "military revolution," Renaissance vocations, military technologies, scientific discoveries, and print culture. Careful research over the past fifty years has contributed to the advancement of this thesis in particular. The field of military history has undergone a structural change from within, presenting itself as more open to other sub-disciplines of historical scholarship. Integrating scientific and technological studies has provided historians, like myself, with the opportunity to expand traditional histories. By focusing on specific vocations like High Renaissance military engineers, new visions and intellectual theories can be explored. There is still very much to gain from primary sources that have been available for centuries. One needs to only include other subfields of history to create such new scholarship.

The first complete chapter of the thesis, "Men who could Balance Defense against Attack," dealt with the difficult acquisition and transferring of knowledge (*trace italienne*) within the Italian city-states. This included the overwhelming desire for hired military engineers among Italian principalities and how their individuality changed due to the evolution of Italian society. Furthermore, the acceptance and/or rejection of *trace italienne* was reflected through three case

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[152] J.R. Hale, *Renaissance War Studies,* 2. This claim is proven by Hale's statement that, "There can be no doubt, however, that in the first generation of the sixteenth century it was the Italians who experimented most freely, and that it was they who, in the second generation, became the acknowledged leaders, and the most prolific exporters of the new bastioned fortification." Other historians like Geoffrey Parker, Jeremy Black, and Brett Steele have also confirmed that the Italians were the first to construct *trace italienne* in the early modern world.

studies which involved Florence, Bologna, and Venice. These three scenarios displayed the evolving demand of military engineers throughout the cinquecento. Engineers were generally sought out as individuals who could envision and carry out *trace italienne* fortifications by themselves. Over the course of the sixteenth century, Italian societies hired military engineers in conglomeration with other professions to construct bastioned fortifications and radial cities. No longer did military engineers become the sole representative of a fortification project and this evolution was addressed explicitly.

The second complete chapter, "Crows Dressed in Peacock Feathers," took the thread of the thesis through anxieties and challenges associated with print, censorship, and patronage within cinquecento Italy. The inner desire for prestige and wealth, along with its limitations, was researched in conjunction with contemporary plagiarism. Few military engineers wanted a culture of sharing among peers but many feared fraudulence and the stealing of intellectual theories and designs.This uneasiness contributed to a lack of printed material dealing with fortifications during the first half of the *cinquecento,* therefore escalating after the Sack of Rome in 1527. It was not until the end of the *cinquecento* that a dominant surge could be seen in printing fortification manuscripts. Military engineers Giovanni Bellucci, Michel Sanmicheli, Francesco di Giorgio, and numerous *editori* were brought together within case studies to illustrate the decline and prominent rise of fortification print demand.

Much work is still required to provide a complete picture of the military engineer's influential impact upon war and society. The character and determination of these men deserves to be recognized as immediate contributors to the advancement of human civilization. Further studies could expand toward areas outside of Italy. France, England, the Netherlands, and the Americas

face similar challenges associated with gunpowder weaponry and ballistic technology. Research concerning the outside influences of *trace italienne* have been tackled by historians like Jeremy Black and Geoffrey Parker but have yet to focus entirely on the role of military engineers within these geographic areas. It is to be hoped that this thesis has contributed to new and innovative ways of perceiving vocational professions within early modern society.

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