HISTORY OF WARFARE ◆ VOLUME 73

Jesuits and Fortifications

The Contribution of the Jesuits to Military Architecture in the Baroque Age

Denis De Lucca

BRILL

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History of Warfare

VOLUME 73

The titles published in this series are listed at brill.nl/hw

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The Contribution of the Jesuits to Military Architecture in the Baroque Age

By

Denis De Lucca

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LEIDEN • BOSTON
2012

Cover illustration: "For the sole defence of the Catholic Faith" – Fortifications protecting Lorenzo Gafà's Baroque cathedral at Mdina, Malta.
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Library of Congress Cataloging-in-Publication Data

De Lucca, Denis
Jesuits and Fortifications : the Contribution of the Jesuits to Military Architecture in the Baroque Age / By Denis De Lucca.
pages cm. — (History of warfare ; v. 73)
Includes bibliographical references (p.) and index.
ISBN 978-90-04-21651-8 (hardback : alk. paper)
1. Military architecture—History. 2. Architecture, Baroque. 3. Jesuits—Education—History. I. Title.

NA490.D4 2012
725'.1808827153—dc23

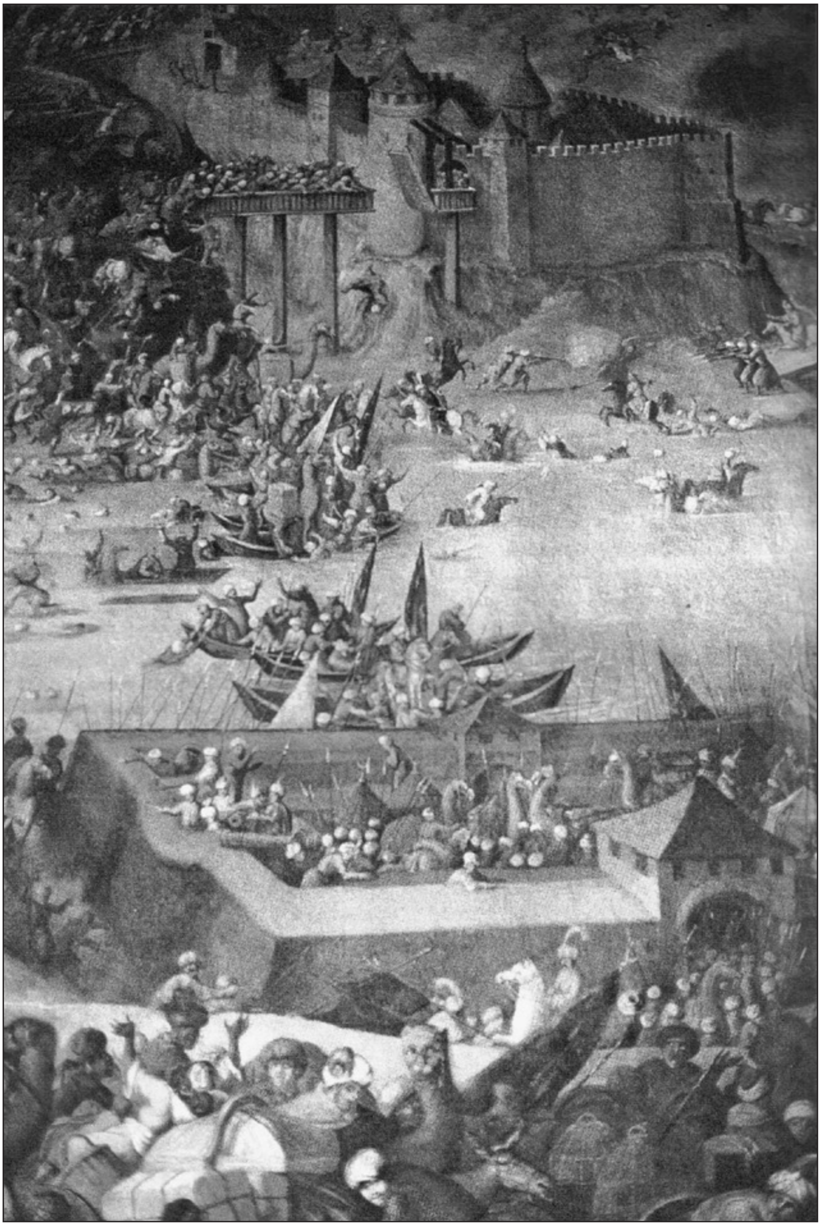
2011047170

ISSN 1385-7827
ISBN 978 90 04 21651 8 (hardback)
978 90 04 22378 3 (e-book)

Although the battlefield formation of squadrons and the building of fortifications appertains more to soldiers than to priests, the reasons for adopting a particular formation or using a particular type of fortification in order to obtain victory or to defend a place, are to be found in the mathematical principles of geometry and perspective, which the art of war makes full use of. And just as it has been approved to be licit for Jesuits to learn and to teach mathematics, it is equally licit (for them) to apply those same principles to military matters…

Juan Baptista Poza SJ

Por los Estudios Reales que el Rey Nuestro Señor ha fundato en el Colegio Imperial de la Compañia de Jesús de Madrid (1627)



1. The 1683 Turkish siege of Vienna [Turnbull, 2003]. Reproduced with the kind permission of Dr Stephen Turnbull.

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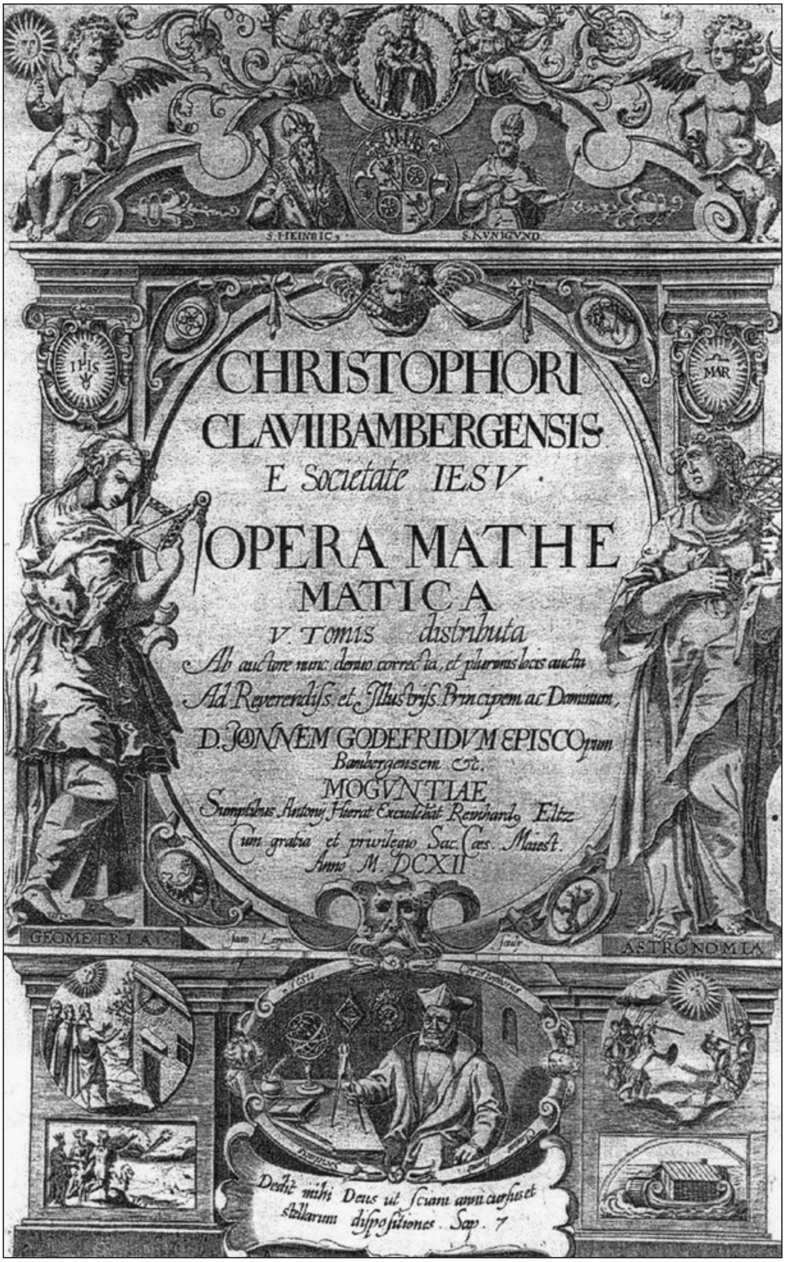
LIST OF ABBREVIATIONS

AGS	*Archivio General de Simancas*, Valladolid
AHSI	*Archivum Historicum Societatis Iesu*
AOM	Archives of the Order of Malta, Valletta
ARSI	*Archivum Romanum Societatis Iesu and Biblioteca Instituti Historici Societatis Iesu*, Rome
ASM	*Archivio Storico di Malta*
ASPN	*Archivio Storico per le Provincie Napoletane*
ASV	*Archivio Segreto Vaticano*, Rome
BAL	*Biblioteca do Palàcio Nacional da Ajuda*, Lisbon
BCRS	*Biblioteca Centrale della Regione Siciliana 'A Bombace'*, Palermo
BGP	*Biblioteca 'Gonzaga',* Palermo
BGUC	*Biblioteca Geral da Universidade de Coimbra*, Coimbra
BL	British Library, London
BNCR	*Biblioteca Nazionale Centrale di Roma 'Vittorio Emanuele II'*, Rome
BNE	*Biblioteca Nacional de España*, Madrid
BNF	*Bibliotèque Nationale de France*, Paris
BNM	*Biblioteca Nazionale Marciana,* Venice
BNP	*Biblioteca Nacional de Portugal*, Lisbon
BOP	*Biblioteca Oliveriana di Pesaro*, Pesaro
BRCC	*Biblioteche Riunite Civica e A. Ursino Recupero*, Catania
BSA	Breda State Archive, Breda
BUA	*Biblioteca Universitaria 'Alessandrina'*, Rome
CHR	Catholic Historical Review
Epist.Gen.	*Epistolae Generalium Societatis Iesu*, ARSI
FN	*Fontes Narrativi de S. Ignatio de Loyola et de Societatis Iesu initiis*, ARSI
Inst. SJ	*Institutum Societatis Iesu*, ARSI
Ital.	*Assistentia Italia Societatis Iesu*
JAV	Jesuit Archives in Vanvés, Paris
MHSI	*Monumenta Historica Societatis Iesu*, ARSI
MI	*Monumenta Ignatiana*, ARSI
Mon.Ger. Paed.	*Monumenta Germaniae Paedagogica*, ARSI
Mon. Paed.	*Monumenta Paedagogica Societatis Iesu*, ARSI
NAV	Notarial Archives, Valletta
NLM	National Library of Malta, Valletta
Rom.	*Provincia Romana Societatis Iesu*
Sic.	*Provincia Sicula Societatis Iesu*
SJ.	Society of Jesus
SMV	Sommervogel: *Bibliothèque de la Compagnie de Jésus*, ARSI
WIL	Warburg Institute Library, London



2. Leypoldt's engraved frontispiece of Clavius' *Opera Mathematica*. Reproduced with the kind permission of the *Herzog August Bibliothek* in Wolfenbűettel.

PREFACE

In this work, I have attempted to explore and map out the largely forgotten contribution of the Jesuit Order, often known as the Society of Jesus, to developments in military architecture during the Baroque age. Fortification by means of bastions and ramparts (the so-called *trace italienne*) has long been seen as a critical factor in the military revolution of the early modern world, and much ink has been spilled in recent years about the processes of its dissemination and the degree to which the new 'science' of military architecture called for advanced surveying skills and mathematical understanding among the ruling classes of Europe, as well as from the newly emerging specialist military engineers. It will be argued that the Jesuits, through their teaching and learning institutions founded to educate the sons of Catholic Europe, played a significant role in teaching and disseminating knowledge about military architecture under the wider rubric of the mathematical disciplines. It will be shown, further, that Jesuit expertise in fortification mathematics was not confined to the classroom, but extended to design consultancy and even active service in the war theatres of Baroque Europe, as well as in the overseas missionary activities of the Order.

The book is structured as follows. Chapter 1 introduces the subject, dealing both with the military mind of the Order's founder, St. Ignatius of Loyola, and the wider interests of the Jesuits in the art of war. Chapter 2 explores Jesuit teachings on military architecture within the colleges and seminaries for nobles established by the Order throughout Catholic Europe. It also deals with the engagement of some Jesuits in fortification consultancy and, more controversially, in active campaign service against 'heretics' and 'infidels'. In Chapter 3, the teachings embodied in the treatises produced by Jesuit mathematicians is discussed, with a focus on the so-called *Escuela de Palas* document of 1693. Chapter 4 examines in detail the case of Giacomo Masò, a Jesuit whose teaching and fortification design consultancy activities in Hospitaller Malta provoked controversy and a crisis of conscience which eventually led him to abandon his calling. In Chapter 5, the effect of the 1773–1814 general suppression and the overall contribution of the Jesuits to the dissemination of ideas about military architecture in the Baroque age are evaluated.

I have used the following categories of evidence. The first and most substantial consisted of original archival sources, the second consisted of old books written by both pro-Jesuit and anti-Jesuit authors and the third consisted of largely, but not always neutral, contemporary publications which contained direct or indirect references to the subject. The research has taken me to consult archives and scholars in a large number of countries, as is indicated by the long list of institutions and individuals thanked at the end of this preface.

In retrospect, the general feedback that I obtained from the institutions and persons that I have visited or contacted in the course of my investigations was that the involvement of the Jesuits in the military architecture of the Baroque world is still a grey area, a largely uncharted territory when compared to the considerable advances in knowledge registered in the past twenty years, concerning the contribution of the Jesuit Order to the sciences and the arts during the 1540–1773 period under study. Most authors of Jesuit historiography have been somehow reluctant to investigate the Jesuit dissemination of knowledge about military architecture, even if this could have easily been interpreted as a logical extension of the well-known interest of the Jesuit Order in the mathematical disciplines that were first promoted in the Jesuit *Collegio Romano* by Christoph Clavius of Bamberg. Could this 'source of many problems for the Society of Jesus', have been perceived as an unacceptable contradiction to the spiritual mission of a canonically-appointed Religious Order? The handful of authors who wrote about some little known Jesuit episode involving warfare and fortifications did not bother to investigate whether such situations had resulted from 'individual' or 'communal' decisions, from some initiative that would have been taken by a more daring Jesuit *mathematicus* as opposed to an initiative that would have been taken at the level of a particular Jesuit college, province, or even the secretariat of the Jesuit General in Rome. I have also tried to investigate the subject of the Jesuit contribution to military architecture in the Baroque age as a typical Jesuit militant response to the threatened interests of the Catholic Church in the violent context of the Counter-Reformation when religious motives and political ambitions were very often intertwined, as repeatedly revealed during the several wars in an age which allowed for only a few years of respite from battles and sieges.

My interest in this subject can be traced back to the year 2000 when browsing through the contents of a rather primitive hand-written catalogue listing the contents of the *Biblioteche Riunite Civica e A. Ursino*

Recupero in the splendid Baroque city of Catania. I was at the time collecting material for a book on a Bergamese military engineer called Giovanni Battista Vertova. As a former student of the Jesuit college of St. Aloysius in Malta in 1960–1968, I still vividly recall my surprise upon coming across a seventeenth-century manuscript on 'defensive and offensive' military architecture written by a Jesuit mathematician from Syracuse who, I afterwards learnt, had the daring to run an academy of military architecture in the Jesuit college in Malta. As a natural reaction to my desire of learning more about the 'scandalous' behaviour of *Padre* Giacomo Masò, I started seeking ways and means to do so, which is why I consider myself fortunate to have had an opportunity some time later to discuss this matter informally with the late Quentin Hughes, my much esteemed professor of architecture at the then Royal University of Malta. Quentin had expressed great interest in the Catania manuscript. He had promised to refer my 'find' to Professor Simon Pepper of the School of Architecture at the University of Liverpool. In the past years, I have realized that Masò's treatise did indeed constitute a valid point of departure for the wider investigation that I had in 2005 been encouraged to undertake by Professor Pepper. My Ph.D. (Liverpool) thesis on which this book is based provided a focal point of my exploration of a fascinating aspect of Jesuit historiography which saw many priests become soldiers and many soldiers—starting from St. Ignatius of Loyola—become priests, the better to serve God according to the Jesuit motto *Ad Maiorem Dei Gloriam*. Which also reminded me of that famous fictional character in Alexandre Dumas' *Vicomte de Bragelonne*, the musketeer René d'Aramis de Vannes. Based on Dumas's knowledge of the life of the noble Henri d'Aramitz and surely reflecting memories about the involvement of many Jesuits in the dangerous world of Baroque politics and wars, Aramis, at the end of the novel, gives up his military career to become a Jesuit. Like Ignatius before him, Dumas' hero abandons his sword and his women and starts using his machiavellian mind to assure for himself a nomination for the exalted post of General of the Jesuit Order.

The *Vicomte de Bragelonne*, having as its thematic background the transformation of Louis XIV of France from a weak boy king dominated by his mother and his ministers to *Le Roi Soleil* in absolute control of the French state, sets the right tone for a brief introduction to the courtly culture which dominated the operational scenario of the Jesuit Order during the years 1540–1773. On one hand, one can identify a Baroque world obsessed with the abstract mathematical and methodical side of things, expressed to a high level of perfection in the 'enfilade' arrangements that determined the axial lines of the layout of the ideal Baroque palace, spilling into formal gardens at one end and into spacious squares and avenues at the other, all fitted with great discipline and precision within a residual urban space formed by the lines and angles of massive fortification arrays which were originally concerned with preserving the 'honour' of the city but which were now also very much concerned with spelling out in no unclear language the power and privileged status of the ruling elites that paid for them, sparing no human or financial resources to give the impression that everything was under control. On the other hand, one can also identify the Baroque world with that rebellious, extravagant and sensuous streak that was expressed in the elaborate ceremonial rituals, the rhetoric and the colourful carnivals of the age, in the prodigious output of skilled decorators like Pietro da Cortona, painters like Peter Paul Rubens, sculptors like Gian Lorenzo Bernini and architects like Francesco Borromini, also in the gilded carriages and splendid attire of noblemen accompanied by their wives and mistresses, in the countless masked balls and court music of a Jean Baptiste Lully and, lastly, in those lascivious painted scenes, those dramatic performances and those devilish *deus ex macchina* devices that would have adorned the stages of many a theatre and palace playhouse, of the type that started mushrooming all over early modern Europe. These aspects of the Baroque world were all concerned with a show of affluence and power, concentrated in the hands of a few individuals who benefited from the obedience of their generals and soldiers and the moral backing of their court advisors and confessors, to thus uphold the honour of their established authority. They were all concerned with a pompous exercise of patronage that was considered necessary to distinguish the 'have' from the 'have nots' underlining the seemingly unlimited resources of popes and princes in the adornment of a Rome, a Dresden or a Versailles. And all these aspects of Baroque courtly culture were ultimately concerned with that emerging god of spectacle who, like the Colossus of Rhodes, now bridged what Lewis Mumford called the above-mentioned 'two contradictory elements' of the Baroque age, a god who was soon recognised by the ruling elites of the time as a most powerful instrument of visual stimulation but also of sinister coercion. In this respect, the daily parades of uniformed soldiers marching along a straight line provided one example of a visually edifying urban spectacle warning the onlookers, however, that any thoughts of rebellion against the prince would be futile. The impressive processions that marked Catholic festivities and the spectacular martial plays—such as that entitled 'Constantine' when the entire city of Munich was in 1574 transformed by the Jesuits into a truly triumphal scenario dominated by the presence of the 'emperor' Constantine on a chariot surrounded by 400 horsemen in glittering armour—provided other examples of visually stimulating urban spectacles, at the same time, however, warning the onlookers to beware of harbouring any 'heretical' ideas that could contradict the doctrinal teachings of the Council of Trent and possibly lead to the emergence of another Martin Luther or John Calvin. And at the very edge of the Baroque urban landscape, the elaborate ramparts, bastions and outwork fortifications with which this book is primarily concerned, provided yet another example, both from within and without, of an awesome spectacle of military drills, martial music, muskets and cannon, here enhanced by a stage setting of imposing ramparts, designed to geometrical perfection and constituting vital instruments of defence against external but perhaps also against internal aggression, so that many were those military leaders who became obsessed with the building of supposedly invincible citadels, of the type discussed in many Jesuit and other fortification treatises of the Baroque age. On a more civilised level, of course, one encounters the dramatic visual spectacles provided by the elaborate facades of churches and palaces, by the beautiful fountains and sculptures of the type found in the Piazza Navona in Rome and by the ephemeral artefacts that were produced to mark the many festivities and ceremonies dealing with the living and the dead. Very much concerned with underlining their power and privileged status by evoking the presence of a dazzling god of spectacle who could reconcile the rigorous mathematical discipline of the *mathematicus* with the liberal artistic licence of the artist, the great despots of the Baroque age could now use a common language to maintain a monopoly of unchallenged power, beyond the curtailments of law. In such circumstances, it comes as no surprise that many Jesuits saw themselves fulfilling a role where their mission of world evangelization had to be necessarily reconciled with the ruthless ideology of a courtly culture that—it was believed by many—could last forever, propped up as it was by strong fortifications, lethal gunpowder and trained armies of soldiers but also by a less visible but equally threatening army of informers, censors, inquisitors and taxation bureaucrats. In that part of the world that had remained faithful to Rome, it was a time when the high and the mighty members of this Baroque courtly culture strongly believed that they were the untouchable protagonists of a political creed called

Absolutism and of a faith called Catholicism, the first autocratic and concerned with the pleasures of warmongering and affluent, sometimes decadent, living, the second generally impervious to criticism, suspicious of any new philosophical and scientific knowledge and intent on disseminating an attractive promise of eternal salvation. A promise that would ultimately lead to a rewarding 'triumph over death,' presented by many Jesuits to the subservient members of Baroque society on the Feast of the Resurrection, as the only palliative to counteract the miseries of living in an unfair world that was by 1700 already crying out for 'enlightenment,' seething for the type of revolutionary outburst that was later symbolised by the storming of the Bastille on the morning of 14 July 1789. These, then, were the main traits of the realities with which the Jesuits of the Baroque age were so closely associated and which provide the background scenario to the military-charged contents of this volume.

I wish to express my thanks to numerous institutions and persons. With regards to institutions, I am indebted to the directors and staff of the *Library am Guisanplatz* in Berne; the *Biblioteca Universitaria* of the *Universidad de Duesto* in Bilboa; the *Biblioteche Reunite Civica e A. Ursino Recupero* in Catania; the *Biblioteca Nazionale Centrale* in Florence; the *Musée Francais de la Carte à Jouer* in Issy-les-Moulineaux; the *Biblioteca Caracciolo* and the *Archivio di Stato* in Lecce; the *Biblioteca da Ajuda* in Lisbon; the British Library, the National Gallery and Warburg Institute library in London; the *Biblioteca Nacional de España* and the *Museo Nacional del Prado* in Madrid; the *Biblioteca Comunale Teresiana* in Mantova; the *Archivio di Stato* in Naples; the *Biblioteca della Facolta di Scienze Politiche 'Ettore Anchieri'* in Padova; the *Biblioteca Centrale della Regione Siciliana 'A. Bombace'* in Palermo; the *Biblioteca Gonzaga del Centro Educativo Ignaziano* in Palermo; the *Bibliothèque Nationale de France* in Paris; the *Biblioteca Oliveriana* in Pesaro; the *Archivio Storico Diocesano—Fondazione Istituto Internazionale di Storia Economica 'F. Datini'* in Prato; the *Biblioteca Reale* and the *Archivio di Stato* in Turin; the Jesuit *Casa Professa del Gesù*, the *Archivum Romanum Societatis Iesu*, the *Biblioteca Casanatense*, the *Biblioteca Apostolica Vaticana*, the *Archivio Secreto Vaticano*, the *Biblioteca Nazionale Centrale 'Vittorio Emanuele II'* and the *Biblioteca di Storia Moderna e Contemporanea* in Rome; the *Biblioteca Comunale* in Sabbioneta; the National Library of Malta in Valletta; the *Archive de la Province de France de la Compagnie de Jesus* in Vanves; the *Biblioteca Nazionale Marciana* in Venice; the *Kunsthistorisches Museum* in Vienna; the Royal Castle Museum in Warsaw and the *Herzog*

August Bibliothek in Wolfenbűettel. With regards to persons, I would like to acknowledge the support that I received from the rector of the University of Malta, Professor Juanito Camilleri and the academic advice that I received from Professor Ugo Baldini, Professor Robert Bireley SJ, Professor Jan Beirlant, Fr Robert Bonfils SJ, Professor Mark Borg, Professor Philippe Bragard, Professor Gian Paolo Brizzi, Dott. Mauro Brunello, Dott[ssa] Maria Rita Burgio, Architect Fernando Cobos-Guerra, Dr Angelo De Bruycher, Dott[ssa] Angela Rita Carbonaro, Fr Joseph De Cock SJ, Dr Jean-Paul De Lucca, Professor Francesco Frasca, Dott[ssa] Veronica Gavagna, Professor Maria Giuffrè, Fr Giuseppe Lombardo, Professor Piet Lombaerde, Fr Brian Mac Cuarta SJ, Dr Ad Meskens, Dr Peter Muscat, Architect Mariella Muti, Professor Marco Rosario Nobile, Rev. Professor Sergio Pagano, Dott[ssa] Margherita Palumbo, Fr. James F.X. Pratt SJ, Fr Thomas Reddy SJ, Dr Stephen Spiteri, Dr Margarida Tavares da Conceicão, Dr Oliver Thill, Dr Stephen Turnbull, Professor Geert Vanpaemel and Professor Michèle Virol.

I would like to also express my appreciation to Professor Simon Pepper and Professor Neil Jackson of the University of Liverpool, for their sound advice and great support. Simon's expertise and vast research experience on warfare practices in the early modern world proved to be of great help to me when the going got tough. On a support level, I feel that I should thank Mr George Camilleri, Mr Alfred Cauchi, Professor Carmen Depasquale, the late Capuchin friar José Garzia, Professor Horace Vella and Mr Leonard Zammit Munro for helping me to translate old texts in the Spanish, French, Latin and Portuguese languages; also Mr Jonathan Apap, Architect Hermann Bonnici, Ms Denise Borg Millo, Ms Audrey-Ann Cassingena, Mr Marco De Lucca, Mr Ramon Micallef, Ms Antoinette Micallef and Ms Annabel Vassallo. Last, but not least, I would like to express my sincere thanks to Ms Marcella Mulder, Ms Renee Otto, Mr Julian Deahl and all others at Brill Academic Publishers who were involved in the publication of this work. My apologies go to a very supportive Monica for onerous demands on her infinite patience during my long hours of silence—thinking and writing about those amazing Jesuits of the Baroque age who happened to have a flair for all matters military.

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3. An anonymous seventeenth-century painting kept in the Jesuit *Casa Professa del Gesù* in Rome, showing the young Ignatius in armour. Reproduced with the kind permission of Fr. Daniele Libanori S.J.

CHAPTER ONE

THE JESUIT INTEREST IN THE ART OF WAR

Summary

The Jesuit interest in the art of war seems to have originated in the violence and bloodshed that marked the early life of Ignatius of Loyola, who in 1552 used his still active military mind to draw up a grand plan for the defence of Catholic Europe against Ottoman aggression. After Ignatius' death, the militant nature of the Jesuit Order that he founded was expressed in the preaching and confessional skills of many leading Jesuits. Their efforts were now aimed at convincing the Catholic leaders of the time to unite and launch a new crusade against the Protestant threat, culminating in the so-called Thirty Years War (1618–1648). More directly, Jesuit militancy in the Baroque age was expressed in the teaching of the mathematical disciplines when it became customary for the *mathematicus* to teach military architecture in the many colleges and seminaries for nobles run by the Jesuit Order. The Jesuit interest in the art of war was often evoked in the writings of scholars of the ilk of Antonio Possevino who used their rhetoric and their formidable pen to justify the inevitable involvement of the more belligerent members of the Jesuit Order in war-related activities targeted against 'heretics' and 'infidels'.

The 'Military Mind' of Ignatius of Loyola

Don Iñigo López de Oñaz y Loyola (1491–1556), better known to posterity as Ignatius of Loyola, is described by Bangert, the author of one of the most authoritative histories of the Jesuit Order, as a "courtier and gentleman, soldier and campaigner, student and teacher, ascetic and mystic".[1] This description of Don Iñigo, generally shared by most authors of Jesuit historiography[2]—irrespective of whether they revered or reviled the Society of Jesus as an assembly of angels or devils—is well supported by both contemporary and later sources, clearly underlining the formative qualities of this Spanish nobleman who on 27 September 1540 managed to convince Pope Paul III Farnese (1534–1549) to formally announce the creation of a new militant Order of the Catholic Church—that of the

[1] Bangert, *Society of Jesus*, 3.

[2] O'Malley *et al.*, *The Jesuits*, 3–37 (Chapter 1 on '*The Historiography of the Society of Jesus: Where does it stand today?*' by John W. O'Malley).

Jesuits—by means of a Papal Bull entitled *Regimini Militantis Ecclesiae*. This document was confirmed 10 years later by Pope Julius III Ciocchi del Monte (1550–1555) who on 21 July 1550 issued a second Bull entitled *Exposcit Debitum* to consolidate the status of Don Iñigo's invention.[3] These Bulls were essentially the end result of a remarkable series of events following the soldier Don Iñigo's spiritual enlightenment soon after his heroic defence of the fortress of Pamplona against invading French forces (1521) in a scene of extreme violence that has been vividly described by Tylenda:

> Since the city (of Pamplona) had decided to greet the French with open arms, Miguel de Herrera, (the) commander of the fortress, felt that any defence on his part would be futile. The fortress would be attacked on all four sides and since his men were few in number to withstand a prolonged siege, he too spoke of surrender. Ignatius (Iñigo), however, was of another opinion and he offered reasons why they should stand their ground and fight. These reasons have not been preserved, but undoubtedly one must have been that it would be shameful to surrender even before battle begun. On May 19 Pamplona sent word to Andrè de Foix (the French commander) that the city was his; he entered on the 20th and his men immediately set up their cannons and directed them against the fortress. These preparations were observed by Ignatius and the garrison and they thus expected the assault to begin that day. Since Ignatius intended to fight to his last breath, and because there was no chaplain among them, he asked one of his comrades to hear his confession of sin. He was now prepared to meet death in the service of his king. The bombardment began that day and after six continuous hours of heavy shelling, a portion of the wall crumbled and a cannonball entered the fortress and shattered Ignatius' right leg.[4]

After Pamplona, Don Iñigo's progress towards Rome had been marked by a period of surgical interventions and recovery (1521–1522),[5] a night's vigil at the Benedictine abbey of Montserrat where he had exchanged his armour for a pilgrim's habit before the altar of the Virgin Mary, evoking a military ritual of great antiquity (1522),[6] a time of reflection leading to the compilation of his Spiritual Exercises at Manresa (1522–1523),[7] a journey to the Holy Land through Venice (1523–1524),[8] a period of academic for-

[3] Ganss, *Constitutions*, 36. Codina, *Monumenta,* 24–32 and 373–383 reproduces the full Latin texts.

[4] Tylenda, *Autobiography*, 8.

[5] *Ibid.*, 7–19 and 140.

[6] *Ibid.*, 20–27 and 141.

[7] Puhl, *Spiritual Exercises* and Bangert, *Society of Jesus*, 10 agree that the Spiritual Exercises reflect the bitter battles in Don Iñigo's soul between 'Christ the King' and the 'Prince of Darkness'. See also Worcester, *The Jesuits*, 52–67.

[8] Tylenda, *Autobiography*, 45–56 and 142–143.

mation in Barcelona, Alcalá, Salamanca and Paris (1524–1536),[9] the formation of an international band of companions in the dark crypt of the chapel of St. Denis at Montmartre (1534)[10] and, finally a difficult trip to Rome in 1537 which was, towards the end of November, interrupted by a stop at the chapel of La Storta,[11] about fifteen kilometres outside Rome. Don Iñigo stated in his autobiography[12] that he had here experienced a celestial vision of God the Father allegedly telling his son Jesus that "I wish you to take him as your servant", following which Jesus had directed his words to the kneeling pilgrim and said "I wish you to be our servant".[13] It was at this point in time that Don Iñigo had coined the name 'Company of Jesus'—*Compañía di Jesus* in Spanish, *Compagnia di Gesù* in Italian and *Compagnie de Jésus* in French—soon to be translated into the Latin *Societas Iesus*. It reflected Don Iñigo's wish to closely identify with the name of Jesus, his new fully-canonical Religious Order whose members were always "ready to serve as soldiers of God beneath the banner of the Cross" so as "to serve the Lord alone and the Church His spouse under the direction of the Roman pontiff as the vicar of Christ on earth."[14]

Soon after the promulgation of *Regimini Militantis Ecclesiae*, the members of the new Order started being known as Jesuits. This term was considered to be a most appropriate indication of the intended close association with the name of Jesus, as had been willed at La Storta by their first General Don Iñigo, now Ignatius, who from a soldier of Spain had become a soldier of Christ. According to Fisher[15] who had no love for the Jesuits, the significance of Ignatius' invention was that it provided the papacy at a moment of great need with a "corps d'elite scrupulously trained to carry out its behests", an organisation that was both "military and autocratic". According to Barzini,[16] another outspoken critic of the

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9 *Ibid.,* 62–99 and 144–150.

10 Bangert, *Society of Jesus*, 15–16.

11 Tylenda, *Autobiography*, 113.

12 *Ibid.*

13 *Ibid.*, 113 and 150–154 citing ARSI, MI, IV-II (FN), 133 (1557–1574) based on a 1904–1908 work entitled *Scripta de Sancto Ignatio* (ARSI, MHSI 66 and 73).

14 Ganss, *Constitutions*, 66 quoting in paragraphs [3]–[6] the formula of the Jesuit Order which had been originally drafted by Don Iñigo in August 1539 as the 'First sketch of the Institute of the Society of Jesus'.

15 Fisher, *History of Europe*, 560. According to Griesinger, *The Jesuits*, 63, Ignatius had once told the Pope that "We, members of the Society of Jesus, are warriors of Christ and must therefore possess all the characteristics of good soldiers. We must be always ready to advance against the enemy, and be always prepared to harass him or fall upon him".

16 Barzini, *The Italians*, 346–347.

Jesuits, "No lay or ecclesiastical body of Christians had ever been more dedicated to regimentation, more tightly disciplined, rationally organised, systematically run and successfully standardised" where all Jesuits "were instructed in blind obedience to their general who stood in the place of God" capable of influencing not only the course of Church history but also "the private lives of obscure millions and the decisions of princes". The first Jesuits believed themselves to be the privileged few who by their exemplary lives could save the Catholic Church from disaster, to be perceived, as implied by the most appropriate title of the 1540 Papal Bull, as a 'regiment', facing overwhelming enemy forces. This reflected the still active military mind of Ignatius who, it is reported, had once said that just as the monks and nuns of the Medieval monastic foundations represented the infantry of the Catholic Church whose duty it was to stand firm in times of great danger, the Jesuits constituted its light horse, capable of moving swiftly and manoeuvring and able to penetrate deep behind the enemy lines to explore, reconnoitre, gather information, capture hostages and carry out whatever tasks that presented themselves with whatever means there were available.[17]

The concern of Ignatius with the urgent need to set up a new form of militant Order to bring about the salvation of the Catholic Church—a spiritual army of highly disciplined 'troops' created by a person who had known what military discipline could do and how impotent was a sixteenth-century Spanish army without it—was historically understandable when one considers the beleaguered position of the Roman papacy in 1540. The situation then was one of unprecedented confusion when the Turkish peril posed by Suleyman the Magnificent (1520–1560)—recently enhanced by a remarkable series of successes at Belgrade (1521), Rhodes (1522), Mohacs (1526) and Moldavia (1538)—had brought the 'infidel' dangerously close to the walls of Vienna which had actually been besieged for the first time in 1529. Another grave provocation, this time of an intellectual nature, had occurred when Martin Luther (1483–1546) and John Calvin (1509–1564) had spearheaded a revolt against papal authority and clerical privilege. Coupled with England's break with Rome and parlia-

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[17] *Ibid.*, 348–349. See also Martindale, *God's Army*, 45 who reproduces a letter which Ignatius once sent to the Pope: "Holy Father, I hold the other Orders in the army of the Church Militant to be as so many squadrons of cuirassiers, who are to stand fast to the post assigned to them, keep their ranks, and face the enemy, always in the same line, and with the same manner of fighting. But we are as so many light horsemen, who must always be ready, night or day, against the hap of alarms and surprises, to assault or support, as it may chance, to go everywhere and skirmish on all sides."

4. The great Turkish peril: Titus Zsondi defending a Hungarian castle against the Turks [Turnbull, 2003]. Reproduced with the kind permission of Dr Stephen Turnbull.

ment's enactment of the Act of Supremacy in 1534, these events had posed a direct challenge of these 'heretics' to papal supremacy. There was then the gross misbehaviour of the Spanish, Italian and German troops led by the Constable of Bourbon who had under the banner of the Holy Roman Empire, ransacked Rome itself in 1527. All these factors that had greatly undermined the credibility of the Catholic Church especially so at a time when the traditional Religious Orders (who should have been in a front line position to counteract these 'dangerous' new ideas and abuses), had become, like the Renaissance Popes whose mundane courts had been founded upon nepotism, simony and lechery, so corrupt themselves that they had lost the respect of society, misusing enormous wealth, filled with dissolute monks and nuns.[18] It was in this grave moment of general predicament that Ignatius entered the historical scene, with a convincing offer to Pope Paul III Farnese to do something to solve the multi-faceted crisis. This would have led the soldier in him to very consciously instill not only a soul of Spanish steel in his new Order but also those typical attributes of mobility and action, of sound strategy and regimental discipline that had served him so well in his military campaigns for the salvation of Spain.[19] His military mind had then been motivated by his reading of *Amadis de Gaula*, and it is recorded that he often "dressed in clothes of bright colours, sporting a scarlet cap on his blond curls which reached down to his shoulders, with sword and dagger at his waist",[20] goaded by "a vain and overpowering desire to gain fame."[21]

The above facts explain the combative spirit instilled by Ignatius in the Jesuit Order. Although he had, in his path to sainthood, replaced his cherished romances of *Amadis de Gaula*[22] with Ludolph of Saxony's *Vita Jesu*

[18] Lord, *Beacon Lights*, III, 2.

[19] Ignatius, the seventh and youngest son of Don Beltrán Yáñez de Onaz y Loyola and Donna Marina Sanchez de Licona of Azpeitia castle in Guipúzcoa, belonged to the principal nobility of North-East Spain. According to Meissner, *Ignatius of Loyola*, 3, the name Azpeitia meant "to terrify the enemy".

[20] Bangert, *Society of Jesus*, 4.

[21] Tylenda, *Autobiography*, 7 adds that "upto his twenty-sixth year" Ignatius also "found special delight in the exercise of arms."

[22] *Ibid.*, 11–12 and 26. See also Brodrick, *Loyola* and Meissner, *Ignatius of Loyola*, 21–22 and 38 who discuss the pyschological effect on the young Ignatius of *Amadis de Gaula*, this explaining those features of "prowess in self-defence and in the arts of war, loyalty, generosity, courtesy and the pursuit of glory, fierce pride and unquestionable courage" which stood out in his personality. Spence, *Spain*, 46 states that *Amadis de Gaula* represented a genre of Spanish literature which inspired many sixteenth-century Spanish nobles.

Christi[23] and Jacobe de Voragine's *Flos Sanctorum*,[24] although he had replaced his daily military exercises in the presence of courtesans with the Spiritual Exercises[25] in the mystic presence of Christ and his Virgin Mother, Ignatius continued using military metaphors in all written material appertaining to his new Order. One case in point was his insistence on using the title *Compañía de Jesus* in the original Spanish version of his Constitutions.[26] The Spanish word *compañía* itself, according to Spanish dictionaries starting from Covarrubias' *Tesoro* of 1611,[27] means a group of soldiers responsible to a captain—but it is to be noted that in the Renaissance world, the Spanish word *compañía* and its Italian counterpart *compagnia* had also been commonly used to denote pious associations, making it an ideal title to describe the new Jesuit Order which, in its founder's mind seems to have assumed the role of a hybrid creation meant to fit both definitions. Ignatius also used the word *compañía* in cursory mentions of the Theatine, Franciscan and Dominican Orders,[28] suggesting that he may have wanted to use this word to define closely-knit associations which now had to have spiritual but also militant ambitions to defeat the new threats to Catholicism. The military overtones of the title *Compañía de Jesus* seem to have been readily accepted by many early Jesuits who had worked with Ignatius. Examples had been provided by his secretary Juan Alonso de Polanco, his roving ambassador Jeronimo Nadal and his colleagues Pedro Ribadeneira and Olivier Mannaerts.[29] In his 1554 exhortations, Nadal had stated that "we should follow Christ in this military service".[30] Ignatius himself frequently had presented Christ as a King (*Rey*), a Lord (*Señor*) and as a Commander-in-Chief (*Verdadero Capitán*).

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23 Brodrick, *Loyola*, 64 gives the full title of this four-volume work as *Vita Jesus Christi e quatuor evangeliis et scriptoribus orthodoxis concinnata per Ludolphum de Saxonia*.

24 This book, also known as the *Legenda Aurea*, was a 1511 reprint of an earlier work authored by the Cistercian monk Gauberto Maria Vagod, that had been in circulation in Spain since at least 1480.

25 See n. 7.

26 Ganss, *Constitutions*, 346.

27 Covarrubias, *Tesoro* (1611).

28 Ganss, *Constitutions*, 346.

29 Ganss, *Constitutions*, 348 citing ARSI, MI, IV-II (FN), 597 (Polanco); ARSI, MI, IV-I (FN), 314 (Nadal); ARSI, MI, IV-II (FN), 377 (Ribadeneira) and ARSI, *Exhortationes*, II, 4 (Brussels, 1912) 395 (Mannaerts).

30 ARSI, FN, I, 314 See also FN, II, 158 mentioned by Ganns.

Ganns[31] has pointed out that military overtones were also very evident in the first sketch of the Jesuit Order known as '*The Five Chapters*' presented to Pope Paul III Farnese in 1539 as well as in the contents of the subsequent Papal Bulls *Regimini Militantis Ecclesiae* and *Exposcit Debitum*, where one finds the significant phrase "to serve as a soldier (*militare*) of God beneath the banner of the Cross". According to the same author, another famous soldier-convert of antiquity—the Apostle Paul—had also referred to the new Christian way of life as warfare (*militia*),[32] while Aldama[33] writes St. Benedict had once met a novice who "was about to join the battle for Christ the King". Even Erasmus of Rotterdam, that great opponent of militant Christianity and author of *Enchiridion Militis Christiani,* repeatedly used military metaphors in his early writings. In the subsequent history of Christianity such military imagery occurs repeatedly, one example being *Padre* Donato Calvi's seventeenth century reference to the Turkish siege of Rhodes (1522) where a military engineer called Gabriele Tadino da Martinengo was described as "the champion who bore the name of the Archangel Gabriel" who "would not only manage to neutralise the furies of hell vomiting their vengeance against the Island" but also "regard the city of Rhodes as the Fortress of God."[34]

Ignatius neither elaborated nor opposed such blatant military overtones in early Jesuit writings but while his followers regarded such military metaphors as being of secondary importance when compared to the spiritual mission that they expressed, the growing number of critics of the Jesuits chose instead to emphasize the *prima facie* contradictions of the two forms of expression. The fact however remains that the military metaphors of Ignatius were politically well suited to underline the militant character of his new Order reflecting his determination to offer combat to the enemies of the Catholic church, against whom well-trained armies and strong fortifications were as much needed as prayers.

Ignatius died in Rome at 5.30pm on 31 July 1556.[35] He was beatified by Pope Paul V Borghese (1605–1621) on 22 July 1609[36] and canonised by Pope Gregory XV Ludovisi (1621–1623) on 12 March 1622.[37] His legacy was indeed considerable. The military thinking that seems to have inspired the use of

31 Ganss, *Constitutions,* 348.
32 *Ibid.*
33 Aldama, *Formula*, 38.
34 Calvi, *Campidoglio de' Guerrieri,* 159.
35 Caraman, *Ignatius Loyola*, 199.
36 Tylenda, *Autobiography*, 134.
37 *Ibid.*

so many military metaphors in the voluminous written material kept in Jesuit archives, was often resurrected after his demise, as when Jeronimo Nadal was quick to present Ignatius as "a great David raised up by God to put down Luther, the Goliath."[38] Just before the siege of Malta in 1565, the Spanish Viceroy of Sicily would confidently proclaim that "after so many battles and victories, he (Ignatius) has taken up his rightful place in heaven along with Dominic and Francis."[39] Later on in 1590, an unnamed visitor to the English Jesuit college in Rome analysed aspiring Jesuits of that college as being "so eager to shed their blood for Christ that this forms the constant theme of their conversations .... many would shorten the time of their studies to be free to rush into the fray".[40] Perhaps, this eagerness for an honourable soldier's death '*Ad Maiorem Dei Gloriam*'[41] represented the best justification for the use of unusually strong military imagery by the Jesuits at the dawn of an age described by Fulvio Testi, the Italian poet and military commander, in 1641, as "the age of the soldier".[42] It would have considerably energized the tensions that were then already being felt between the Jesuit hierarchy in Rome and the individualistic instincts of members of the Order in the provinces who would have been caught between the requirement of absolute obedience to the person of the General and the ever-growing pressures for the engagement of Jesuits in military operations involving the building of real 'Fortresses of God' to resist with their mathematically-designed fortifications the onslaught of all rebels against the authority of the pope to whom Ignatius had sworn everlasting loyalty.[43] This contradicts Duff who wrote that Ignatius of Loyola had produced a monolithic organisation where:

> The drilling and discipline which gave to Alexander the men that marched in triumph from Macedon to the Indies; to Caesar, the men that marched in triumph from Rome the wilds of Caledonia; to Hannibal, the men who marched in triumph from Carthage to Rome; to Napoleon, the men whose achievements surpassed in brilliance the united glories of the soldiers of Macedon, of Carthage and of Rome; and to Wellington, the men who smote into the dust the very flower of Napoleon's chivalry—why the drilling and

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38 O'Malley *et al.*, *The Jesuits*, 5.

39 Wright, *Jesuits*, 15 citing Rahner's article on Ignatius in *Stimmen der Zeit*, 248.

40 *Ibid.*, 30 citing Towers' article on the 'Venerable English College' in *Ushaw magazine*, 29–30.

41 The words '*Ad Maiorem Dei Gloriam*' meaning 'for the greater glory of God' was and still is the motto of the Jesuit Order. It is generally believed to have been coined by Ignatius as the basis of its operational philosophy.

42 Villari, *Baroque Personae*, 32 (Chapter 2 on '*The Soldier*' by Geoffrey Parker).

43 Ganss, *Constitutions*, 32.

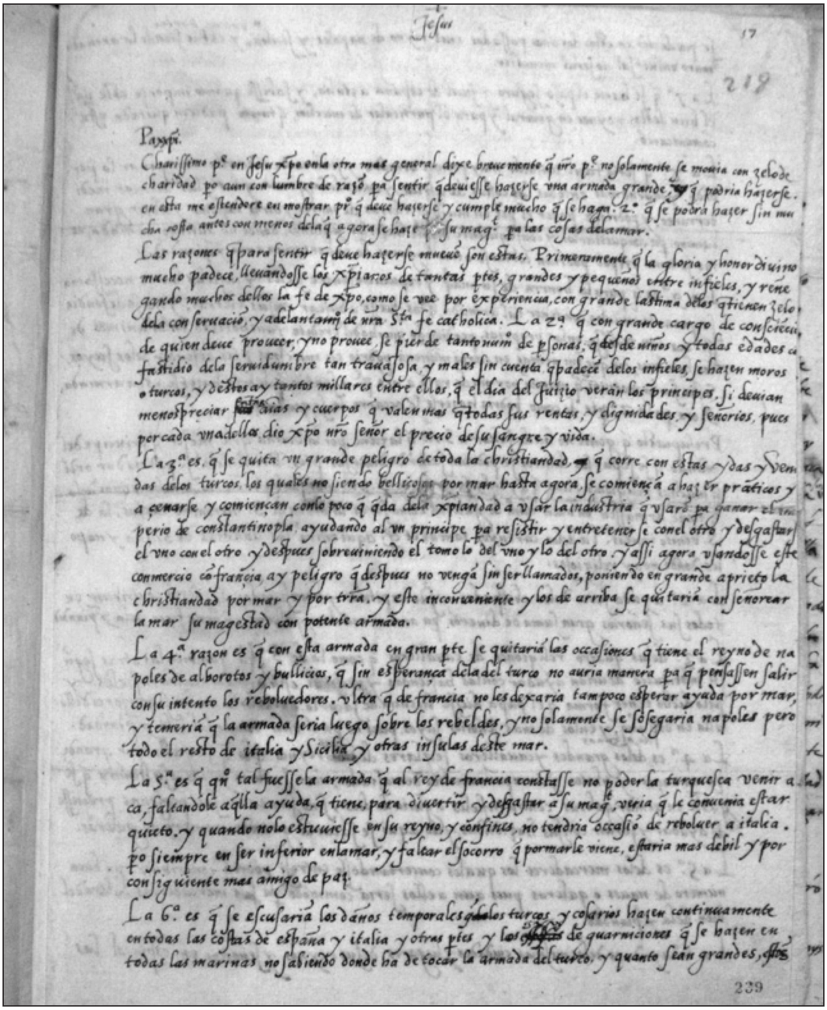
> the discipline of all these combined cannot, in point of stern, rigid, and protracted severity, for a moment be compared to the drilling and discipline which fitted and moulded men for becoming full members of the militant Institute of Jesus.[44]

Notwithstanding the controversial nature of this statement the fact remains that Ignatius had been a soldier and that his Order had been organised on military principles as a necessary response to the conflicts and violence of the sixteenth century.[45] The strongest evidence that exists supporting this statement consists of two unique letters,[46] dictated by Ignatius on 6 August 1552 to his secretary Polanco, urging the Emperor Charles V (1519–1556) to build a powerful fleet of galleys for defensive and offensive operations in the Mediterranean sea. Ignatius' aim was to force the Turks either to sue for peace or else squander their resources in building fortifications and stationing garrisons along the enormous length of Turkish-controlled coastline, from Albania to Algiers, to resist this powerful striking force. Obviously provoked by an unprecedented spree of Turkish landings in the Maltese islands, Taggia, Riva Brigoso, Pantalleria, Ponza, Massa Lubrense, Sorrento, Pozzuoli, Augusta, Licata, Minturno, Nola, Augusta, Licata, Taormina, Policastro, Sardenia, Corsica, Lazio and the Gulf of Naples in 1551–1552 and by the arrival of news of a plan of the Turkish Sultan to forge an unholy alliance with Ignatius' old enemy, King Francis I of France, these letters were addressed by Polanco to Jeronimo Nadal for onward transmission to the emperor. The contents of the second letter, which refers to possible funding from all the Religious Orders, rich bishoprics, the Hospitaller Knights of Malta, the Italian principalities, the Grandees of Spain and the King of Portugal, reveals the still active military mind of the sixty-one year old Ignatius. It illustrates the ability of the elderly former soldier to not only devise sound military strategies for

[44] Duff, *The Jesuits*, 19, also cited by Wylie, *History of Protestantism,* II, 15, 3.

[45] Russell, *Western Philosophy*, 510. See also Höpfi, *Jesuit political thought*, 25.

[46] ARSI, MI, I-IV, 353 (*Epist.*2774) entitled *Commotus magnitudine malorum, ex praedonum infestatione provenientum, vehementer cupit Ignatius ut magna classis a Carolo V aedificetur, quae prompta ac parata sit ad Turcarum incursus repellendos* (*Pater Joannes de Polanco ex Comm. Patri Hieronymo Natali, Roma 6 Augusti 1552*) and MI, I-IV, 354–359 (*Epist.*2775) entitled *Momenta quibus censet Ignatius per magnam navium classem a Carolo V, ornandam et instuendam esse: unde parari possint opes et sabsidia, ad illam aedificandam, docet* (*Pater Joannes de Polanco ex comm. Patri Hieronymo Natali, Roma 6 Augusti 1552*). The original version of the second and longer letter can be found in *Polancus: Epistolae S.P. Ignatii* (*1546–1556*), vol. LIII, ff. 239–240 which I have also examined at ARSI. A translation of this letter can be found in Donnelly, *Jesuit Writings,* 16–21, based on an earlier translation by Young, *Letters*, 259–265.



Jesus

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Pax xpi.

Charissimo p.e en Jesu xpo en la otra mas general dixe breuemente q̃ nro p.e no solamente se mouia con zelo de charidad po aun con lumbre de razõ pa sentir q̃ deuiesse hazerse vna armada grande, y q̃ podria hazerse. en esta me estendere en mostrar pr.o q̃ deue hazerse y cumple mucho q̃ se haga. 2.o q̃ se podra hazer sin mucha costa antes con menos dela q̃ agora se haze p su mag.t pa las cosas dela mar.

Las razones q̃ para sentir q̃ deue hazerse mueuẽ son estas. Primeramente q̃ la gloria y honor diuino mucho padece, lleuandosse los xpianos de tantas ptes, grandes y pequenos entre infieles, y renegando muchos dellos la fe de xpo, como se vee por experiencia, con grande lastima delos q̃ tienen zelo dela conseruaciõ, y adelantamio de nra S.ta fe catholica. La 2.a q̃ con grande cargo de consciencia de quien deue proueer, y no prouee, se pierde tanto num.o de psonas, q̃ desde ninos y todas edades con fastidio dela seruidumbre tan trauajosa, y males sin cuenta q̃ padecẽ delos infieles, se hazen moros o turcos, y destos ay tantos millares entre ellos, q̃ el dia del Juizio veran los principes, si deuian menospreciar entre animas y cuerpos q̃ valen mas q̃ todas sus rentas, y dignidades, y senorios, pues por cada vna dellas dio xpo nro senor el precio de su sangre y vida.

La 3.a es. q̃ se quita vn grande peligro de toda la christiandad, q̃ corre con estas ydas y venidas delos turcos. los quales no siendo bellicosos por mar hasta agora, se comiençã a hazer praticos y a çemarse y comiençan como poco q̃ q̃da dela xpiandad a vsar la industria q̃ vsarõ pa ganar el imperio de constantinopla, ayudando al vn principe pa resistir y entretenerse con el otro y desgastar el vno con el otro y despues sobreuiniendo el tomo lo del vno y lo del otro. y assi agora vsandosse este commercio cõ françia ay peligro q̃ despues no vengã sin ser llamados, poniendo en grande aprieto la christiandad por mar y por trra. y este inconueniente y los de arriba se quitaria con senorear la mar su magestad con potente armada.

La 4.a razon es q̃ con esta armada en gran pte se quitaria las occasiones q̃ tiene el reyno de napoles de alborotos y bullicios, q̃ sin esperança dela del turco no auria manera pa q̃ pensassen salir con su intento los reboluedores. vltra q̃ de francia no les dexaria tampoco esperar ayuda por mar, y temeriã q̃ la armada seria luego sobre los rebeldes, y no solamente se sosegaria napoles pero todo el resto de italia y Sicilia y otras insulas deste mar.

La 5.a es q̃ q.n tal fuesse la armada q̃ al rey de francia constasse no poder la turquesca venir aca, faltandole aq̃lla ayuda, q̃ tiene, para diuertir y desgastar a su mag.t, veria q̃ le conuenia estar quieto. y quando no lo estuuiesse en su reyno, y confines, no tendria occasiõ de reboluer a italia. po siempre en ser inferior en la mar, y faltar el socorro q̃ por mar le viene, estaria mas debil y por consiguiente mas amigo de paz.

La 6.a es q̃ se escusaria los danos temporales q̃ los turcos y cosarios hazen continuamente en todas las costas de espana y italia y otras ptes y los gastos de guarniciones q̃ se hazen en todas las marinas no sabiendo donde ha de tocar la armada del turco. y quanto sean grandes, estos

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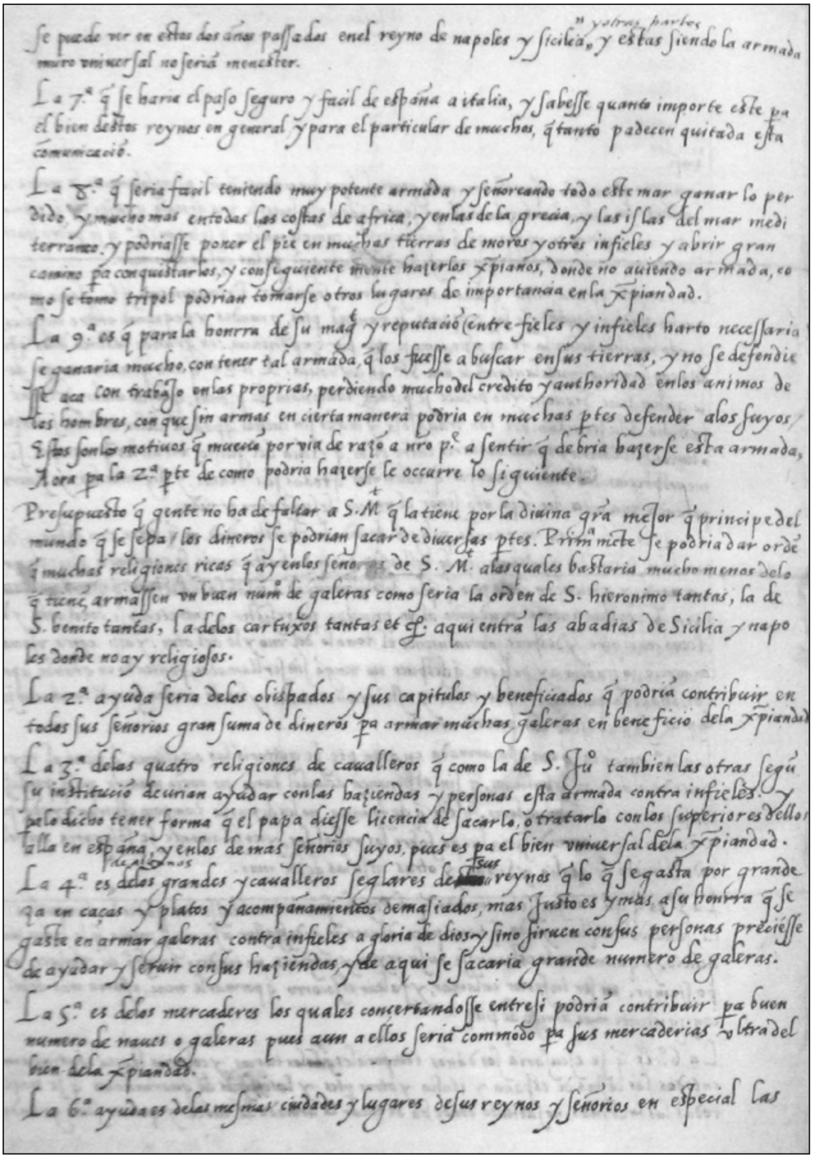
5. Ignatius' second letter to Charles V urging offensive military action against the Turks [ARSI, Polancus, *Epistolae, 1546-1556*, LII, 239]. Reproduced with the kind permission of the *Archivum Romanum Societatis Iesu* in Rome.



se puede ver en estos dos años passados enel reyno de napoles y sicilia, y estas siendo la armada
muy universal no seria menester.

La 7.ª q se haria el passo seguro y facil de españa a italia, y sabesse quanto importe este pa
el bien destos reynos en general y para el particular de muchos, q tanto padecen quitada esta
comunicació.

La 8.ª q seria facil teniendo muy potente armada y señoreando todo este mar ganar lo per
dido, y mucho mas entodas las costas de africa, y enlas dela grecia, y las islas del mar medi
terraneo. y podriasse poner el pie en muchas tierras de moros y otros infieles y abrir gran
camino pa conquistarlos, y consiguiente mente hazerlos xpianos, donde no auiendo armada, co
mo se tomo tripol podrian tomarse otros lugares de importancia enla xpiandad.

La 9.ª es q para la honrra de su mag y reputació entre fieles y infieles harto necessaria
se ganaria mucho, con tener tal armada, q los fuesse a buscar en sus tierras, y no se defendie
sse aca con trabajo enlas proprias, perdiendo mucho del credito y authoridad enlos animos de
los hombres, con que sin armas en cierta manera podria en muchas ptes defender alos suyos.
Estos son los motiuos q mueuen por via de razó a nro p.e a sentir q debria hazerse esta armada,
Aora pa la 2.ª pte de como podria hazerse se occurre lo siguiente.

Presupuesto q gente no ha de faltar a S.M. q la tiene por la diuina gra mejor q principe del
mundo q se sepa / los dineros se podrian sacar de diuersas ptes. Primamete se podria dar ordé
q muchas religiones ricas q ay enlos señorios de S. M. alas quales bastaria mucho menos delo
q tiene, armassen vn buen num de galeras como seria la orden de S. hieronimo tantas, la de
S. benito tantas, la delos cartuxos tantas et c. aqui entrá las abadias de Sicilia y napo
les donde no ay religiosos.

La 2.ª ayuda seria delos obispados y sus capitulos y beneficiados q podriá contribuir en
todos sus señorios gran suma de dineros pa armar muchas galeras en beneficio dela xpiandad

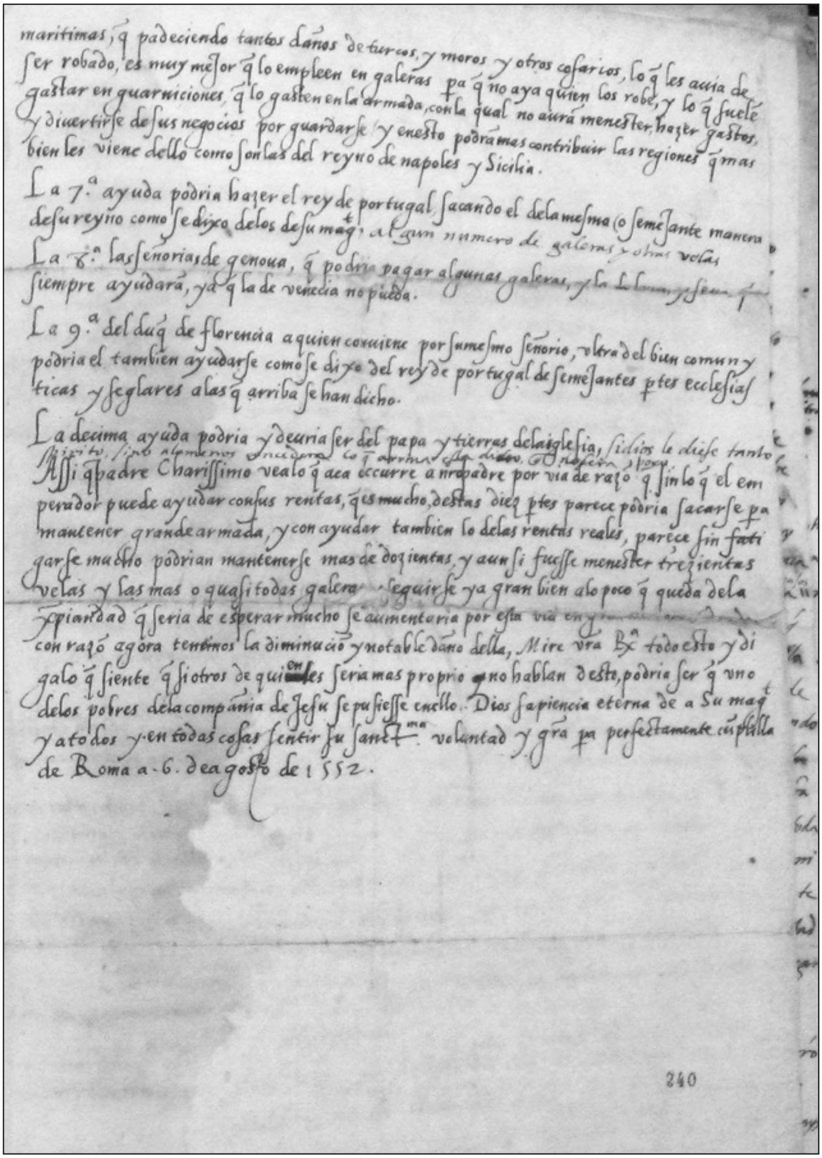
La 3.ª delas quatro religiones de caualleros q como la de S. Ju.º tambien las otras segú
su institució deurian ayudar con las haziendas y personas esta armada contra infieles. y
pa lo dicho tener forma q el papa diesse licencia de sacarlo, o tratarlo con los superiores dellos
alla en españa, y enlos demas señorios suyos, pues es pa el bien universal dela xpiandad.

La 4.ª es de algunos grandes y caualleros seglares de sus reynos q lo q se gasta por grande
za en caças y platos y acompañamientos demasiados, mas justo es y mas a su honrra q se
gaste en armar galeras contra infieles a gloria de dios y si no siruen con sus personas precisse
de ayudar y seruir con sus haziendas, y de aqui se sacaria grande numero de galeras.

La 5.ª es delos mercaderes los quales concertandosse entresi podriá contribuir pa buen
numero de naues o galeras pues aun a ellos seria commodo pa sus mercaderias oltra del
bien dela xpiandad.

La 6.ª ayuda es delas mesmas ciudades y lugares de sus reynos y señorios en especial las

6. Ignatius' second letter to Charles V (continuation) urging offensive military action against the Turks [ARSI, Polancus, *Epistolae, 1546-1556*, LII, 239v]. Reproduced with the kind permission of the *Archivum Romanum Societatis Iesu* in Rome.


maritimas, q padeciendo tantos daños de turcos, y moros y otros cosarios, lo q les avia de
ser robado, es muy mejor q lo empleen en galeras pa q no aya quien los robe, y lo q suele
gastar en guarniciones, q lo gasten en la armada, con la qual no aurá menester hazer gastos,
y diuertirse de sus negocios por guardarse y en esto podrá mas contribuir las regiones q mas
bien les viene dello como son las del reyno de napoles y Sicilia.
La 7.ª ayuda podria hazer el rey de portugal, sacando el de la mesma o semejante manera
de su reyno como se dixo de los de su magt, algun numero de galeras y otras velas
La 8.ª las señorias de genoua, q podria pagar algunas galeras, [illegible]
siempre ayudará, ya q la de venecia no pueda.
La 9.ª del duq de florencia a quien conuiene por su mesmo señorio, vltra del bien comun y
podria el tambien ayudarse como se dixo del rey de portugal de semejantes ptes ecclesias
ticas y seglares a las q arriba se han dicho.
La decima ayuda podria y deuria ser del papa y tierras de la iglesia, si dios le diese tanto
spiritu, sino al menos [illegible]
Assi q padre Charissimo vea lo q aca occurre a nro padre por via de razó q. sin lo q el em
perador puede ayudar con sus rentas, q es mucho, destas diez ptes parece podria sacarse pa
mantener grande armada, y con ayudar tambien lo de las rentas reales, parece sin fati
garse mucho podrian mantenerse mas de dozientas, y aun si fuesse menester trezientas
velas y las mas o quasi todas galeras. seguirse ya gran bien a lo poco q queda de la
Xpiandad q seria de esperar mucho se aumentaria por esta via en [illegible]
con razó agora tenemos la diminució y notable daño della, Mire vra Rª todo esto y di
galo q siente q si otros de quien es seria mas proprio no hablan desto, podria ser q vno
de los pobres de la compañia de Jesu se pusiesse en ello. Dios sapiencia eterna de a Su magt
y a todos y en todas cosas sentir su sanctma voluntad y gra pa perfectamente cumplilla
de Roma a 6. de agosto de 1552.

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7. Ignatius' second letter to Charles V (continuation) urging offensive military action against the Turks [ARSI, Polancus, *Epistolae, 1546-1556*, LII, 240]. Reproduced with the kind permission of the *Archivum Romanum Societatis Iesu* in Rome.

the defence of Catholicism but also to attend to the practical details of the implementation of this grand plan for the protection of the Roman Pontiff, so that "God's honour and glory" would not continue to suffer when "from nearly all parts, Christians, great and small, are seized and carried off to live among the infidels, where everyday we see many of them denying their faith in Christ to the great pity of those who retain some zeal for the preservation and advancement of our Holy Catholic Faith".

Decisive Battles for the Salvation of the Catholic Church: The Rhetoric of the Jesuit Preacher, the Skills of the Jesuit Confessor and the Foundation of the Best Teaching and Learning Institutions of the Baroque Age

There is general agreement among historians that the Council of Trent (1545–1563), dominated by the presence of Carlo Borromeo and Diego Laynez, that "stern, eloquent and invincible Jesuit who stood out like a giant",[47] had managed to not only define the doctrine of the Catholic Church, to strengthen its disciplinary mechanisms and to formalize its novel desire for an outward display of artistic splendor as expected from a new church triumphant, but also to unleash a series of campaigns. These were aimed at strengthening the loyalty of those who had remained faithful to Rome, at conquering those former Catholics who had become disillusioned with the scandalous leadership of the Renaissance papacy, leading them to embrace the Protestant 'heresy' and at converting persons of other religious convictions, then categorised as 'infidels'. In this context it was inevitable that one of the most explicit military metaphors in Ignatius' Constitutions mentioned that "after having enlisted, through the inspiration of the Lord, in this militia of Christ, they (the Jesuits) ought to be prompt in carrying out this obligation which is so great, being clad for battle day and night".[48] This clearly defined the role of the new Order created by Ignatius to save souls by "public preachings, lectures and any other ministries whatsoever, by spiritual exercises, by the education of children and unlettered persons in Christianity, by the spiritual consolation of Christ's faithfully through the hearing of confessions and, lastly by the administration of the sacraments" with the added agenda of "reconciling the estranged, assisting and serving those who are found in prison or

[47] Fisher, *History of Europe,* 562.
[48] Ganns, *Constitutions,* 68.

hospitals and performing any other works of charity, according to what will seem expedient for the glory of God and the common good".[49]

Ignatius had realized that, like most terrestrial battles for European supremacy in the Baroque age, the forthcoming battles for the salvation of the Catholic Church, had to be fought on Italian soil. It was here and here alone that Catholicism could be saved or lost forever as opposed to the situation elsewhere where events could fluctuate between gaining or losing influence and authority. He had therefore devised three powerful weapons to do the job, weapons designed "to edify, amuse, instruct, frighten, beguile and dominate"[50] contemporary Italian society—weapons which consisted of the rhetoric of the Jesuit preacher, the skills of the Jesuit confessor and the creation of the best schools of the age for poor but clever children, but also for the nobility, so that the administrative and ruling elites of the following generation would have a Jesuit background, spreading culture and knowledge to truly reflect the glory and triumph of the Catholic Counter-Reformation. By establishing his headquarters in Rome, Ignatius had succeeded in doing all this with flying colours. From his unassailable position close to Pope Paul III Farnese (who had protected the city of Rome with new artillery fortifications)[51] the former soldier had wisely replaced his sword with a pen to introduce a unique Jesuit management system based on information gathering and rapid communication, achieved by means of no less than 6815 letters that Ignatius is said to have written during the period 1548–1556.[52] A tradition of written records was thus established that was continued by his successors. Having realized the value of a large city in which to locate the nerve centre of the new Jesuit way of life and having persuaded his Jesuit Provincials that the crucial battles for the salvation of Catholicism had to be fought not from rural areas but from the main thoroughfares and squares of the great cities of Europe, Ignatius also wanted his Jesuits and their heirs to become concerned with those hallmarks of a truly Baroque urban culture based on spectacular displays, scenographic architecture and superbly-designed fortifications, this partly explaining the large num-

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49 O'Malley *et al, The Jesuits II*, xxxv–xxxvi.

50 Barzini, *The Italians,* 349.

51 Lucas, *Landmarking,* 79. For Farnese's fortifications see Rendina, *I Papi*, 629–635.

52 Lucas, *Landmarking*, 131 refers to Ignatius as "the most prolific writer of the sixteenth century". See also Bertrand, *Politique* cited by Lucas.

ber of publications authored by Jesuits about these subjects. All this and much more had started happening in the Rome of Ignatius.[53]

Jesuit preaching activity, firmly entrenched in the Papal Bulls *Regimini Militantis Ecclesiae* and *Exposit Debitum*, had been inaugurated soon after Ignatius had established his residence in Rome.[54] According to Luis de Granada's *Ecclesiasticae Rhetoricae* of 1576, the subject of preaching by which "the rude and ignorant multitude" had to be won over "by long speeches, in order for it not only to know and comprehend but also to do what we would want" so that "it is important to terrify and disturb it, not only with syllogisms but also with vivid representations and a great storm of eloquence, this requiring an argument that is not brief and limited but harsh, impetuous and abundant",[55] had been one of the most important topics discussed at an early stage in the Council of Trent, this having led to the publication on 17 June 1546 of the decree *Super Lectione et Praedicatione*.[56] Placed in the context of the mission statement of Ignatius, the role of the first Jesuit preachers had been to instruct in that "which everyone must know in order to gain eternal salvation, announcing with brevity and clarity the vices they should flee and the truths they should embrace, so as to succeed in avoiding the pains of hell and obtain eternal happiness".[57] This explains the interest of the Jesuit Order, throughout its chequered history, in the art of rhetoric—that remarkable ability to express oneself clearly and persuasively using diverse media—brought to a state of perfection in the seventeenth- century sermons of the famous Jesuit preacher Paolo Segneri who willingly used his profound knowledge of not only theology but of "all the arts, all the sciences, in short a complete encyclopaedia none of which would be superfluous"[58] to convince huge audiences.

Before delivering his sermons, the typical Jesuit preacher of the Baroque age "would be seated at a table surrounded by books silently bent

[53] Details about urban activity in sixteenth-century Rome can be found in Fagiolo and Madonna, *Roma Atlante*, 125–204 and 145.

[54] Lucas, *Landmarking*, 88 and 215. This author cites the old Jesuit proverb: "Bernard loved the valleys, Benedict the mountains, Francis the towns and Ignatius the great cities".

[55] Villari, *Baroque Personae*, 129–130 (Chapter 6 on '*The Preacher*' by Manuel Morán and José Andrés-Gallego).

[56] *Ibid.*

[57] These instructions are found in Chapter IV of the *Decretum de Reformatione* approved in the final session of the Council of Trent. (1563).

[58] Villari, *Baroque Personae*, 143 quoting a recommendation made by bishop Francisco Teriones del Carro of Leon (1551–1613).

8. Peter Paul Rubens' 1617-1618 painting in the *Kunsthistorisches Museum,* Vienna, showing the preaching activity of Ignatius in sixteenth-century Rome [O'Malley *et al.*, 2000]. Reproduced with the kind permission of the *Kunsthistorisches Museum* in Vienna.

to his task"[59] this at a time when the two main political protagonists of the Thirty Years War (1618–1648), Richelieu of France and Olivares of Spain, were both assisted by hand-picked teams of brilliant rhetoricians who were normally expected to provide arguments in favour of the respective positions of their kings in the conflict, but also to employ a high level of linguistic finesse "to praise the morals and sustain the wit" of their respective countries.[60] In Classical times and in the Middle Ages, the art of rhetoric had crowned the entire cycle of the liberal arts, forming the basis of all education in the humanities. In the 'Constitutions' (where "in addition to grammar, rhetoric was understood to be under the classification of humane letters")[61] and in the 1599 *Ratio Studiorum* (where the General Claudio Aquaviva drew up clear rules of the teaching and learning of rhetoric based on the works of Cicero, Aristotle and Quintilian),[62] the Jesuits of the Baroque age elevated the subject of rhetoric to a position of even greater prominence to govern all their preaching activities. This explains the remarkable successes of Jesuit missionaries not only in Europe but also in the several overseas missions that were gradually established in India, China, Japan, Abyssinia and in North, Central and South America, where Jesuit preachers used exceptionally zealous forms of rhetoric, more often than not, attired in native costumes and using native languages, frequently suffering horrendous martyrdoms of the types that once adorned the walls of the S. Andrea al Quirinale Jesuit novitiate in Rome.[63] In Europe, the famous rhetoric of Jesuit preachers acquired great importance in, say, Lithuania where a Jesuit work by Sigismundus Lauxmin entitled *Praxis Oratoria Sive Praecepta Artis Rhetoricale* (1648)[64] became a model and a goad for the development of the Baroque literary achievement in that country.

Another important application of Jesuit rhetoric concerned the many war theatres of Baroque Europe. The second General Congregation of the Jesuit Order held in Rome in 1563 offered six preachers, all very skilled in

[59] Villari, *Baroque Personae*, 143 refering to the famous Jesuit preacher from Ferrara, Daniello Bartoli.

[60] O'Malley *et al.*, *The Jesuits*, 94 (Chapter 3 on '*The Fertility and Shortcomings of Renaissance Rhetoric: the Jesuit Case*' by Marc Fumaroli).

[61] Ganss, *Constitutions*, 188 and 214.

[62] Farrell, *Ratio*, 79–84. An early Jesuit work was Soarez, *De Arte Rhetorica* (1560).

[63] Bangert, *Society of Jesus,* 109–110 writes that these lost paintings of Jesuit martyrs were described in Richeome, *Spiritual Painting* (1611). See also Bailey, *Jesuit Art in Rome* (2003).

[64] Ulčinaite, *Baroque Literature*, 9–10.

rhetoric, to the Pope to participate in the 'Holy Crusade' then being spearheaded by Philip II of Spain against the Ottoman Turks and in 1566 General Francisco Borgia, a former Grandee of Spain, introduced for the first time the incantation of the Litany as the Turks and their Muslim corsair allies operating from North Africa became more menacing.[65] These moves were intensified in 1587 when Count Alessandro Farnese, the commander-in-chief of the Catholic forces in the Spanish Netherlands acceded to the request of the influential Jesuit Thomas Sailly (1558–1623) to set up a so-called '*Missio Castrensis*' (initially composed of twelve Jesuit military chaplains but rising to twenty-four in 1600), to exhort and raise the morale of the soldiers in the 'just war' that was then being waged by Spain against the Protestant insurgents—according to Bangert,[66] ten particularly zealous Jesuit army chaplains were killed at the siege of Ostend and three others at the battle for Nieuport. Another example of the impact of Jesuit rhetoric on the war zones of Europe happened in Poland where the Jesuit Carlo Vota used his considerable rhetorical skills to convince a reluctant King Jan III Sobieski (1668–1696) to relieve Vienna in 1683 when that city was for the third time being attacked by the Turks.[67] In Malta, the French Grand Master of the ruling Hospitaller Order of St. John the Baptist, Jean-Paul Lascaris Castellar (1636–1657) also took great pains to obtain on an annual basis the services of the best Italian Jesuit preachers to inspire his warrior monks with their powerful rhetorical skills during Lent and Advent.[68] Among the prominent names mentioned in the voluminous correspondence[69] exchanged between Lascaris and the Jesuit authorities in Rome and Palermo, one finds those of the Jesuits Silvano de Viso, Giuseppe Spucces, Francesco Saracino, Pietro Caravaschino, Ippolito Maria Pergamo, and the famous Daniello Bartoli, author of an immensely

65 Padberg *et al., Congregations*, 6.

66 Bangert, *Society of Jesus,* 141–143.

67 *Ibid*. See also Suchodolski, *Polish Culture*, 85–87.

68 Lascaris was a prominent grand master and a great friend of the Jesuits who reorganised the armed forces of his Order, built new fortifications and introduced printing in Malta when he gave a license to Pompeo del Fiore.

69 NLM, AOM 1415 (Letters dated 27-08-1636 re. Silvano del Viso and Joseph Spucces); AOM 1417 (Letter dated 06-07-1638 re. Francesco Saracino); AOM 1420 (Letter dated 08-07–1642 re. Pietro Caravaschino); AOM 1424 (Letter dated 14-04-1646 re. Ippolito Maria Bergamo) and AOM 1427 (Letters dated 06–02- 1649 and 14-04-1649 re. Pietro Caravaschino and Daniello Bartoli). AOM 1431 contains a 01-12-1653 letter from Lascaris to the Jesuit General Nickel stressing the importance of having a good Jesuit preacher in Malta during Lent 1654.

popular work entitled *L'uomo di lettere*.[70] There was then the high-profile conversion publicity coup that had also been sealed in Hospitaller Malta when Friedrich von Hesse-Darmstadt had been decisively seduced back from 'heresy' to the Catholic fold through his association in Malta with the famous Jesuit mathematicians and orators Athanasius Kircher and Theodoric Baegk.[71]

Throughout their history in the Baroque Age, the Jesuit authorities in Rome were always fully aware of the dangers of the misuse of rhetoric in the multi-faceted battles that they incessantly waged on behalf of the Pope. One example of misguided and unprepared preaching in these times of theatricality and violence, was that vividly described by Daniello Bartoli (1608–1685):

> A most worthy preacher climbed up to the pulpit on Thursday of the second week of Lent, his face like that of a man in a state of terror, almost as if he had come out of hell, and from his mouth, with a tone of voice horrible to hear that came right from the heart, he gave no other preaching but a solemn recitation of the reading of the Gospel for that day: *Mortus est ...dives et supultus est in inferno* Three times he repeated this and then got down from the pulpit and many conversations ensued.[72]

This truly dramatic event can be contrasted with another description of Paolo Segneri's outstanding achievement in the field of Jesuit preaching reproduced by Moran and Andrés-Gallego when:

> Towards the end of the session, he would place a crown of thorns on his head and begin to strike the flesh of his bare shoulders with an iron rod. Not content with this he would beat his breast hard with a round cork stuck with pins and needles set into a tin box, causing great quantities of blood to flow before crowds who went and implored forgiveness. [73]

One was here confronted with a Baroque spectacle which would have been certainly enhanced by the sight of flowing blood and its effect on an inherently violent society. Impressions of this *genre* seem to have been common since in far away England, the poet John Donne, who hated Jesuits, had once preached his own funeral service in St. Paul's Cathedral in London in similar fashion, to the extent of afterwards slowly robing himself in a white shroud to pose for an almost posthumous painting.[74]

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70 Villari, *Baroque Personae*, 320 (Chapter 12 on *'The Bourgeois'* by James S. Amelang).
71 NLM, AOM 1417, ff. 28V, 29 and 33.
72 Villari, *Baroque Personae*, 135.
73 *Ibid.*
74 De Lucca, *Festa Funebre*, 22.

While the rhetoric of the Jesuit preacher was vital to inflame the souls of many a Catholic soldier or peasant, to instil a consciousness of the presence of a God who would certainly help them to die well during the carnage of a bloody battlefield at a time when anaesthesia and antibiotics did not exist, the skills of the Jesuit confessor were targeted at those who were more directly associated with the fickle politics of Baroque Europe. Conscious of their great responsibility in such a delicate and sensitive mission, (where some 'extremist' Jesuit confessors interpreted the militant spirit of the Counter-Reformation as a licence to war-mongering as opposed to others who had decided to remain faithful to the "spiritual consolation of Christ's faithful through the hearing of confessions" clause entrenched in *Exposcit Debitum*)[75], various Jesuit Generals in Rome, while acknowledging that their Order depended on the support of rich and ambitious princes for the success of its apostolic ministries, were fearful that the actions of their more belligerent confessors could lead to the identification of the entire Order with their warlike activities. Although the practice of hearing the confessions of princes had started during the life time of Ignatius when he had given permission to the Portuguese Jesuit Luis Gonçalves da Câmara (1519–1575) to accept the post of Court Confessor to the King Joao III 'The Pious' (1502–1577),[76] a high point of such potentially dangerous situations was reached in the first part of the seventeenth century. It now started becoming clear that the Jesuits could not be considered to be a monolithic organisation.[77] Bireley has shown that during the Thirty Years War, Jesuit Court confessors exercised different types of influences at the courts of Vienna, Munich, Paris and Madrid,[78] sometimes even persuading Jesuit-trained military commanders like Albrecht von Wallenstein and Johann Tzerclaes von Tilly that this war had the special status of a sin-exonerating 'Holy War'. Among the Jesuit confessors who stood out prominently during the first century of Loyola's invention[79] one can mention Martin Becan and Wilhelm Lamormaini as confessors to the Emperor Ferdinand II (1619–1637) together with Johannes Gans as confessor to the Emperor Ferdinand III (1637–1658); Johann Buslidius, Adam Contzen and Johannes Vervaux as confessors to the Duke Maximilian of Bavaria (1598–1659); Émond Auger as confessor to King Henry III of France

[75] O'Malley *et al, The Jesuits II*, xxxv.
[76] Bireley, *Thirty Years War*, 26–27. See also Kaplan, *The Portuguese*, 77–78.
[77] *Ibid.*, 267.
[78] *Ibid.*, 267–275.
[79] The role of the mentioned confessors is discussed at length by Professor Bireley in the above-mentioned work.

(1574–1589); Pierre Coton as confessor to King Henry IV of France (1589–1610); Jean Arnaux, Nicholas Caussin, Gaspar de Sequiran and Jean Suffren as confessors to King Louis XIII of France (1610–1643) and Francois de la Chaize as confessor to King Lous XIV of France (1643–1715), together with Hernando de Salazar, Francisco Aquado and Juan Martinez de Ripalda as confessors to the powerful Count-Duke Gaspar de Guzman Olivares (1622–1643) of Spain. Amidst the inevitable problems caused for the Jesuit Order by these militant confessors—some of whom were perceived by many as a living contradiction to the mission statement outlined in Ignatius' Constitutions—the Jesuit hierarchy after 1590 started concerning itself with this troublesome problem.

As a first step, the fifth Jesuit General Congregation of 1593–1594 issued a blanket decree concerning the involvement of Jesuits in politics where no Jesuit "no matter who he may be, for whatever reason at all, was to involve himself in the public or secular affairs of princes, affairs touching on the government of the state, no matter who might wish to induce the Jesuit to do this and engage him in these affairs."[80] This decree, although justified in view of the obvious and repetitive temptation of many French and Spanish Jesuits to have become involved in the French religious wars and the Spanish armada against England, drew the ire of many belligerent Jesuits. The Jesuit scholar and diplomat Antonio Possevino (1534–1611) reacted savagely by drawing up more than twenty examples intended to show that this 'pacifist' attitude was not at all in harmony with Jesuit militant practice.[81] Refuting Possevino's arguments, General Aquaviva published his *De Confessarum Principum* (1602).[82] This manual was ratified by the sixth General Congregation of the Order in 1608 and henceforth served as an official document of the Jesuit Order in so far as the duties and parameters of Jesuit Court Confessors were concerned. To balance things out, it was declared in the contents that the aim of this manual was not to offend Catholic princes, more so those who had proved themselves to be generous benefactors of the Order, nor was it meant to miss any golden opportunity that may present itself to influence world events *Ad Maiorem Dei Gloriam*, but only to give clear instructions to confessors in positions of power and influence to "deal only with those affairs

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[80] Padberg *et al., Congregations*, 12.

[81] Bireley, *Thirty Years War*, 28 fn. 86 (*Dubii proposte dal P. Possevino l'anno 1594 circa il decreto de non trattar cose di stato*).

[82] ARSI, *Inst.SJ.* III, ff. 281–284 and 297 (*De Confessariis Principum*). A translation of the Latin text can be found in Donnelly, *Jesuit Writings*, 216–221.

which pertain to the conscience of Princes or are related to it or to certain pious works", furthermore "to avoid even the appearance of exercising any political power, not seeking favours from others, not allowing themselves to serve as channels to the Prince's directives or reprimands, not to allow themselves to be dragged into conflicts between Princes or among court factions". As one would have expected, there were some unpleasant repercussions to Aquaviva's manual, even though further clarifications[83] were forthcoming at the seventh General Congregation of 1615 which elected Muzio Vitelleschi to the generalship. One particular worrying repercussion was the appearance in Krakow in 1614 of an anonymous pamphlet entitled *Monita Privata Societatis Iesu*—a publication which was rapidly condemned by the Papal Inquisition on 28 December 1616 when it was described by the Jesuit Cardinal Roberto Bellarmino as containing statements that were clearly incomparable with the "genuine piety, morality and even good sense for which Jesuits worldwide had achieved great fame with their exemplary behaviour".[84] Aware of the unsavoury consequences[85] that appointments to the post of confessor of princes entailed—at times made even worse with the publication of books by Juan de Mariana (1599),[86] Roberto Bellarmino (1610)[87] or Martin Becan (1613)[88]—the Jesuit Order repeatedly took all those measures that were deemed necessary to protect its integrity. Many Jesuits, however, continued involving themselves in the secular affairs of princes, as shown in the help that was regularly given to them in planning battlefield formations and building new fortifications, the subject of this book.

Beyond achieving fame and results as brilliant preachers and skilled confessors of the high and mighty, the Jesuits of the Baroque age also managed to fulfil a third objective—that of becoming the first Religious

83 Padberg *et al., Congregations*, 15.

84 O'Malley *et al., The Jesuits II,* 50–65 (Chapter 4 on *'Between History and Myth: The Monita Secreta Societates Iesu'* by Sabina Pavona) citing *Lettere originali del S. Cardinale Bellarmino* (*1604–1611*) kept in ARSI.

85 A discussion of this issue can be found in Bireley, *Thirty Years War*, 267–275.

86 In his work, Mariana (1536–1624) fowarded his famous defence of tyrannicide when, according to him, anyone could assassinate a king who oppressed his subjects. Mariana's controversial views were elaborated in his later volume entitled *De Monetae mutatione* (1605).

87 In his work, Bellarmino (1542–1621) defined the powers of the papacy in the wake of the Venetian Interdict (1606), the literary controversies involving James I of England (1607–1609) and the debate on Gallicanism (1610–1612).

88 In his work, Becan (1563–1624) advocated tyrannicide in special circumstances. His views were harshly criticised by Griesinger, *The Jesuits,* 508.

Order of the Catholic church to adopt formal education as a major ministry in the wake of Ignatius' declaration that education was a most efficacious instrument for the defence and propagation of the Catholic way of life. One can recall in this respect that "the education of children and unlettered persons in Christianity" was a sentence that had appeared at an early stage in the three major official Jesuit documents of 1539–1550, namely, the '*Five Chapters*', *Regimini Militantis Ecclesiae* and *Exposcit Debitum*.[89] It is in this context not surprising that all seventeenth and eighteenth-century Jesuit Generals[90] were unanimous in devoting much time and effort to the development of an indeed revolutionary educational system that had been established when Ignatius founded the first college for aspiring Jesuits at Gandia, Spain in 1545.[91] This event had been soon followed by the inauguration of the first college open to lay students in Messina in 1548.[92] Messina marked the start of a long process of growth which escalated from 245 colleges in 1599 to 441 in 1626 onto 669 in 1749[93]—confined not only to Europe but also to the Asian and American continents, attracting huge enrolments ranging from 800 to 2000 students in the larger cities and 500 to 800 students in the smaller urban centres.[94]

The new 'schoolmasters of Europe' achieved great fame not only because of the excellence of their colleges and the efficacy of introducing a free-of-charge system of education but also because of their foundation of special seminaries for nobles as well as specialised academies and even new universities. It was within the beautifully-designed walls of these institutions that many eminent Jesuit professors who authored treatises and books about diverse subjects including military architecture, mainly targeted their teaching efforts at those pivotal students whose exalted position in the high society of the Baroque age enabled them to exercise considerable influence on their relatives, this in turn providing innumerable opportunities to many Jesuits to transport their expertise from the classroom to more mundane environments, including those marked by intrigues and strife. So great was the demand for these new Jesuit teaching

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[89] O'Malley *et. al.*, *The Jesuits II,* xxxiv-xxxvi. See also Woodrow, *I Gesuiti,* 43 who mentions a 1551 letter written by Ignatius to the Duke of Bavaria revealing that the aim of his education policies was "to resurrect science, theology and religion".

[90] Bangert, *Society of Jesus*, 515.

[91] Ganss, *Constitutions*, 171. The Gandia College was opened to lay students in 1546 and acquired university status in 1547.

[92] *Ibid*.

[93] Farrell, *Ratio*, ii.

[94] *Ibid*., iii.

and learning centres that as early as 1563, the second General Congregation of the Jesuit Order recommended 'moderation and reserve' in the acceptance of new colleges for lay students.[95] It was only in the sixth General Congregation held in 1608 that the old dispute among Jesuits as to whether it was "permissible and in accordance with our vocation"[96] to run colleges exclusively for laymen, was finally resolved and approval was given for what had already become *de facto*, the Order's largest and most successful apostolate in its battles for the salvation of the Catholicism, moulding the formation of countless popes, cardinals, bishops, emperors, kings, princes and members of the nobility. A new vision of the world—that of Ignatius of Loyola—was taking shape.

The common tie linking all the Jesuit colleges that were founded in Baroque Europe and beyond was undoubtedly General Claudio Aquaviva's *Ratio Studiorum* of 1599 which essentially was a technical elaboration of Part IV of Ignatius' Constitutions.[97] Although modified several times since its first definitive expression in 1599, the *Ratio* provided a much needed platform for the organised diffusion of Jesuit knowledge in different spheres of learning. It also defined the entire philosophy of Jesuit education hinged on a close relationship between theory and practice. It is to his credit that General Aquaviva realised that his novel educational platform had to equip students for a worthwhile life experience based on sound religious beliefs. At the time of his death on 31 January 1615, all Jesuit teaching and learning institutions had become the most organised instruments of Catholic instruction and propaganda. They also acted as bases for Jesuit preaching excursions into the countryside, offering the desired counterbalances to repeated heretical and infidel ideological infiltrations and complementing the spectacular conversions that were then being registered by the Jesuit Order in its overseas missions.

Based on the above-outlined principles, the contents of Aquaviva's *Ratio Studiorum* of 1599 addressed those crucial areas of the education

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95 Padberg *et al., Congregations,* 5.

96 *Ibid.*, 14. Ganss, *Constitutions*, 174 points out that there were five types of Jesuit Colleges (1) buildings occupied by Jesuit Scholastics attending public universities (2) buildings in which lectures by Jesuit professors were given to both aspiring Jesuits and lay students (3) buildings for lay students which, however, could also incorporate some Jesuit scholastics (4) boarding colleges for aspirants to the priesthood and (5) boarding colleges for lay students. According to MacCulloch, the Portuguese Jesuit Baltasar Teles had in 1647 described a Jesuit college as "a Trojan horse filled with soldiers from heaven, which every year produces *conquistadores* of souls".

97 Ganss, *Constitutions*, 171–225.

that was provided to students who had joined the colleges at the age of nine or ten and also to adult 'external students' who wanted to learn more beyond the acquisition of basic reading and writing skills. The first area to be addressed concerned the administration of the schools[98] where the interacting duties of 'Provincials', 'Rectors', 'Prefects of Studies', 'Professors of the Higher Faculties' (Sacred Sculpture, Philosophy, Moral Philosophy and Mathematics), 'Teachers of the Lower Classes' (Humanities and Grammar), 'Jesuit Scholastics', 'Moderators of the Academies', 'Directors of the Marian Sodalities' and even 'Beadles' were all carefully formulated. One interesting clause stated that "none of our students shall enter the school with weapons, daggers or knives which may be forbidden by reason of place or circumstance". The second area to be addressed concerned the 'Curriculum of Studies',[99] one typical example being the rule that was established for the 'Professor of Mathematics' which dictated that:

> He should spend about three quarters of an hour of class time in explaining the elements of Euclid to the students of physics. After two months when his students are somewhat familiar with the subject, he should add some geography, astronomy or similar matter which the students would enjoy hearing about. This added material is to be given on the same day with Euclid or on alternate days.[100]

The tough Jesuit curriculum has to be evaluated in the context of classes that commenced at 07.00 hours immediately after the recital of morning prayers, attendance at mass and a light breakfast—continuing right through the morning, when the students heard lectures, and through the afternoon, when the students were asked to study privately or in groups—followed by other classes which would be held in the evening to prepare the students for the material that would be covered on the following morning. The sessions normally ended at about 21.00 hours, with the exception of Thursdays and Saturdays (when afternoons were free) and Sundays (when formal lectures were substituted by mass, sermons and vespers) all this leaving very little time for recreation.[101] The third and fourth areas to be addressed by the *Ratio Studiorum* concerned teaching methodology and matters of discipline,[102] the latter based on formulated norms of conduct, regularity of attendance and good order for students.

[98] Farrell, *Ratio,* ix, 1–46, 62–99, 105.
[99] *Ibid.*, ix, 1–97.
[100] *Ibid.*, 46.
[101] O'Neill and Dominguez (ed.), *Diccionario*, 1205 (*Educacion*).
[102] Farrell, *Ratio*, 101.

An interesting provision was here also made for the setting up of specialised academies,[103] composed of chosen groups of students (inclusive of adult 'external students') who would willingly form an 'academy' because of their special interest in some branch of knowledge under the guidance of a Jesuit moderator. Members of the academies were expected, "to set an example to the rest of the students by excelling in virtue and piety, in diligence in their studies and in observance of the rules of the college". Preference was given to those who belonged to one of those many Sodalities dedicated to the Virgin Mary that were present in all Jesuit colleges and Catholic cities, based on a model that had been set up by a young Belgian Jesuit called Jean Leunis at the *Collegio Romano* in 1563.[104]

The Jesuit college soon emerged as the best organised and best managed urban element of its times, cleverly inserted by brilliant Jesuit architects in the heart of urban armatures that were now more than ever marked by powerful fortifications, ostentatious churches and magnificent palaces. The efforts of the Jesuit Order to control the society of the early modern world, however, did not stop here. Beyond the physical presence and imposing façade and plan of the Jesuit college and its Baroque adjacent church, the Jesuits used their Marian Sodalities to permeate the entire social fabric of the contemporary world where each Sodality was tailor-made "for a particular craft, or vocation, or social class, artisans, magistrates, students, professional men",[105] a particularly effective networking instrument for the formation of a truly Catholic ruling elite in each and every city of consequence. It was also not uncommon for Jesuits to occupy professorial chairs in the universities as happened, for instance in Cologne, Erfurt and Freiburg,[106] or even to dominate entire faculties as happened at Ingolstadt, Prague, Vienna, Trier, Mainz, Wurzburg, Heidelberg, Innsbruch and so many other cities,[107] not to mention the occasional presence of brand new Jesuit colleges enjoying university status as happened at Coimbra, Evora, Vilnius, Olmutz, Bamberg, Breslau, Dillingen, Graz, Molsheim, Osnabruch, Paderborn—the list is long.[108]

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103 *Ibid.*, 103–112.

104 Bangert, *Society of Jesus,* 56 and 106. See also Cowan, *Urban Europe,* 103–107.

105 Bangert, *Society of Jesus*, 106.

106 Brizzi and Greci, *Università in Europa, 95–108* (Chapter 6 on '*The Jesuitensystem in the university structure of early modern Germany*' by Rainer A. Muller).

107 *Ibid.*, 106, text and fn. 44.

108 *Ibid.*, 106, text and fn. 45. See also O'Neill and Dominguez, *Diccionario*, 1205–1207 (*Educacion*).

Considered from this viewpoint, it would have seemed that the *Compañía de Jesús* founded by Ignatius of Loyola had lived up to the will of its inventor not to be shut up within the confines of a conventional monastic cloister but to be actively and aggressively involved, through preaching, confessional and teaching activities, in the rush and bustle of the ever-expanding Baroque city, where all battles for the salvation of the Catholic church could be fought and won once the right backing of the ruling elites—whose palaces and churches were more often than not located close to the Jesuit colleges—was forthcoming.

Entering Dangerous Territory: The Jesuit *Mathematicus* and the Geometry of War in Early Modern Europe

One remarkable characteristic of the Jesuit Order in the Baroque age was the involvement of many of its learned members in the dissemination of mathematical knowledge. This was inspired by Ignatius' belief that any acquisition of knowledge was a spiritually profitable exercise. In the great scientific revolution that was shaking sixteenth-century Europe, it was understandable that many learned Jesuits, would emerge in the forefront of a massive promotion exercise involving mathematical education in its wider and more practical sense of the word. This contrasted sharply with the narrow interpretation of the subject today, a 'mathematical disciplines' approach which went far beyond the time-honoured study of Euclid to include a wide range of topics including Euclidean geometry, the art of measuring, analytic geometry, the sphere, trigonometry, logarithms, navigation, gnomonics and horology, the calender, civil and military architecture, geometry as applied to calculus, geometry as applied to astronomy and geometry as applied to mechanics. At the dawn of the Baroque age, the promotion of such a wide spectrum of mathematical knowledge invested the Jesuit *mathematicus* with awe and credibility which, in perfect accord with Ignatius' strategy, was considered essential to elevate the status of his invention over that of the traditional Orders. As Sarton wrote, "One cannot really talk about mathematics in the sixteenth and seventeenth centuries without seeing a Jesuit at every corner."[109]

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[109] Sarton, *Belgian Mathematics* in 'Isis' 40, 3–5 cited by Angelo De Bruycher in '*A matter of opportunities? Jesuits practising mathematics in the seventeenth century Spanish Netherlands*', paper presented at the 17th Novembertagung on History and Philosophy of the Mathematical Science Studies Unit of the University of Edinburgh, 3–5 November 2006.

At the same time, however, the involvement of the Jesuit Order with the mathematical disciplines, then closely associated, in the minds of many, with the dangerous world of alchemy and astrology, created certain problems for a canonically appointed Religious Order, as did the even more widely held view among many philosophers and theologians in Italy, that mathematics was a subject of notorious disrepute, worthy of ridicule by both professors and students of the traditional universities, since it did not demonstrate its conclusions through causes but dealt instead with 'odious abstractions' rather then 'real objects'. All this had led to repeated criticism of the first professor of Mathematics at the Jesuit *Collegio Romano*, the Spanish Jesuit Balthasar de Torres (1518–1561)[110] who had been appointed in 1553, soon after the establishment of the first chair of mathematics at the Jesuit college at Messina in 1548 by its rector Jeronimo Nadal.[111] Nadal had firmly believed in the importance of the mathematical disciplines, humbly accepting the official viewpoint that the teaching of this dangerous subject had to be regulated within a hierarchical structure where theology ruled over philosophy which in turn ruled over mathematics and the lower disciplines, on the model of the educational structure of the university of Paris known as the *Modus Parisiensis.* This structure had been praised by the Jesuit as "the most exact and fruitful,"[112] well within the spirit of articles 451 and 458 of Ignatius' Constitutions.[113]

The one person who changed the above-described negative perceptions and attitudes towards mathematical teaching was the German Jesuit Christoph Clavius (1538–1612) who served as professor of mathematics at the *Collegio Romano* during the period 1565–1612.[114] With his brilliant mind and convincing rhetoric, Clavius managed to establish the Jesuit college in Rome as the most important Counter-Reformation centre of excellence and authority on the mathematical disciplines, responsible for providing undergraduate training to all Jesuit students in the second year of a two-year philosophy course and postgraduate training of a minimum one-year duration, given to gifted Jesuit scholastics gathered in a

110 AHSI 103, a.LII (1983) 56–92 (article on *'Jesuiten-Mathematiker in Frankreich und Italien'* by K.A.F.Fischer). See also Gorman, *Scientific Counter-Revolution*, 61–64.

111 Gorman, *Scientific Counter-Revolution*, 17–20. See also O'Neill and Dominguez, *Diccionario* 2571–2574 (Matemáticas).

112 O'Malley, *First Jesuits*, 200–242.

113 Ganss, *Constitutions*, 214 -217.

114 AHSI 103, a.LII (1983), 84 and 87. See also Baldini, *Saggi*, 17 who mentions E. Knoblock's 1988 contribution on Clavius in '*Revue d'histoire des sciences*'.

so-called *Accademia di Matematica,* who would afterwards be sent to teach the mathematical disciplines in the different provinces of the Order. Clavius also inspired the dissemination of Jesuit mathematical knowledge in several European colleges, encouraging the private tuition arrangements that were often made by the Jesuits for the more eager 'external students' in positions of power and influence.[115] As expected, Clavius' efforts to create a new *corps d'elite* of Jesuit mathematicians scattered all over the Jesuit world, provoked stiff opposition from circles both within and outside his Order.

Clavius relied on a very efficient Jesuit print culture (ignored by his predecessor Torres) to rally support for his stand. One case in point was a document entitled *Modem quo disciplinae mathematicae in Scholis Societates possent promoveri* (1582) where the following paragraph particularly emphasized the importance of mathematical knowledge in Jesuit campaigns for religious dominance:

> Mathematics will also bring great ornament to the Society where noblemen would understand that our Jesuits are not ignorant of mathematics, for this subject is discussed very frequently in their conversations and meetings. For this reason, our Jesuits, would incur great shame and disgrace if they were to remain silent in gatherings of this kind, as has been related most frequently by those who were thus embarrassed.[116]

While such comments clearly imply that one reason for the Jesuit interest in the mathematical disciplines was certainly the external stimulus that was provided by the nobility of the Baroque age, another reason—also having Clavius as its protagonist—was the welcome alignment of the post-Tridentine Catholic Church with mathematical knowledge. This had happened when Clavius (who had been heavily involved in formulating the new Gregorian Calendar that was promulgated by means of the Pope Gregory XIII Boncompagni's Bull *Inter gravissimos* of 24 February 1582)[117] used the Jesuit press to defend his role as papal mathematician from a ferocious attack on this new calendar spearheaded by Jakobus Heerbrandus and Lucas Ossiander of the Lutheran University of Tubingen,[118]

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[115] Baldini, *Saggi*, 49–98 writes that Jesuit academies consisted in either one or a combination of five options: a seminar or extended debate on a previously identified topic, a course of lessons focused on a particular subject, an extra-mural course for adults, a special class focused on matters which were dealt with marginally in ordinary Jesuit colleges or a '*corso di perfezionamento*' offering postgraduate education.

[116] ARSI, *Mon. Paed.*, VII, 115–117.

[117] Coyne and Pedersen, *Gregorian Reform of Calendar,* 201–239.

[118] Gorman, *Scientific Counter-Revolution*, 24.

encapsulated in a lengthy 1583 document prepared by Kepler's teacher Michael Maestlin.[119] On this occasion, Clavius had enlisted the valuable help of an old friend who was much more accustomed to battling with 'heretics'—the Jesuit scholar Antonio Possevino (1534–1611)—who, in characteristic style did not hesitate to use the harsh words 'incompetence' (*imperitiam*) and 'vanity' (*vanitatem*) to describe Maestlin's document.[120] Possevino's words were later echoed by Clavius when Maestlin was described by the Jesuit mathematician as a "man infected with the strain of Ubiquitorian heresy."[121] Another early confrontation which Clavius had to face was with a Jesuit professor of philosophy called Benito Pereira (1535–1610) who had, in the wake of the Pope Sixtus V Perretti's condemnation of judicial astrology in his *Coeli et Terrae* Papal Bull, published at Ingolstadt a book entitled *Adversus Fallaces et Superstitiosas Artes* (1591). This publication highlighted the dangers of teaching mathematics because of its questionable relationship with astronomy and practical astrology. Pereira's wrote that the Jesuit Order would find it very hard to distinguish 'pious' mathematicians from 'impious' counterparts, this making the introduction of Clavius' mathematical disciplines in the curriculum of Jesuit colleges, dangerous territory[122]—especially so in Spain where the Spanish Inquisition would surely swoop upon any perceived malpractices in the handling of the subject by Jesuit professors. Upset with these attacks but also encouraged by the Pope's declaration that the teaching of mathematics was legitimate only insofar as it could be seen to be ancillary to other knowledge of clear benefit to contemporary society, Clavius and his zealous student Giuseppe Biancani (1566–1624) argued that the good Jesuit *mathematicus* was more capable of providing true and certain knowledge than the philosophy professors who were more often than not embroiled in controversies, such as those on which form of

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119 *Ibid*., 25, text and fn. 26.

120 Possevino, *Moscovia, et alia opera*, 223. For Possevino's battles against 'heretics' in the Valtelline, see Griesinger, *The Jesuits*, 166 who alleges that Possevino at the head of 2000 soldiers once attacked the village of St. Germain, killing all the male inhabitants and burning two reformed clergymen "on a slow fire."

121 Gorman, *Scientific Counter-Revolution*, 25 and 27–28 citing F. Kaltenbrunner's 1877 work on the Clavius-Maestlin controversy. Ubiquitarianism was the name given to the religion of a Lutheran sect who believed that the '*Corpus Christi*' was not confined to the Eucharist.

122 Pereira, *Adversus Fallaces*, (1591). For details of the Papal Bull *Coeli et Terrae* see Pumfrey *et.al*., *Renaissance Europe*, 249–273 (article on '*Astrology, Religion and Politics in Counter-Reformation Rome'* by Germana Ernst).

Aristotleianism truly represented the thoughts of the Master.[123] Besides, there was the advantageous use of mathematical knowledge in the military operations of Catholic armies, of the type that Clavius had earlier described in his *Sphaeram Ioannis de Sacro Bosco Commentarius* (1570):

> We should not overlook that which happened not many years ago, when the leader of the army of the King of Spain snatched away the whole army of Christians from imminent death with the help of this Divine Discipline, on the island of Jamaica. When the entire Spanish army was in the most extreme danger of death, and the general could not find any way to provide food from the Jamaicans, he ordered that it should be announced to the leaders of the Jamaicans that unless they provided all the necessary food to himself and his army, they would suffer many terrible evils. They would see the moon to be darkened not long afterwards to bear witness to this fact. As he was excellently versed in astronomy, he knew that the moon was about to be eclipsed. At first the Barbarians made light of the commands and threats of the Christian general, but when they perceived the moon to be eclipsed at the time at which he had stated, and did not understand the cause of this matter, they gave complete faith to the words he had uttered before, provided the Christians with abundant provisions and rushed to fall at the feet of the same general and the rest of the army, so that they forgot themselves and were left in a terrible state of need.[124]

Beyond this first Jesuit reference to the possible military applications of mathematical knowledge, two important aspects of this early Jesuit interest in the art of war were Clavius' association with Possevino's plan for world evangelisation—to be attained through militancy and an aggressive print culture—and his role in the drafting of the 1599 *Ratio Studiorum* which established the status of the professors of the mathematical disciplines within the higher faculties of the Jesuit college.

With regards to the first aspect, Possevino, in Book XV of his *Biblioteca Selecta* (1593) acknowledged that "in this matter, among others, the judgement and the excellence of Christoph Clavius, the *mathematicus* of our Society, were enormous help to me"[125] so that the legendary mathematically-based war-related exploits of Archimedes and Proclus, were now entrenched in an authoritative work which regarded mathematical knowledge as a useful tool to serve the battle strategy that was then being devised by Possevino for the implementation of his grand plan. Referring to the perceived association of mathematics with the art of war, a very

123 Clavius, *Euclides elementorum* (1574), *Prolegomena*.
124 Clavius, *In Sphaeram Ioannis* (1570), 11–12.
125 Possevino, *Biblioteca Selecta* (1593).

significant entry in Possevino's *Biblioteca Selecta* entitled '*Ars Militaris inter Mathematicas Numeranda*' criticised those philosophers who:

> had rejected the military arts which some had already called Mathematics and which really appertains to the formation and co-ordination of lines of battle, on the grounds that this was only computation, similar to that which happens in the reviewing of troops, in the measurement of land and in the partitioning of spaces in the military camp.[126]

Such insertions suggest that the time had arrived for the Jesuits to openly appreciate the possible military applications of the subject in the context of Biagioli's witty observation that, after the sweeping 1495–1496 invasion of Italy by King Charles VIII of France, at the head of 25,000 professional soldiers using heavy artillery and iron cannonballs that wreaked havoc on the medieval walls of many an Italian town, "the cannon-syndrome and the introduction of the bastion forced the *milites*, the professional warriors of aristocratic origins, to begin to rely less on their horses and more on Euclid for their survival as a distinct social group."[127] These soldiers were usually the most influential supporters of the Jesuit Order.

Clavius' role in the drafting of the 1599 *Ratio Studiorum* was as significant as his close collaboration with Possevino. His involvement here can be traced back to the very first drafts of the document compiled during the period 1565–1572 by Nadal, Borgia and Ledesma which was followed by at least two other preliminary drafts in 1586, two others in 1591 and 1592 and the final version in 1599.[128] Despite pressures to the contrary from the high and the mighty, Clavius seems to have tactfully managed to avoid including explicit military applications in his '*Modus quo disciplinae mathematicae in Scholis Societatis possint promoveri'* (1582) and other documents, although one can notice that *'Opera Archimedes*' was listed as one of the many subjects included under '*disciplinis mathematicis*' in an earlier document authored by Clavius in 1581.[129] The learned professor seems to have been very conversant with the work of the ancient Greek mathematician since in his *'Euclides Elementorum Libris XV'* (1574), Clavius reproduced the following anecdote:

> When Hieron, King of Syracuse, built a ship that he intended to send to Ptolemy, King of the Egyptians, it was so heavy that all the people of Syra-

126 *Ibid.*, 179 (Book XV, Chapter II)
127 Biagioli, *Italian Mathematicians*, 41–95.
128 Ganss, *Constitutions*, 216, text and fn. 4.
129 *Ordo serrandus in addiscendis disciplinis mathematicis* in ARSI., *Mon.Paed.*, VII, 110–113 (14-1).

Hebrides five Hebudae
HIBERNIA
Noort
zee
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ALIS
The Lands end
Sorlingas
Langedoc
Minorca
Maiorca
Eſtrecho de Gibraltar
B A R B A R I A
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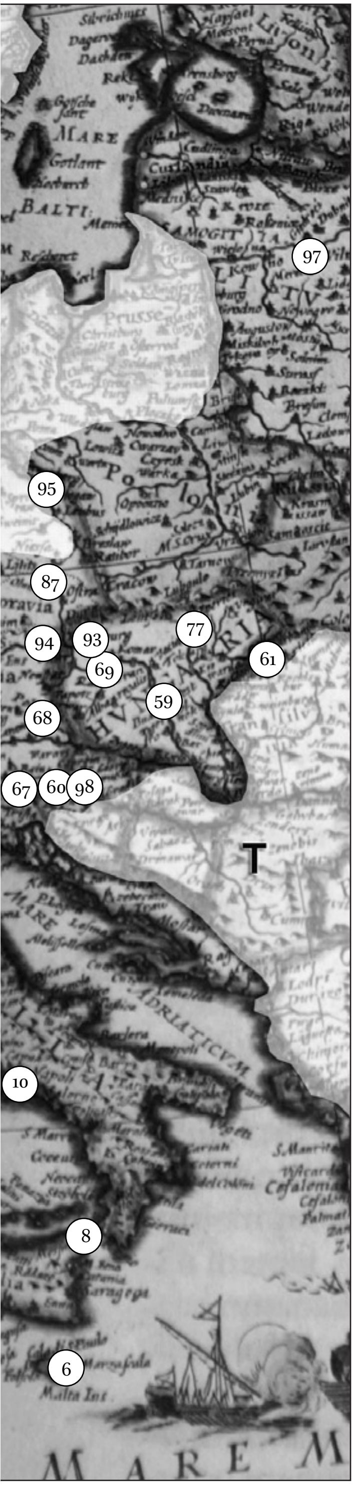

Jesuit mathematical faculties in the indicated Jesuit assistencies:

ITALY
1. Bologna [2]
2. Brescia
3. Cremona
4. Ferrara
5. Genova
6. Malta
7. Mantova
8. Messina
9. Milano [2]
10. Naples
11. Palermo [2]
12. Parma
13. Rome
14. Siena
15. Venice
16. Cagliari

FRANCE
17. Aix
18. Avignon
19. Bordeaux
20. Brest
21. Caen
22. Cahors
23. Chambéry
24. Clermont-Ferrand
25. Dieppe
26. Dijon
27. Dôle
28. Hesdin
29. La Flèche
30. La Rochelle
31. Lyon
32. Marseille
33. Montpellier
34. Nancy
35. Nantes
36. Paris
37. Pau
38. Perpignan
39. Poitiers
40. Pont-à-Mousson
41. Reims
42. Rennes
43. Strasbourg
44. Toulon
45. Toulouse
46. Tournon

PORTUGAL
47. Coimbra
48. Élvas
49. Évora
50. Lisbon

SPAIN
51. Barcelona [2]
52. Bilbao
53. Cadiz
54. Madrid [2]
55. Valencia

GERMANY
56. Aachen
57. Antwerp
58. Bamberg
59. Budapest
60. Burghausen
61. Cluj
62. Dillingen
63. Douai
64. Freiburg im Breisgau
65. Fribourg
66. Fulda
67. Gorizia
68. Graz
69. Györ (Rab)
70. Heidelberg
71. Hildesheim
72. Ingolstadt
73. Innsbruch
74. Klagenfurt
75. Köln
76. Konstanz
77. Košice
78. Leuven
79. Liège
80. Linz
81. Ljubljana
82. Luzern
83. Mainz
84. Molsheim
85. München
86. Munster
87. Olmütz (Olomouc)
88. Osnabrück
89. Paderborn
90. Praha
91. Regensburg
92. Trier
93. Trnava
94. Wien [2]
95. Wroclaw (Breslau)
96. Würzburg
97. Vilnius
98. Zagreb

Principal Wars of the Baroque Age

1489-1648 Franco-Spanish Wars
1558-1582 Livonian Wars
1562-1598 French Religious Wars
1563-1570 Northern Seven Years War
1568-1648 Dutch Wars
1585-1604 Anglo-Spanish War
1618-1648 Thirty Years War
1625-1630 Anglo-Spanish War
1640-1668 Portuguese War of Restoration
1642-1660 English Civil War
1654-1660 Anglo-Spanish War
1667-1668 Devolution War
1672-1679 Dutch War
1688-1697 War of the Grand Alliance
1700-1721 Great Northern War
1702-1713 War of the Spanish Succession
1718-1720 War of the Quadruple Alliance
1740-1748 War of the Austrian Succession

9. Religious divides and Jesuit mathematical faculties in the Baroque age, superimposed on Joan Blaeu's 1665 map of Europe. The shaded areas represent dominantly Protestant [P] and Turkish [T] territories in about 1600, revealing the sensitive 'frontier' position of many Jesuit mathematical faculties.

> cuse working together were unable to move it. Archimedes most skilled in geometry, promised the King that he would ensure, by the power of geometry alone, that the King himself could move the ship by only the powers of geometry. When he carried this out, in view of everyone, the King is said to have exclaimed with astonishment—from this day on, whatever Archimedes says, he is to be believed. [130]

As a result of his good work, Clavius single-handedly managed to give a new image to the teaching of the mathematical disciplines at the *Collegio Romano* where "the students", he wrote "would be greatly drawn to these studies if once a month all the philosophers would gather in a single place where one of the students would be given the opportunity to explain some astronomical or geometric problem, which would both be fun for the audience and useful for the humanities."[131] The assistants and successors of Clavius[132] all contributed to the dissemination of mathematical knowledge from the Roman college to seventeen chairs of mathematics in the Italy,[133] seven in Spain,[134] four in Portugal,[135] thirty in France[136] and forty-three in Germany.[137] Such was the reputation of Jesuit mathematical investigation in the Collegio Romano that in 1603, Clavius' future successor Christoph Greinberger was able to confidently introduce his '*Problemata*' as follows:

> the boldness of mathematicians has always been great, as has their power, most religious fathers and honourable members of the audience; they possess so much spirit in a small number of people, that there is nothing in the whole universe either cloaked in darkness or buried in difficulties, that has been able to escape their ingenuity and that has not been investigated with their machines. [138]

Further on in this address delivered to the applause of the many Jesuits, church dignitaries and nobles gathered in the grand hall of the Roman

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[130] Clavius, *Euclides elementorum*, 6v.

[131] *Modus quo disciplinae mathematicae in Scholis Societatis possent promovere* in ARSI., *Mon. Paed.*, VII, 117 (14-II).

[132] AHSI 103, a.LII (1983) 84–85.

[133] O'Neill and Dominguez (ed.), *Diccionario*, 2571–2572 (*Matemáticas*). See also AHSI 103, a.LII(1983) 79–92.

[134] O'Neill and Dominguez, *Diccionario*, 2572 (*Matemáticas*).

[135] *Ibid.*

[136] *Ibid.* See also AHSI 103, a.LII (1983) 56–78.

[137] O'Neill and Dominguez (ed.), *Diccionario,* 2573 (*Matemáticas*). See also AHSI 93, a.XLVII (1978) 159–224 (article on *'Jesuiten-Mathematiker in der Deutschen Assistenz'* by K.A.F. Fischer).

[138] Feingold, *Jesuit Science*, fn. 77 (article on '*Mathematics and Modesty in the Society of Jesus: the problems of Christoph Grienberger*' by M. J. Gorman).

college for the occasion, Grienberger praised Archimedes' military exploits at the siege of Syracuse in 213 BC. His contribution paved the way for the Jesuit application of mathematics to the military domain in a scenario that had, since 1550, been characterised by innumerable armed conflicts of a religious nature. It was therefore not at all accidental that the close relationship between the expertise of the Jesuit *mathematicus* and the geometry of war would become explicit at about this time.

The many developments in the art of warfare in early modern Europe[139] can be broadly classified into three inter-related categories. The first category comprised the use of cannon and muskets of various types and sizes and the mathematical instrumentation that was required to measure the type and weight of their shot (calipers, gauging rods and scales), the inclination of their barrels (quadrants and sight levels) and their effective range of fire *viz-a-vis* distances from targets (triangulation instruments like the *radio latino* and astrolabes). The second category comprised the orderly logistic systems that had to be developed to move troops and cannon, organize the arrival of supplies, set up camps and devise elaborate systems of field fortifications and underground navigation to launch well-planned and well-timed attacks on defensive positions. The third category comprised the actual design of these defensive positions—the gradual evolution, as from c.1500, of a new *genre* of military architecture purposely devised to withstand artillery attack. This would have entailed the use of Euclidean geometry to devise sufficiently thick earthworks which could absorb the impact of artillery projectiles, which could be easily repaired and, moreover, difficult to undermine—earthworks which were therefore protected by ditches and random countermines and which on plan followed a 'trace italienne' of curtain walls and mutually-supporting bastions where all faces were protected by flanking cannon fire leaving no 'dead spaces' which could be identified by a shrewd enemy commander.[140] After 1600, mathematical tables which related the line dimensions and angle values of the different parts of the trace italienne to the range of a musket led to the introduction of more sophisticated fortifications of the 'sistema italiano migliorato' type which now also incorporated a systematic planned network of countermines and additional defensive structures known as 'outworks' positioned in and beyond the ditch, (counterguards, ravelins, demilunes, hornworks, crownworks,

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[139] Some publications about early modern warfare consulted include those by Black, Hale, Childs, Norris, Van Creveld, Tallett, Pepper, Fara and Cobos-Guerra.

[140] Sopra, *Palmanova*, 34–41.

tenailles and others), to offer the kind of stunning images that would have greatly impressed contemporary painters of urban landscapes, at the same time also offering a powerful source of inspiration for the many military metaphors in Jesuit correspondence. In this context, Mumford writes:

> These new fortifications were far more elaborate than the old walls: they had outworks, salients, bastions, in spearheaded forms which permitted both the artillery and the armed infantry to rake the ranks of the attacking forces, from whatever side they might approach. By bringing the muskets of the defenders to the outmost positions, they could theoretically put the city itself, whose circumference would be many hundred yards behind, beyond the reach of the enemy's most powerful gun. [141]

The development process of military architecture c.1500–1750 was closely intertwined with contemporary developments in mathematical investigation. The sieges of Pisa (1500) and Padua (1509) revealed that the basic trace italienne of the early sixteenth century, comprising polygonal plans of ramparts and pentagonal bastions placed at each salient angle, was primarily targeted at resisting the massive cannon bombardments and underground mining action that normally preceded an attack by foot soldiers during offensive operations. Mathematical applications at this time, therefore, had three concerns. There was firstly the need to develop reliable range-finding instruments to properly operate cannon of various sizes. There was secondly the need to study the impact of cannonballs and unexpected underground explosions of gunpowder on the ramparts. Thirdly, there was the need to use Euclidean geometry to perfect the planimetric and height dimensions of the various bastions to offer the best cannon-fire responses from the fortifications. The experience of several sixteenth-century sieges reveals that the aim of defensive fire was primarily to deny the enemy any chance of positioning his cannon within close range of the fortress to thus use the destructive type of direct fire that could breach the fortifications but since all the ditches and walls were now also geometrically designed to channel attacking soldiers into veritable killing grounds, a second aim of defensive fire was for the cannon of the defenders to cause havoc on enemy troops attempting to storm the walls, with gun emplacements carefully positioned to prevent the aggressors from finding any place of refuge from the resulting combination of direct and flanking defensive fire. It was therefore by no accident that the

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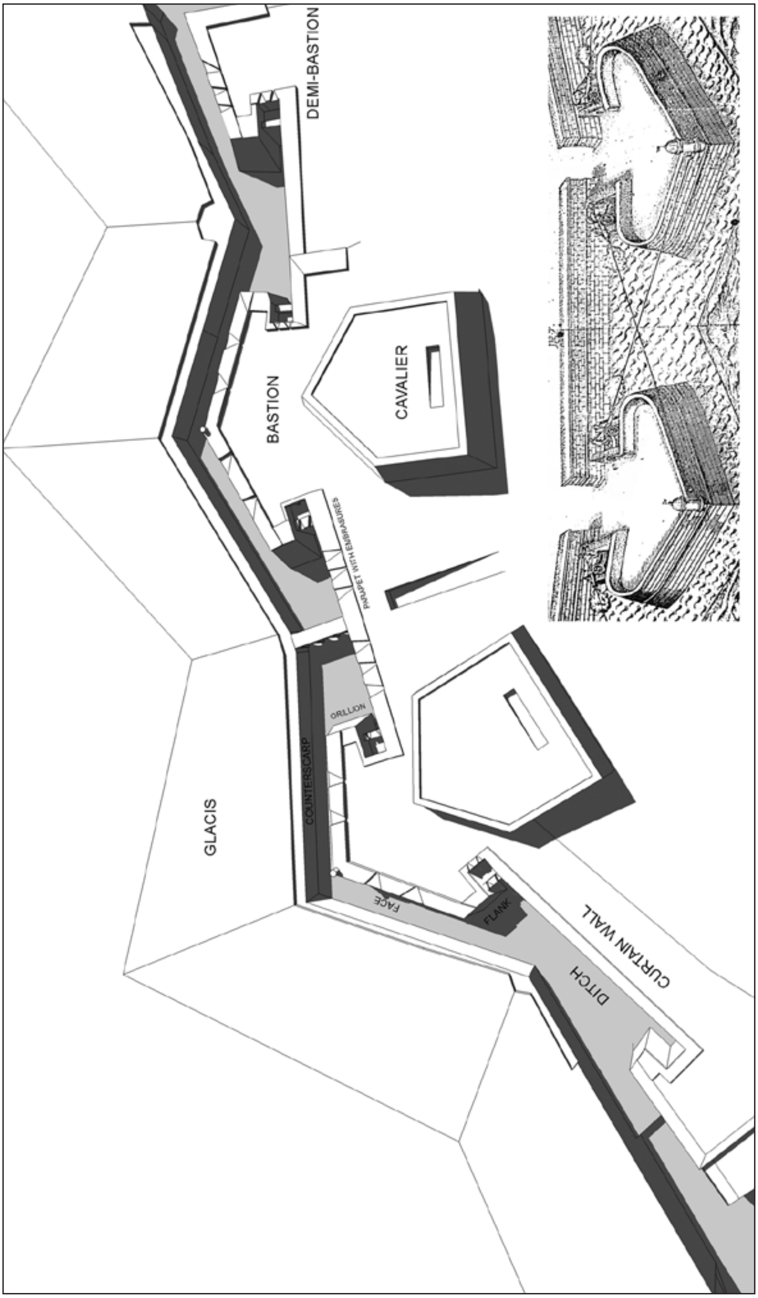
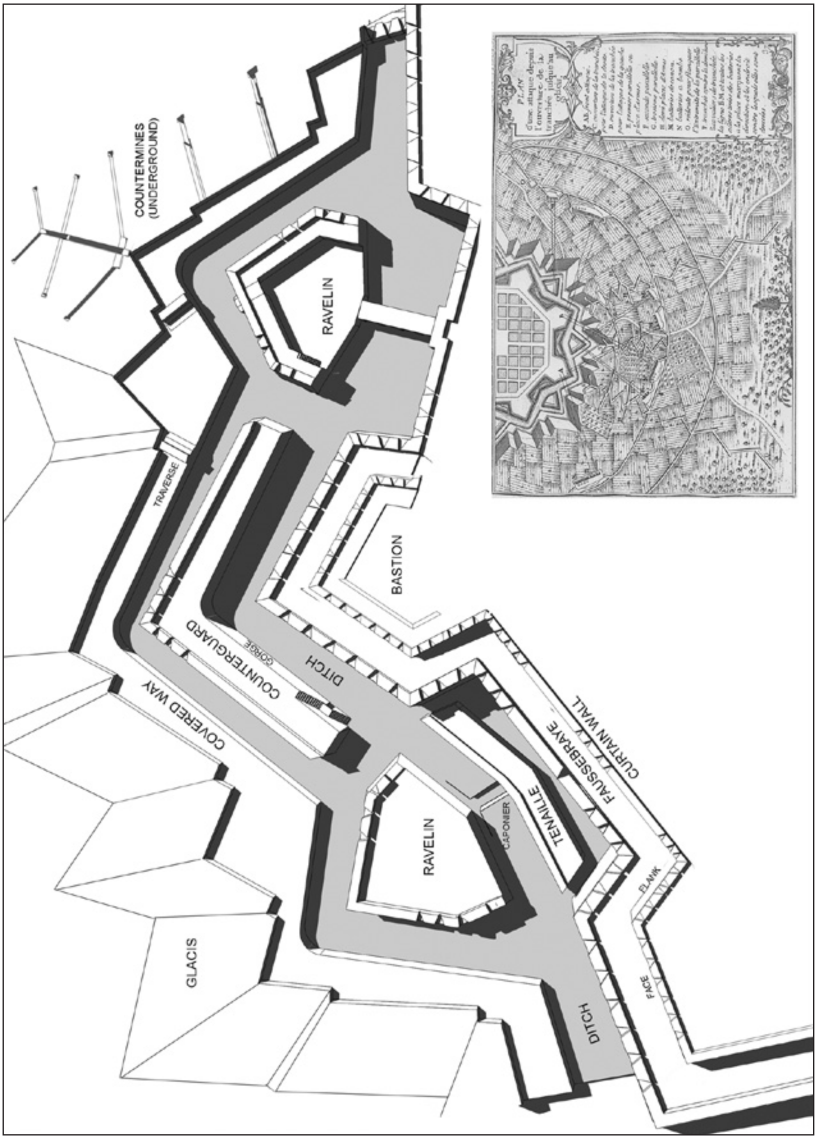
[141] Mumford, *City in History*, 410.

10. Frontispiece of the 1550 edition of Niccolò Tartaglia's book *Nova scientia inventa*.



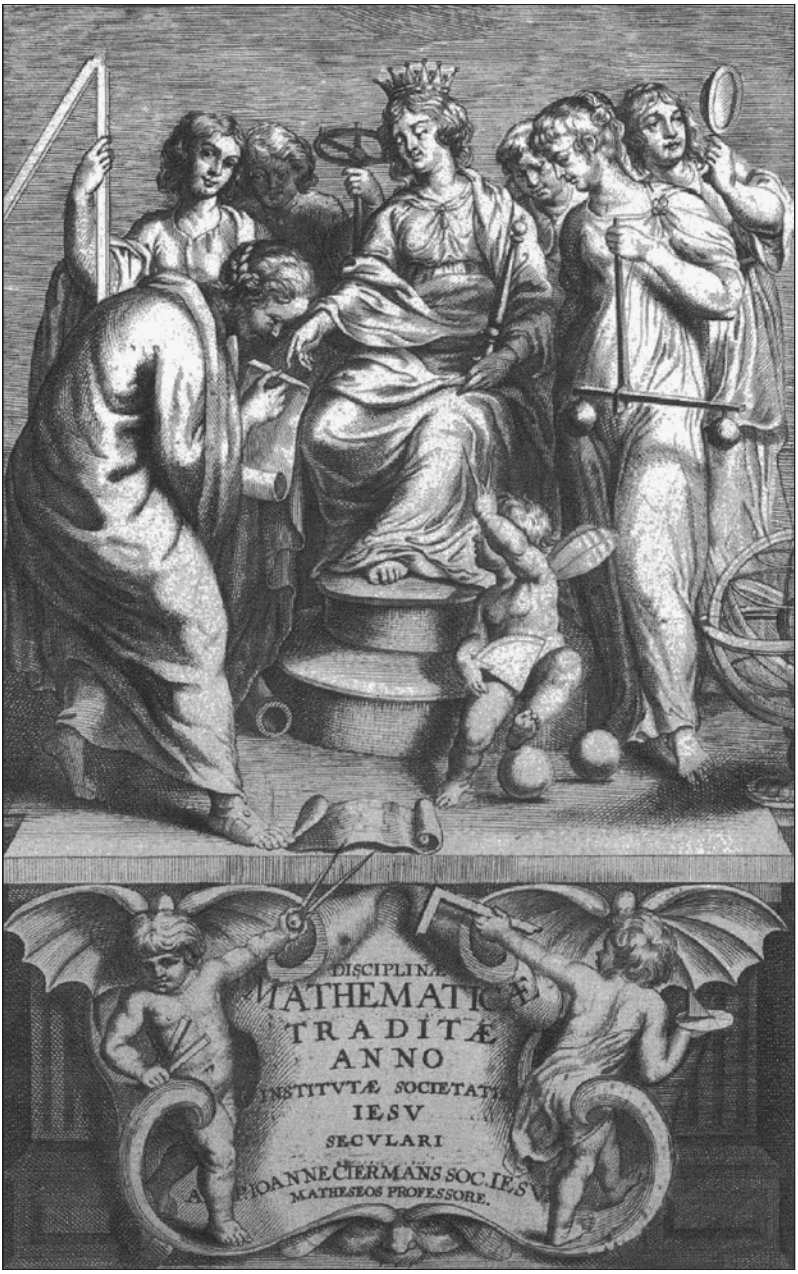
11. Typical sixteenth-century fortifications.



12. Typical seventeenth-century fortifications. The line joining the meeting point of the two faces of a bastion with the meeting point of the flank of the opposite bastion with the adjacent curtain wall was called the 'line of defence' while the angle formed by the projection of the bastion face line with the curtain wall was called the 'angle of defence.' The inset drawing shows the 'parallel' method of siege operations used by Vauban.

frontispiece of the 1550 edition of the book Nova scientia inventa authored by the mathematician Niccolò Tartaglia (1499–1557) reproduces a picture of Euclid who is here seen opening the door to a walled circle representing a 'fortified town.' Within the circular space, Tartaglia himself stands surrounded by allegorical figures symbolizing all the mathematical disciplines, who are all carefully watching the mathematician's learned demonstration of projectile trajectories from a cannon and a bombard of the type used in contemporary sieges. Aristotle then opens the door to a second smaller walled circle representing a 'citadel' and behind him stands Plato holding a banner with the inscription Nemo huc Geometrie expers ingrediat, meaning, 'let no one enter here save the expert in geometry.' As expected, Philosophy sits enthroned above this second walled circle, presiding, as happens in the Modus Parisiensis, over all that was happening in this rare scenario of mathematical applications to the art of war. Tartaglia's investigations became the basis of military practices in the sixteenth century, dominating the fortification experiments of Gabriele Tadino da Martinengo (1475–1543), Baldassare Peruzzi (1481–1536), Antonio da Sangallo the Younger (1484–1546), Michele Sanmicheli (1484–1559) and so many others who very effectively used their ruler and their compass to relate their fortification systems (based on their preferred dimensions for the curtain wall and the bastion flank) with radial or orthogonal 'ideal' forms of town planning, primarily designed to facilitate the rapid movements of troops and cannon.

Important developments in military architecture happened at the dawn of the Baroque age. The emerging French, Dutch and Spanish schools of thought about military architecture, inspired by the so-called 'sistema italiano migliorato' of c.1600, now agreed to relate the so-called line of defence of a fortification to the range of a musket. It was also universally accepted that outworks and a systematic planned network of underground countermines placed in and beyond the ditch could provide a very useful additional protection to the main line of curtain walls and bastions, especially so in terrain conditions which would have imposed geometrical distortions, then called 'irregular fortifications'. The value of outworks as an effective means of counteracting the various improvements in seventeenth-century siege methods perhaps reached a salient point at Vauban's siege of Maastricht (1673). During the early days of the siege, cannon batteries were positioned along a maximum cannon-range trench dug parallel to the fortifications of the town, known as the 'first parallel.' From here zig-zag trenches were excavated to allow the attackers to gradually move closer to the fortifications in relative safety and dig a 'second parallel' trench which was then also equipped with cannon batteries. This process was then repeated until the aggressors reached a 'third parallel' position from where they could hope to continue undermining and storm the covered way and the various outworks of the town in a difficult and smoke-filled progression that was normally characterized by many casualties and time delays caused by setbacks, more often than not proportionate to the extent and complexity of the outworks involved and the intensity of defensive musket fire which in turn depended on the type and number of guns that were available to the defenders. In order to accommodate these new warfare sophistications, all the parts of a defensive position now had to have inter-related line dimensions and angle values to ensure that the musket fire of the defenders could effectively counteract each and every move of approaching enemy infantry. In view of the employment of the wide range of the polygonal shapes that appear in seventeenth-century military treatises, the computation of the above-mentioned inter-relationships to maintain a fixed dimension of about 200 metres for the line of defence, became increasingly complicated, this explaining why trigonometrical formulas and logarithmic computations (of the type that were soon being thought in all Jesuit mathematical faculties) soon started being used to produce mathematical fortification tables giving the correct inter-related line dimensions and angle values for all parts of a fortress. It was the great contribution of the early seventeenth-century military mathematicians Samuel Marolois (1572–1627), Adam Freitag (1602–1664), Wilhelm Dilich (1571–1650) and others that they managed to very successfully market the use of such tables which, according to one authoritative source "delivered us from the bother of multiplying, dividing, extracting roots and applying proportional rules since now everything would have been worked out beforehand by the mathematicus." Through the fortification tables of the Baroque age, which formed the basis of the achievement of such outstanding seventeenth-century military engineers as Blaise Francois de Pagan (1604–1665), Menno Van Coehoorn (1641–1704), Eric Jönsson Dahlberg (1625–1703) and Sébastien le Prestre de Vauban (1633–1707), it was possible to now rapidly know all the dimensions of each and every part of a fortification corresponding to the dimension of the line of defence or the value of the angle of defence that would have been specified. This would have enabled the military engineer of the Baroque age to design and build fortifications and equip them with the necessary countermines in record time and, perhaps more



13. Engraved frontispiece of a 1650 book explaining the mathematical disciplines of Jan Ciermans. Note the drawing of a fortress on the unfolded parchment lying on top of the pedestal.

importantly, to provide reliable cost estimates before the commencement of these very expensive military works which, more often than not, tended to drain the financial resources of many a nobleman or a city, not to mention the onerous costs of maintaining the trained soldiery and guns required to defend them.

It is therefore understandable that the above-mentioned developments in the military architecture of the emerging Baroque world would have shifted the attention of princes and military commanders interested in the 'honour' of their fortresses and cities, from the liberal arts to the mathematical disciplines, from aesthetic considerations to those material calculations of weight, number and position which were well within the competence of any *mathematicus* worth his salt. Such a person would have been aware of the rich heritage of Euclid, Archimedes and Polybius who together with Aeneas Tacitus, Caesar and Augustus used a primitive form of arithmetic and algorithmic forms to devise a system of secret communications for military purposes.[142] Although the achievements of these ancient mathematicians had featured prominently in the curricula of the Jesuit mathematical classes controlled by Clavius, it was only after his death in 1612 that many Jesuit mathematicians in Italy, Spain, Portugal, France and Germany started including contemporary fortification building in their programmes of mathematical study and research. In the Baroque age, lay mathematicians also started becoming interested in the military applications of their subject. In this respect, one notes the contents of the 1614 programme of Johann Valentin Andreae (1586–1642),[143] the 1617 programme of Robert Fludd (1574–1637),[144] the 1644 programme of Pierre Herigone (1580–1643)[145] and the 1730–1738 programme of

142 Booss-Bavnbek, *Mathematics and War*, 2, consulted online.

143 Andreae, *Collectaneorum mathematicorum* (1614) incorporating geometry, arithmetic, statics, astronomy, gnomonics, automata, optics, architecture, fortifications, surveying and polyhedra. The Lutheran Andreae was also the author of *Reipublicae Christianopolitanea* (1619) which discusses an ideal state of the seventeenth century, focusing on 'principles of fortifications' and 'moral defences', influenced by the original manusript of Tommaso Campanella's *Città del Sole*.

144 Fludd, *Cosmi maioris* (1617) incorporating arithmetic, music, geometry, optics, pictorial art, military art, the science of motion, the science of time, cosmography, astrology and geomancy.

145 Herigone, *Cursus Mathematicus: Tome III* (1644) incorporating Euclid and theoretical geometry in its first section; arithmetic, computation, algebra and analysis in its second section; trigonometry, practical geometry, fortifications, military arts and mechanical applications in its third section; the study of the sphere, geography and navigation in its fourth section and the study of optics, caloptrics, dioptics, perspective, spherical trigonometry, planetary theories, gnomonics and music in its fifth section. Herigone's '*artem*

Christian von Wolff (1679–1754).[146] Their achievement can be compared with the 1641 curriculum devised by the distinguished Jesuit *mathematicus* Jan Ciermans (1602–1648)[147] who with great originality chose a dozen mathematical disciplines to teach to his students corresponding with the twelve months of the year, namely geometry, arithmetic, optics, statics, hydrostatics, nautical science, military architecture, logic, war machines, geography, astronomy and chronology. There was then the 1674 curriculum devised by the Jesuit mathematician Claude Francois Milliet de Chales (1621–1678)[148] who drew up a very influential programme of instruction based upon the books of Euclid, arithmetic, the sphaerics of Theodosius, trigonometry, practical geometry, mechanics, statics, geography, magnetism, civil architecture, the art of carpentry, the art of the stone cutting, military architecture, hydrostatics, fountain and river studies, hydraulic machines, navigation, optics, perspective, caloptrics, dioptics, music, pyrotechnics, astrolabes, gnomonics, astronomy, calenders, astrology, algebra, meteors and conics.

When one considers that Clavius had included no less than twenty-two mathematical disciplines in his *Ordo servandus in addiscendis disciplinis mathematicis* of 1581—including Euclid, arithmetic, the sphaerics according to Theodosius, instrumentation (quadrants and astrolobes), algebra, horology, geography according to Gemma Frisius, Archimedes, perspective, astronomy, music and mechanics—one marvels at this wide spectrum of mathematical knowledge in the Baroque age. An application of great interest was undoubtedly that concerning the measurement of time

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muniendi' discussion consists of 2 parts, the first with 12 chapters concerning 'regular fortifications' and the second answering 9 problems posed by 'irregular fortifications'. The real name of Herigone was Clement Cyriaque, Baron de Mangin.

146 Wolff, *Elementa matheseos: Tome IV* (1730–1738) incorporating mathematical method, arithmetic, geometry and trigonometry in its first section; mechanics with statics, hydrostatics, aerometry and hydraulics in its second section; optics, perspective, caloptrics, dioptics, the sphere, spherical trigonometry and astronomy, spherical and theoretical, in its third section and geography with hydrography, chronology, gnomonics, pyrotechnics and civil and military architecture in its fourth section. Important contemporary works on mathematical military applications were Frobes, *Encyclopaediae* (1743) and Hermann, *Mathematiques* (1728).

147 Ciermans, *Annus Positionum mathematicarum* (1641). According to MacDonnell, *Jesuit Geometers*, 11 this Jesuit *mathematicus* used the lunar year of 354 days as the basis of his work, dividing the month into 3 parts, as did previous Muslim authors from whom he may have got the idea. According to Cobos-Guerra and Fernandez, *Arquitectura militar españ̌ola*, the 1640–1641 course of Ciermans was tailor-made to teach Spanish military officers in the occupied Netherlands.

148 Milliet de Chales, *Mundus Mathematicus* (1674) dedicated to Duke Carlo Emanuele II of Savoy.

which had great military relevance in the seventeenth and eighteenth centuries. Realising that a fortress or fortified city could only hold out in siege conditions until a stormable breach had been made in its main line of defence, the objective of any military engineer attacking the place would have been to speed up this process while that of the defender would have been to delay this event for as long as possible by the construction of sprawling outworks in and beyond the ditch. The further these outworks stretched in front of the principal line of defence, the further away had the enemy to start his siege operations, the excavation of trenches and the mounting of gun batteries, before coming to grips with the main line of defence, all this necessitating careful timing calculations.[149] This often-overlooked factor underlined the importance of time-related mathematical knowledge for both the attacking and the defending parties. At the same time, all outworks had to be geometrically designed so as to be flanked and supported by the cannons and musket fire since any face not properly covered by flanking fire would have been be identified as a weak point in the defensive network. In this context, it was of paramount importance that all the outworks had to be dominated by the artillery platforms of the works behind them so that if captured, they could first be swept by lethal back fire and afterwards, at an opportune moment, be blown up from beneath by means of a series of accurately-timed explosions of gunpowder stored in barrels concealed in those much-feared invisible underground chambers called countermines, this again introducing a crucial time factor in the military operations of the defenders not to mention all those mensuration, surveying and recording procedures that were necessary for the construction of such elaborate defensive works. All this suggests that in an age of continuous warfare, the wide spectrum of mathematical knowledge that was created and diffused by Clavius at the *Collegio Romano* would have had great practical relevance and value.

In such circumstances, it would not have been at all surprising that many Jesuit mathematicians who would have become interested in exploiting the relationship between mathematical knowledge and the geometry of war. Given the widespread violence of the times, they would have surely perceived such links as yet another opportunity for them to demonstrate their zeal for the salvation of Catholicism. But in an age where geometry also dominated the more humane pursuits of explora-

[149] The French military engineer Vauban was a master of this kind of timing, as explained in Duffy, *Fortress in the age of Vauban*, vol.II, 153.

tion, astronomical observation, painting, riding, dancing, theatre, gardening and so many other creative activities dominating the daily life of princes and nobles, many Jesuits also found time to explore such non-military applications of mathematics. Among their outstanding creations, one can identify the calender and scale invented by Christoph Clavius; the *Pantometrium* and counting machine invented by Athanasius Kircher; the gnomons of Leonard Ximenes and Ignace Gaston Pardies; the water clocks of Frances Line; the telescopes of Christoph Greinberger, Christoph Schiener, Nicolo Zucchi and Roger Boscovitch; the flight machines of Francesco Lana-Terzi; the surveying instruments of Johann Helfenzrieder; the time-measuring instruments of Giovanni Riccioli; the cartographic achievements of Matteo Ricci and Ferdinand Verbiest; the perspective experiments of Andrea Pozzo—the list[150] is seemingly endless, a tribute indeed to the ingenuity of the Jesuit *mathematicus*, and, with apologies to Lev Nikolayevich Tolstoy,[151] to his often forgotten contributions to war and peace in the Baroque world.

"I am now a priest and a colonel"—The Views of the Learned Antonio Possevino and Other Jesuit Scholars Regarding the Involvement of Clerics in War-Related Activities to Conquer the Enemies of the Catholic Church

Francois Marie Arouet's philosophical novel entitled *Candide* provides a rare example where the interest of the Jesuits in the art of war became fully explicit. A declared critic of the Jesuit Order, the legendary Voltaire (1694–1778) describes the scene at a Jesuit frontier outpost in Paraguay when his hero Candide, surrounded by twenty-four armed soldiers, meets the reverend commandant of the place—a German Jesuit who turns out to be none other than Candide's old friend, the son of baron Von Thunder-Ten-Tronckh. Wearing the "three cornered hat and tucked up habit" of a Jesuit but with a soldier's "sword by his side" and also carrying "a half pike", the commandant declares that "I am now a priest and a colonel" adding that "we shall give a warm reception to the troops of the King of Spain, I can assure you, because they will be beaten first and excommunicated afterwards."[152] Although Voltaire is here obviously enjoying his

[150] MacDonnell, *Jesuit Geometers*, various pages.
[151] Lev Nikolayevich Tolstoy's *War and Peace* (1865–1869) cited in Aylmer, *The life of Tolstoy*, various pages, and Clark, *The Russian Chronicles*, 357.
[152] Voltaire, *Candide*, 30.

opportunity of joining a chorus of contemporary criticism about the so-called Jesuit 'Kingdom of Paraguay', historical facts do tend to reveal that there is much truth in this description of that unique fusion of religious and military authority that the Jesuit Order enjoyed over the South American Indios in the seventeenth and eighteenth centuries.

The origins of the Jesuit interest in fortification building activities directed against 'heretics, Turks and other infidels', clearly implied in the writings of several early Jesuit scholars, must perhaps be explored in the context of a long history of pre-Christian and Christian attitudes towards warfare based on what was perceived as constituting a 'just war'. This incorporated the twin principles of *Jus ad bellum*—when is it permissible to wage war—and *Jus in bello*—what would be the limitations in the conduct of war. Considering the contents of the very first recorded book about the subject entitled *The Art of War* by the ancient Chinese author Sun Tzu (which was for the first time translated into French from the original Chinese language by the Jesuit missionary Joseph-Marie Amiot in 1772)[153] and considering the many biblical references to the Jewish concept of a 'just war' as outlined in the Old Testament Book of Deuteronomy,[154] also the writings of the classical authors Thucydides, Heraclitus, Plato, Aristotle, Cicero Seneca, Cato the Younger, Polybius, Sallust and others,[155] it becomes clear that, contrary to what is generally believed, there was an omnipresent awareness about the relationship of religious beliefs and the morality of warfare, well before the dawn of the Christian era.

Augustine of Hippo—the first major Christian thinker about war ethics—bequeathed to posterity two key documents which revealed his thoughts about the so-called 'just war theory'. The first was his celebrated *De Civitate Dei* of 413–426AD. The second was a letter that he wrote to Count Boniface in 418AD where two paragraphs stand out—the fourth stating that "Do not think it is impossible for anyone to please God while engaged in active military service"—and the sixth stating that:

> think, then, of this first of all, that when you are arming for battle, that even your bodily strength is a gift of God; for considering this you will not employ the gift of God against God... Peace should be the object of your desire, war should be waged only as a necessity, and waged only so that God may by it

153 ARSI, SMV, I, 294–296. See also Giles, *Sun Tzu*, 9–325 and Denma, *Sun Tzu*, V-XXII.

154 The Holy Bible: Old Testament (*Book of Deuteronomy,* XX, 1–20).

155 Useful information about these authors can be found in Reichbert *et.al., Ethics of War*, 1–59. See also Russell, *Western Philosophy*, 60 and 197–198.

> deliver men from this necessity and preserve them in peace. For peace is not sought in order to the kindling of war, but war is waged in order that peace may be obtained.[156]

Having defined a 'just war' as a way to bring about peace, Augustine in *De Civitate Dei* elaborates his thoughts on the subject by writing that warfare would only be just if it satisfied two basic requirements—that of a proper authority implying that it should only be initiated by those leaders of men "whom God had entrusted with the responsibilities of governance"—and that of a proper cause, one conspicuous example being the wrongdoing of an opposing party which "even were it not to give rise to a just war, would still be a matter of grief to man and therefore sinful", this opposed to such clearly unacceptable causes for war (mentioned elsewhere by Augustine) such as "the desire of causing harm, the cruelty of revenge, the product of a restless and implacable mind, the savagery of revolting and the lust for domination".[157]

The writings of Augustine about war were expanded over the years to reach a salient point in Thomas of Aquinas' *Summa Theologiae* of 1265–1274. In addition to proper authority and proper cause, the two new philosophical developments of Augustine's 'just war' concepts forwarded by Aquinas now required that there would also be a reasonable chance of success since human life was considered to be too precious to waste and that there would be recognition of the so-called principle of proportionality where the relevant authority had to ensure that the harm caused by any response to aggression would not exceed the harm caused by the actual aggressor, thus defining as sinful anything that happened to the contrary in the course of a war. In the *Secunda Secundae Partis* of his work,[158] Aquinas addressed four specific issues of interest—Is some kind of war lawful, is it lawful for clerics to fight, is it lawful for belligerents to lay ambushes and is it lawful to fight on holy days.

With regards to the first issue, Aquinas expanded on his predecessor's views that in order for a war to be just, the three things that would be necessary were the authority of a king; the presence of a just cause (since it was essential that those who are attacked should be attacked because they deserve it on account of some fault such as "refusing to make amends

[156] St. Augustine of Hippo, *Letter 189* (418). Other relevant letters were letter 93 (to Vincentius), letters 133 and 138 (to Marcellinus), letter 185 (to Boniface) and letter 229 (to Darius).

[157] St. Augustine of Hippo, *De Civatate Dei,* XIX, 7.

[158] St. Thomas of Aquinas, *Summa*, II-II, 40, I-IV.

for the wrongs inflicted by subjects" or "refusing to restore what has been unjustly seized") and the presence of a right intention (since "true religion looks upon as peaceful those wars that are waged not for intentions of aggrandizement, or cruelty, but with the objective of securing peace, of punishing evil-doers and of uplifting the good—for it may happen that the war is declared by the legitimate authority, and for a just cause, and yet be rendered unlawful through a wicked intention"). With regards to the second issue—of special interest to the more belligerent Jesuits—Aquinas marshalled several historical instances where bishops and priests had been engaged in belligerent activities against Lombards, Saracens and other enemies of the early church. This led him to conclude that although it was clearly unacceptable for clerics to engage in active service since such pursuits would not only tend to distract the mind "from the contemplation of Divine things" but also "because war is directed to the shedding of blood", clerics could, by authority of the superiors, participate indirectly in wars by "not indeed by taking up arms themselves" but by giving their "spiritual help to those who fight justly be exhorting and absolving them" and by offering their "counsel to men engaged in just war" since "they are forbidden to take up arms, not as though it were a sin, but because such an occupation is unbecoming their personality". With regards to the third issue concerning the subject of unexpected ambushes, Thomas, quoting from two books—*De Officiis Ministrorum* of Ambrose of Milan[159] and *Stratagematicon* of Sextus Julius Frontinus[160]—authorised ambushes so long as they were related to military strategy as opposed to "vile deception".With regards to the fourth issue concerning holy days, Aquinas concluded his utterances on warfare by writing that it was only lawful to engage in combat on holy days if there was a valid reason for doing so, as mentioned in the first Book of the Maccabees.[161]

Jesuit scholars were well aware of such a background of pre-Christian and Christian 'just war' concepts which they often used to justify their own involvement in their onslaughts against Turks and Protestants. In the eyes of many, their writings on the subject—including those about the application of their mathematical knowledge to military formations and fortification building—were justified since they were seen as offering that much

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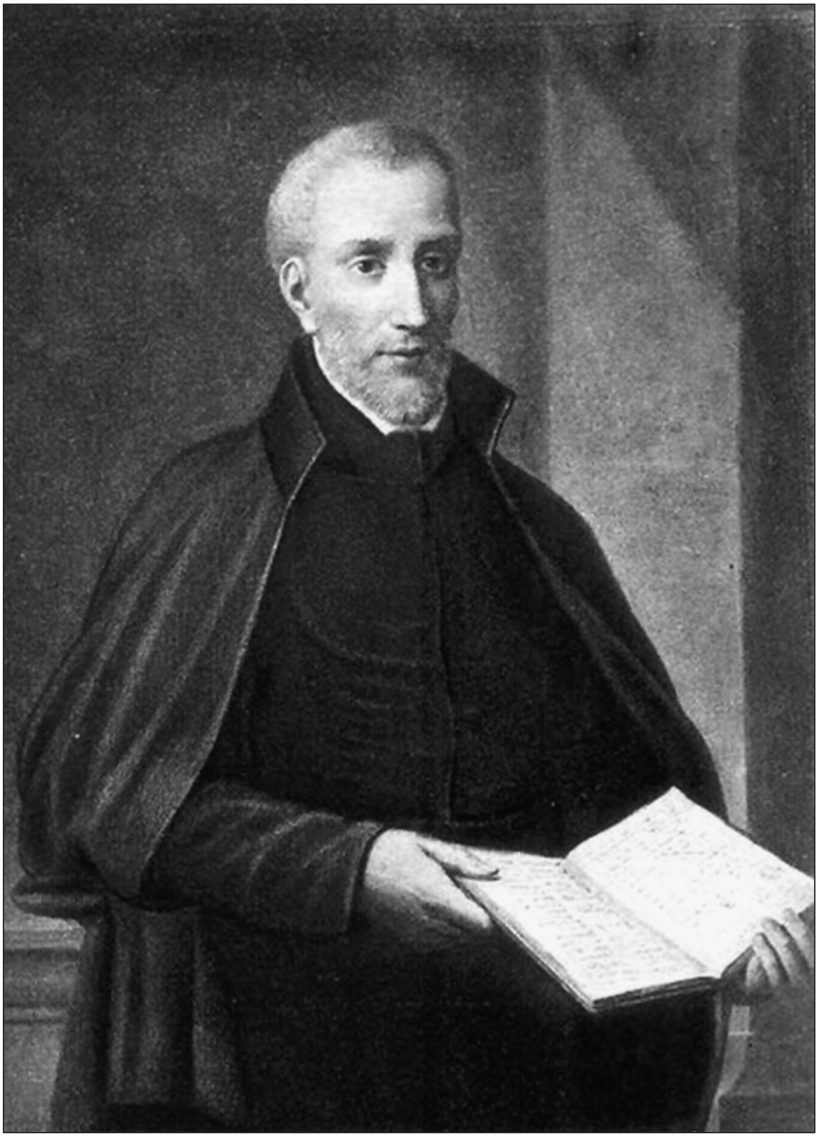
[159] St. Ambrose (c.337–397) was an important bishop of the fourth century. The mentioned work was a manual specifying the duties of clerics.

[160] Frontinus (c. 35–104) was a prominent Roman general who wrote, besides *Stratagematicon*, another important work, now lost, entitled *De Re Militari*.

[161] The Holy Bible: Old Testament, *First Book of the Machabees*, II, 41.



14. The Jesuit scholar and diplomat Antonio Possevino [Hamy, 1893].

needed 'spiritual help' and 'counsel' to the Catholic leaders of early modern Europe with whom the Jesuit Order was so closely associated.

The first and most prominent of these Jesuit writers was Antonio Possevino (1534–1611) who was writing in a century when Erasmus of Rotterdam (1466–1536),[162] Nicolò Machiavelli (1469–1527),[163] Thomas More (1478–1535),[164] Martin Luther (1483–1546) and Jean Calvin (1509–1564),[165] Francisco de Vitoria (1492–1546)[166] and Hugo Grotius (1583–1645)[167] had all addressed the issue of a 'just war' in its wider Christian context. Possevino, a fierce opponent of Protestantism first in the Waldensian valleys and later in France, wrote three outstanding works about war ethics entitled *Il Soldato Christiano* (1569), *Biblioteca Selecta* (1593) and the *Iudicium De Nuae Galli scriptis* (1592).

The book *Il Soldato Christiano*[168] was commissioned by Pope Pius V Ghislieri (1566–1572) for distribution among the soldiers of the Catholic army that he had sent to King Charles IX of France (1560–1574) to help him suppress the Huguenot rebels and among the troops that were then being mobilised by Don Juan of Austria to keep the Turks at bay. As expected in a work of this *genre*, Possevino, quoting extensively from the Bible, from Augustine, from Aquinas as well as from other sources, addressed several issues concerning war ethics focused on matters related to the dignity, excellence and objectives of the 'ideal' Christian soldier. He

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162 Erasmus, *Christian Prince*, 108–109 complained about the widespread practice of clerics to incite and legitimise the military adventures of princes, remarking that "war against the Turks should not be hastily undertaken, remembering first of all that the Kingdom of Christ was created, spread and secured by very different means".

163 Machiavelli, *The Prince*, 37 wrote that "A Prince, therefore, should have no care or thought but for war" (Translation by N.H. Thompson).

164 More, *Utopia*, 109 wrote that the Utopians "consider nothing as more inglorious than glory won in warfare" adding that "they were willing to go to war only to defend their lands, to protect their allies or to liberate others from tyranny, and this after all means including subversion, sedition and political assassination to discourage a potential enemy, had failed"

165 Hale, *War and Society*, 35 comments that Luther once remarked that "war is as necessary as eating, drinking or any other business".

166 Reichberg *et. al. Ethics of War,* 288–338 discusses in detail Vitoria's views about the concept of a just war as expressed in his *De jure belli relectiones* (1557). In Question 1, Article 4 of this work, Vitoria justified the building or demolishing of fortifications in enemy territory only to prevent further aggression.

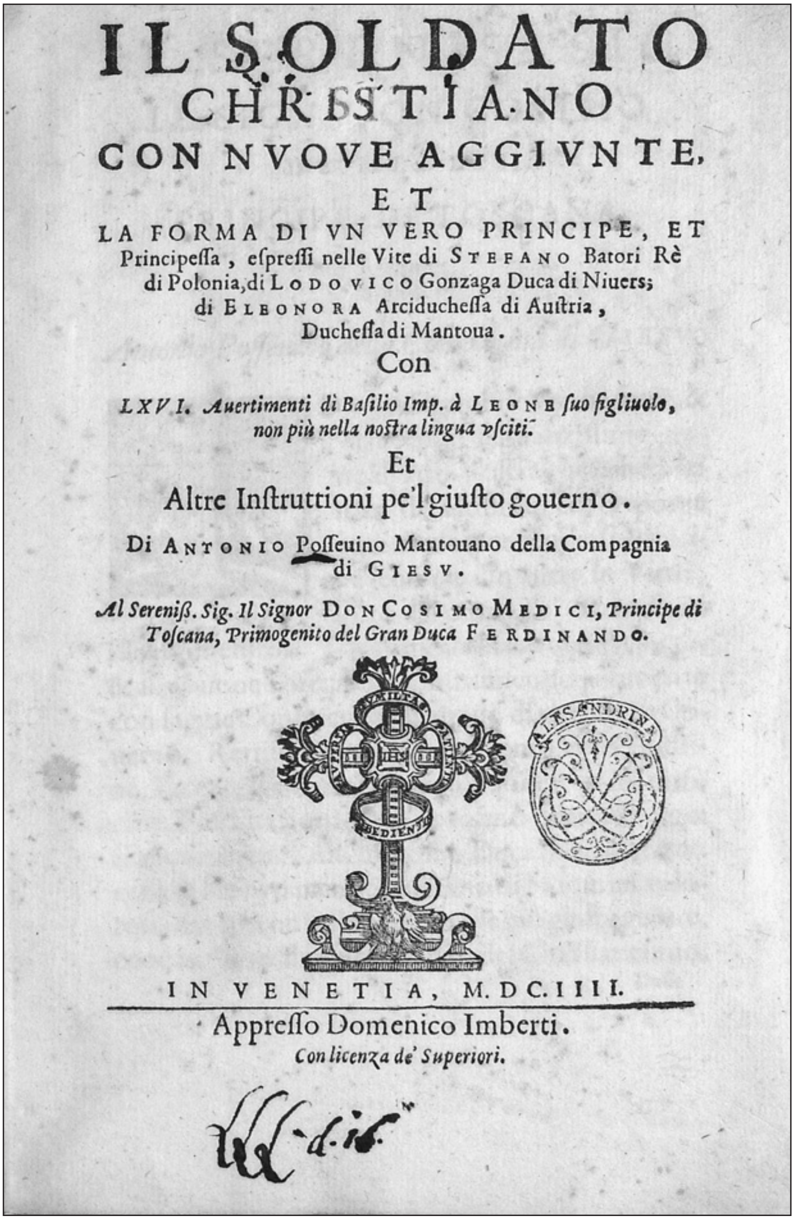
167 Childs, *Warfare*, 160–161 discussed Grotius in the context of the contribution of the other distinguished jurists Zarche (1590–1660), Pufendorf (1632–1694), Bynkershoek (1673–1743) and Vattel (1714–1769), who all addressed human rights issues in times of war.

168 Possevino, *Soldato Christiano* (1569) mentioned in ARSI, SMV, VI, 1065–1066. The revised edition of this work which I have examined at BUA was published in Venice in 1604.

also dealt with matters concerning the clear conscience of the Catholic soldier when engaged in 'just wars'; matters concerning the usefulness of such wars; matters concerning the 'ideal' Catholic leadership vested in the *Capitano Generale del' Esercito* and matters concerning the soldiers chosen by a Catholic general—no 'heretics' or 'infidels' were to be under any pretext admitted into Catholic armies.

Possevino's *Soldato Christiano* also discussed at length matters concerning those 'sinful' things that Catholic soldiers should shun in order to assure them of victory (avoiding any dialogue with 'heretics'; avoiding identifying themselves as 'heretics' or 'infidels' on spy missions; avoiding, if captured, giving information that could harm the Catholic cause and, lastly, avoiding blasphemy, fornication, theft, gambling and duels). Possevino also provided a list of approved books that Catholic soldiers should read and a discussion of the lessons to be learnt from several events that had happened after the death of Christ which should "surely guide the Catholic soldier in his deeds". The revised 1604 edition of Possevino's work was concluded with an extract from his earlier *Biblioteca Selecta* concerning the need of compiling a Catholic military manual, complete with a list of authors who wrote about military matters on folios 55–61. For good measure, the Jesuit also included a series of debates about the 'good' examples of Catholic leadership provided by King Stephen Báthory of Poland, Duke Ludovigo Gonzaga of Nevers and the Archduchess Eleonora of Austria, treated in the context of the 'bad counsels' of Machiavelli and of the 'sound advice' given by the emperor Basil of Byzantium to his son Leo. Possevino concluded the 1604 edition of his work with a beautifully-written masterpiece of Baroque literature which assumed the form of an oration to be given to soldiers about to enter the fray so as to better prepare them for impending death or injury—all in all a remarkable work of 188 pages introduced by Claudio Aquaviva, the general of the Jesuit Order.

In his book about war ethics, Possevino made a number of observations which underlined contemporary 'official' Jesuit thinking about the Catholic position in the context of the religious wars situation in Europe towards the end of the sixteenth century. In Chapter IV entitled '*Di quanta utilità, et frutto sia cotal guerra*' he drew a vivid picture of Pope Leo IV (847–855) exhorting his troops then preparing for battle with the Saracens who had just landed in Italy:

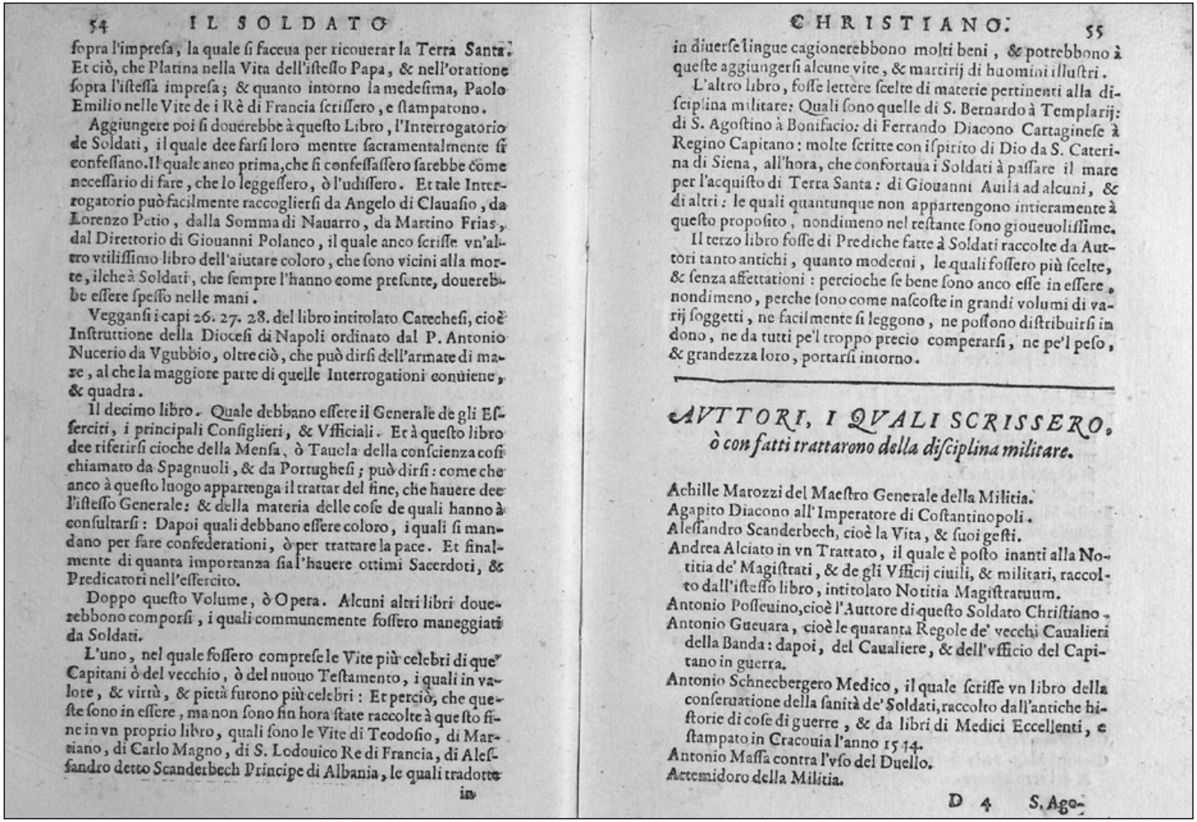


IL SOLDATO
CHRISTIANO
CON NVOVE AGGIVNTE,
ET
LA FORMA DI VN VERO PRINCIPE, ET
Principeſſa, eſpreſſi nelle Vite di STEFANO Batori Rè
di Polonia, di LODOVICO Gonzaga Duca di Niuers;
di ELEONORA Arciducheſſa di Auſtria,
Ducheſſa di Mantoua.
Con
*LXVI. Auertimenti di Baſilio Imp. à LEONE ſuo figliuolo,
non più nella noſtra lingua vſciti.*
Et
Altre Inſtruttioni pe'l giuſto gouerno.
Di ANTONIO Poſſeuino Mantouano della Compagnia
di GIESV.
Al Sereniß. Sig. Il Signor DON COSIMO MEDICI, *Principe di
Toſcana, Primogenito del Gran Duca* FERDINANDO.

IN VENETIA, M.DC.IIII.
Appreſſo Domenico Imberti.
Con licenza de' Superiori.

15. Frontispiece of the 1604 revised edition of *Il Soldato Christiano* by Antonio Possevino [BUA, C.c.47]. Reproduced with the kind permission of the Italian *Ministero per i Beni e le Attività Culturali.*

16. Jan Matejko's 1860 painting showing Possevino and King Báthory of Poland at the siege of Pskov, 1581-1582. Reproduced with the kind permission of the Royal Castle Museum in Warsaw (Photograph: Andrzej Ring).



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ſopra l'impreſa, la quale ſi faceua per ricouerar la Terra Santa. Et ciò, che Platina nella Vita dell'iſteſſo Papa, & nell'oratione ſopra l'iſteſſa impreſa; & quanto intorno la medeſima, Paolo Emilio nelle Vite de i Rè di Francia ſcriſſero, e ſtampatono.

Aggiungere poi ſi douerebbe à queſto Libro, l'Interrogatorio de Soldati, il quale dee farſi loro mentre ſacramentalmente ſi confeſſano. Il quale anco prima, che ſi confeſſaſſero ſarebbe còme neceſſario di fare, che lo leggeſſero, ò l'udiſſero. Et tale Interrogatorio può facilmente raccoglierſi da Angelo di Clauaſio, da Lorenzo Petio, dalla Somma di Nauarro, da Martino Frias, dal Direttorio di Giouanni Polanco, il quale anco ſcriſſe vn'altro vtiliſſimo libro dell'aiutare coloro, che ſono vicini alla morte, ilche à Soldati, che ſempre l'hanno come preſente, douerebbe eſſere ſpeſſo nelle mani.

Vegganſi i capi 26. 27. 28. del libro intitolato Catecheſi, cioè Inſtruttione della Dioceſi di Napoli ordinato dal P. Antonio Nucerio da Vgubbio, oltre ciò, che può dirſi dell'armate di mare, al che la maggiore parte di quelle Interrogationi conuiene, & quadra.

Il decimo libro. Quale debbano eſſere il Generale de gli Eſſerciti, i principali Conſiglieri, & Vfficiali. Et à queſto libro dee riferirſi cioche della Menſa, ò Tauola della conſcienza coſi chiamato da Spagnuoli, & da Portugheſi; può dirſi: come che anco à queſto luogo appartenga il trattar del fine, che hauere dee l'iſteſſo Generale: & della materia delle coſe de quali hanno à conſultarſi: Dapoi quali debbano eſſere coloro, i quali ſi mandano per fare confederationi, ò per trattare la pace. Et finalmente di quanta importanza ſia l'hauere ottimi Sacerdoti, & Predicatori nell'eſſercito.

Doppo queſto Volume, ò Opera. Alcuni altri libri douerebbono comporſi, i quali communemente foſſero maneggiati da Soldati.

L'uno, nel quale foſſero compreſe le Vite più celebri di que' Capitani ò del vecchio, ò del nuouo Teſtamento, i quali in valore, & virtù, & pietà furono più celebri: Et perciò, che queſte ſono in eſſere, ma non ſono ſin hora ſtate raccolte à queſto fine in vn proprio libro, quali ſono le Vite di Teodoſio, di Martiano, di Carlo Magno, di S. Lodouico Re di Francia, di Aleſſandro detto Scanderbech Principe di Albania, le quali tradotte

in

CHRISTIANO. 55

in diuerſe lingue cagionerebbono molti beni, & potrebbono à queſte aggiungerſi alcune vite, & martirij di huomini illuſtri.

L'altro libro, foſſe lettere ſcelte di materie pertinenti alla diſciplina militare: Quali ſono quelle di S. Bernardo à Templarij: di S. Agoſtino à Bonifacio: di Ferrando Diacono Cartagineſe à Regino Capitano: molte ſcritte con iſpirito di Dio da S. Caterina di Siena, all'hora, che confortaua i Soldati à paſſare il mare per l'acquiſto di Terra Santa: di Giouanni Auila ad alcuni, & di altri: le quali quantunque non appartengono intieramente à queſto propoſito, nondimeno nel reſtante ſono gioueuoliſſime.

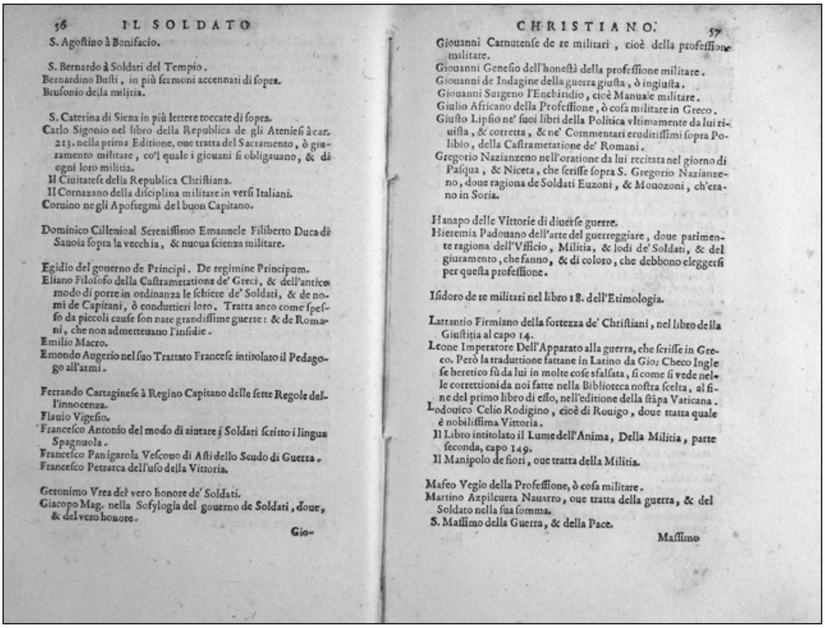
Il terzo libro foſſe di Prediche fatte à Soldati raccolte da Auttori tanto antichi, quanto moderni, le quali foſſero più ſcelte, & ſenza affettationi: percioche ſe bene ſono anco eſſe in eſſere, nondimeno, perche ſono come naſcoſte in grandi volumi di varij ſoggetti, ne facilmente ſi leggono, ne poſſono diſtribuirſi in dono, ne da tutti pe'l troppo precio comperarſi, ne pe'l peſo, & grandezza loro, portarſi intorno.

AVTTORI, I QVALI SCRISSERO, ò con fatti trattarono della diſciplina militare.

Achille Marozzi del Maeſtro Generale della Militia.
Agapito Diacono all'Imperatore di Coſtantinopoli.
Aleſſandro Scanderbech, cioè la Vita, & ſuoi geſti.
Andrea Alciato in vn Trattato, il quale è poſto inanti alla Notitia de' Magiſtrati, & de gli Vfficij ciuili, & militari, raccolto dall'iſteſſo libro, intitolato Notitia Magiſtratuum.
Antonio Poſſeuino, cioè l'Auttore di queſto Soldato Chriſtiano.
Antonio Gueuara, cioè le quaranta Regole de' vecchi Caualieri della Banda: dapoi, del Caualiere, & dell'vfficio del Capitano in guerra.
Antonio Schneebergero Medico, il quale ſcriſſe vn libro della conſeruatione della ſanità de' Soldati, raccolto dall'antiche hiſtorie di coſe di guerre, & da libri di Medici Eccellenti, e ſtampato in Cracouia l'anno 1544.
Antonio Maſſa contra l'vſo del Duello.
Artemidoro della Militia.

D 4 S. Ago-

17. Military authors listed on page 55 of the 1604 revised edition of *Il Soldato Christiano* [BUA, C.c.47]. Reproduced with the kind permission of the Italian *Ministero per i Beni e le Attività Culturali.*



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S. Agostino à Bonifacio.

S. Bernardo à Soldati del Tempio.
Bernardino Busti, in più sermoni accennati di sopra.
Brusonio della militia.

S. Caterina di Siena in più lettere toccate di sopra.
Carlo Sigonio nel libro della Republica de gli Ateniesi à car. 213. nella prima Editione, oue tratta del Sacramento, ò giuramento militare, co'l quale i giouani si obligauano, & di ogni loro militia.
Il Ciuitatese della Republica Christiana.
Il Cornazano della disciplina militare in versi Italiani.
Coruino ne gli Apoftegmi del buon Capitano.

Dominico Cillenio al Sereniffimo Emanuele Filiberto Duca di Sauoia sopra la vecchia, & nuoua scienza militare.

Egidio del gouerno de Principi. De regimine Principum.
Eliano Filosofo della Castrametatione de' Greci, & dell'antico modo di porre in ordinanza le schiere de' Soldati, & de nomi de Capitani, ò conduttieri loro. Tratta anco come spesso da piccioli cause son nate grandissime guerre: & de Romani, che non admetteuano l'insidie.
Emilio Macro.
Emondo Augerio nel suo Trattato Francese intitolato il Pedagogo all'armi.

Ferrando Carthaginese à Regino Capitano delle sette Regole dell'innocenza.
Flauio Vegetio.
Francesco Antonio del modo di aiutare i Soldati scritto i lingua Spagnuola.
Francesco Panigarola Vescouo di Asti dello Scudo di Guerra.
Francesco Petrarca dell'uso della Vittoria.

Geronimo Vrea del vero honore de' Soldati.
Giacopo Mag. nella Sofylogia del gouerno de Soldati, doue, & del vero honore.

Gio-

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Giouanni Carnutense de re militari, cioè della professione militare.
Giouanni Genesio dell'honestà della professione militare.
Giouanni de Indagine della guerra giusta, ò ingiusta.
Giouanni Sargeno l'Enchiridio, cioè Manuale militare.
Giulio Africano della Professione, ò cosa militare in Greco.
Giusto Lipsio ne' suoi libri della Politica vltimamente da lui riuista, & corretta, & ne' Commentari eruditissimi sopra Polibio, della Castrametatione de' Romani.
Gregorio Nazianzeno nell'oratione da lui recitata nel giorno di Pasqua, & Niceta, che scrisse sopra S. Gregorio Nazianzeno, doue ragiona de Soldati Euzoni, & Monozoni, ch'erano in Soria.

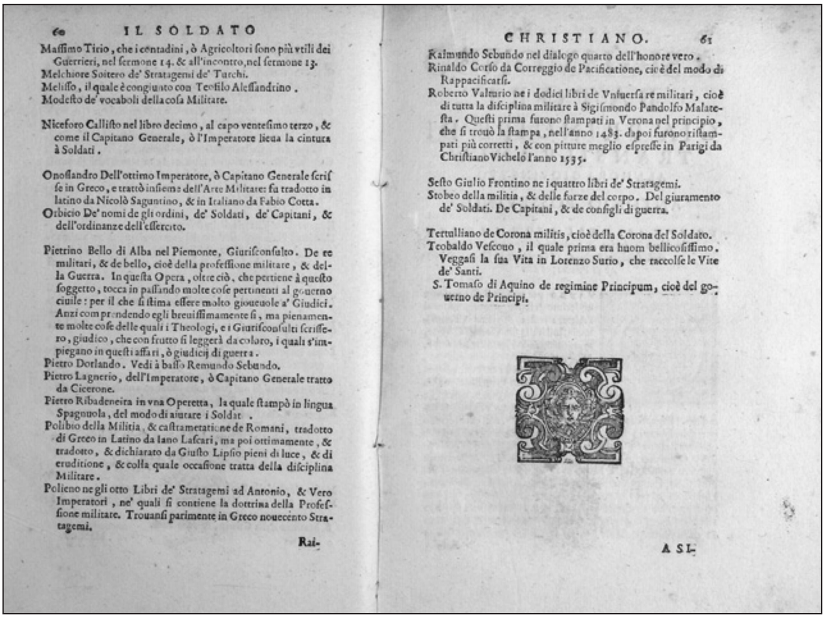
Hanapo delle Vittorie di diuerse guerre.
Hieremia Padouano dell'arte del guerreggiare, doue parimente ragiona dell'Vfficio, Militia, & lodi de' Soldati, & del giuramento, che fanno, & di coloro, che debbono eleggersi per questa professione.

Isidoro de re militari nel libro 18. dell'Etimologia.

Lattantio Firmiano della fortezza de' Christiani, nel libro della Giustitia al capo 14.
Leone Imperatore Dell'Apparato alla guerra, che scrisse in Greco. Però la traduttione fattane in Latino da Gio: Checo Inglese heretico fù da lui in molte cose sfalsata, si come si vede nelle correttioni da noi fatte nella Biblioteca nostra scelta, al fine del primo libro di esso, nell'editione della stāpa Vaticana.
Lodouico Celio Rodigino, cioè di Rouigo, doue tratta quale è nobilissima Vittoria.
Il Libro intitolato il Lume dell'Anima, Della Militia, parte seconda, capo 149.
Il Manipolo de fiori, oue tratta della Militia.

Mafeo Vegio della Professione, ò cosa militare.
Martino Azpilcueta Nauarro, oue tratta della guerra, & del Soldato nella sua somma.
S. Massimo della Guerra, & della Pace.

Massimo



60 IL SOLDATO

Massimo Tirio, che i contadini, ò Agricoltori sono più vtili dei Guerrieri, nel sermone 14. & all'incontro, nel sermone 13.
Melchiore Soitero de' Stratagemi de' Turchi.
Melisso, il quale è congiunto con Teofilo Alessandrino.
Modesto de' vocaboli della cosa Militare.

Niceforo Callisto nel libro decimo, al capo ventesimo terzo, & come il Capitano Generale, ò l'Imperatore lieua la cintura à Soldati.

Onosandro Dell'ottimo Imperatore, ò Capitano Generale scrisse in Greco, e trattò insieme dell'Arte Militare: fu tradotto in latino da Nicolò Saguntino, & in Italiano da Fabio Cotta.
Orbicio De' nomi de gli ordini, de' Soldati, de' Capitani, & dell'ordinanze dell'essercito.

Pietrino Bello di Alba nel Piemonte, Giurisconsulto. De re militari, & de bello, cioè della professione militare, & della Guerra. In questa Opera, oltre ciò, che pertiene à questo soggetto, tocca in passando molte cose pertinenti al gouerno ciuile: per il che si stima essere molto gioueuole a' Giudici. Anzi comprendendo egli breuissimamente si, ma pienamente molte cose delle quali i Theologi, e i Giurisconsulti scriffero, giudico, che con frutto si leggerà da coloro, i quali s'impiegano in questi affari, ò giudicij di guerra.
Pietro Dorlando. Vedi à basso Remundo Sebundo.
Pietro Lagnerio, dell'Imperatore, ò Capitano Generale tratto da Cicerone.
Pietro Ribadeneira in vna Operetta, la quale stampò in lingua Spagnuola, del modo di aiutare i Soldati.
Polibio della Militia, & castrametatione de Romani, tradotto di Greco in Latino da Iano Lascari, ma poi ottimamente, & tradotto, & dichiarato da Giusto Lipsio pieni di luce, & di eruditione, & colla quale occasione tratta della disciplina Militare.
Polieno ne gli otto Libri de' Stratagemi ad Antonio, & Vero Imperatori, ne' quali si contiene la dottrina della Professione militare. Trouansi parimente in Greco nouecento Stratagemi.

Rai-

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Raimundo Sebundo nel dialogo quarto dell'honore vero.
Rinaldo Corso da Correggio de Pacificatione, cioè del modo di Rappacificarsi.
Roberto Valturio ne i dodici libri de Vniuersa re militari, cioè di tutta la disciplina militare à Sigismondo Pandolfo Malatesta. Questi prima furono stampati in Verona nel principio, che si trouò la stampa, nell'anno 1483. dapoi furono ristampati più corretti, & con pitture meglio espresse in Parigi da Christiano Vichelo l'anno 1535.

Sesto Giulio Frontino ne i quattro libri de' Stratagemi.
Stobeo della militia, & delle forze del corpo. Del giuramento de' Soldati. De Capitani, & de consigli di guerra.

Tertulliano de Corona militis, cioè della Corona del Soldato.
Teobaldo Vescouo, il quale prima era huom bellicosissimo. Veggasi la sua Vita in Lorenzo Surio, che raccolse le Vite de' Santi.
S. Tomaso di Aquino de regimine Principum, cioè del gouerno de Principi.

A SI-

18. Military authors listed on pages 56-57 and 60-61 of the 1604 revised edition of I Soldato Christiano [BUA, C.c.47]. They included Frontinus, Polybius, Vegetius and Valturio. Reproduced with the kind permission of the Italian *Ministero per i Beni e le Attività Culturali.*

> Deport yourself valorously, banishing all terror and fear from your hearts in the face of the sworn enemies of the Holy faith and of the adversaries of all religious, so that the omnipotent God will know that if any of you were to lose his life, he would have done so for the faith, for the salvation of the country and for the defence of Christians, this earning him the prize of heaven.

This should serve as a lesson to all true Catholic soldiers, continued Possevino, "who would have taken the sign of the cross and prepared themselves to exterminate those heretics, reinforced by that same indulgence, that sacred privilege that was once conceded to those who went to save the Holy Land"—a very strong statement indeed which was not very far removed in spirit from the statement of the Duke of Alba on the Dutch Rebellion in 1573 that "these troubles must be ended by force of arms without any use of pardon, mildness, negotiation or talks until everything had been flattened."[169] In Chapter V entitled '*Quale debba essere il Capitano Generale dell'Essercito*', Possevino wrote on the most crucial requirement that any leader of the Catholic army should be a "staunch admirer of God, venerating the Holy Virgin and the Saints, a most sincere believer of all things Divine and the Catholic religion". In Chapter VII entitled '*Quali debbano essere i Soldati eletti dal Generale per far la Guerra'*, the Jesuit, in clear reference to Aquinas, warned Catholic leaders not to recruit their troops from among clerics who, rather than acting as soldiers could be better utilised to "preach, advise, exhort the soldiers in battle and administer to them the mass and the sacraments"—a justification of the perceived role of Jesuits in the battlefields of Europe as military advisers and military chaplains rather than as active combatants. In Chapter IX entitled *'Da Quai cose deono i Soldati Christiani astenersi per essere idonei alla militia e acquistar vittoria in Guerra*', Possevino admonished Catholic soldiers engaged in fighting the Turks not to be too curious about their *Koran* which, he specified, advocated hatred, violence and assassination. The Jesuit also advised that soldiers engaged in fighting 'heretics' should avoid debates on matters concerning the faith "unless they have the necessary religious knowledge to do so". In Chapter XV entitled '*Il Duello, la macchia, le Giostre ò Tornei pericolosi deono essere proibiti da Capitani fra i loro Soldati Catolici'*, Possevino recalled that in the Council of Trent, duels were described as being "created by the devil who thirsts for

[169] Grant, *Battle*, 146. Possevino's and Alba's words were inspired by Aquinas, *Summa*, II-II, 11, III who wrote that 'heretics' deserved "not only to be separated from the Church by excommunication but also to be severed from this world by death".

Christian blood" while in Chapter XXIII entitled '*Quali libri debba leggere il Soldato per farsi esperto*' the learned Jesuit author mentioned some works that Catholic soldiers should read, including the Books of Kings and the Maccabees from the Bible, the Book of Joseph the Jew, Augustine's *De Civitate Dei*, the Histories of England, the Books of Bede, Virgil, Orofius, Procopius, Agathio and Leo, son of the emperor Basil of Byzantium, Sauer's *De Probatis Sanctorum Historiis* and his writings against the Lutheran Church, the Histories of the East and West Indies by various authors and the *Guerra di Malta* by various authors, which had been written in both the Latin and '*vernacular*' languages. The ultimate aim of *Il Soldato Christiano*, as metaphorically mentioned in the preface, was that a fortress, irrespective of how well fortified and provisioned it is, would be useless if the soldiers who are defending it decide "to dishonour God". This observation was reinforced by Possevino in the conclusion to the last Chapter XXX of his work when he wrote that if all Catholic soldiers were to read his book, if they were well cared for by their captains and if they had learnt all that was to be learnt in the military arts, then God would assure them of victory in this world and eternal rest in the next—"*Cosi' Dio al soldato darà vittoria in questo mondo, ed eterno riposo nell'altro*".

There are good reasons to believe that when Antonio Possevino published in 1593 his *Biblioteca Selecta*,[170] a veritable Jesuit compendium of Counter-Reformation knowledge, his intention had been to create an important reference work to adorn the libraries of Catholic leaders, this having become particularly urgent in the wake of the publication of the Protestant Conrad Gesner's *Biblioteca Universalis* (1545) which had afterwards twice been placed on the Index of forbidden books (1559 and 1564). Basing himself on his first hand experiences of the military environments of France, Poland and far away Russia,[171] Possevino dedicated the fifth book of his impressive work to those Catholic noblemen who had shown themselves dedicated to the religious struggle and to all those who wished "to dedicate their lives to the priesthood, hoping that they could better serve the Catholic cause in the military camp by performing sacred functions and delivering exhortations than through the handling of arms". This necessitated the foundation of military colleges for nobles and special seminaries

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[170] Possevino's *Biblioteca Selecta* was published just before the second Turkish attack on Vienna when, according to Folcario, *Vita Eleonora*, 360, Pope Clement VIII Aldobrandini (1592–1605) was seen to fill five handkerchiefs with tears at mass on 25 September 1594. See also Brinton, *Gonzaga*, 188.

[171] For Possevino's life history see ARSI, SMV, VI, 1061–1093. See also O'Neill and Dominguez (ed.), *Diccionario*, 3201–3203 (*Possevino*) and Fülop-Miller, *Gesuiti*, 378–386.

for military chaplains. Under the title '*Quae leges partim a viro nobilissimo, partim ab aliis de ratione instituendi Seminaria Militaria fuere propositae Pio V Pont. Max. & Philippo Regi Catholico, partim Gregorio XIII qui ea, si vixisset, volebat instituere*',[172] the Jesuit provided details about the establishment of the proposed military colleges where "noble adolescents, ready to dedicate themselves to military duties may be inbred with firm courage so that time may well prepare them for their actions in the holy war, this for the rest of their life, in obedience to God". He also discussed the rules that would be applicable in these Jesuit-run institutions with all discipline focused on the figure of an omnipotent Rector "whom all would obey". According to Possevino's instructions, the "handling of every type of arms" would now not only be reconciled with his concept of a 'just war' but would form the basis of a military course of studies when, even during meals, "the reading aloud of the book of sacred scriptures and other pious books would be followed by the reading of history books concerning those wars where Christians had fought the enemies of their faith". In these colleges "no access of any woman was permitted" and "the learning of Latin" was encouraged since this language was considered to be "especially useful for reading (the texts) of military historians". Writing extensively on organisational aspects Possevino insisted on the condemnation of duelling to define "a point of honour'", about which his brother, Gianbattista Possevino, had written a book entitled *Dialogo d'Onore* (1553).

In '*Quinam liber scribendus esset, unde materia quem optissima existeret ad informandos tam milites, quam sacerdotes, qui cum iis in expeditionem, ac bella mittuntur*',[173] Possevino further discussed the role of the soldier within the context of 'just wars' that were required to resist the enemies of Catholicism. This chapter was concluded by a list of books about '*De re militari'* which included the first edition of *Il Soldato Christiano*. Perhaps the most significant statement in this formidable exercise was Possevino's comment, carefully interposed between the end of Chapter VII and the beginning of Chapter VIII:

> How important will all these things (the setting up of military schools) be for the formation of the Society of Jesus which will have at hand a military society and the best leaders of it, for eliminating all gatherings of idlers and seditious men.

Concerned with the fact that Jesuit academy professors would be pitted against the ideological assaults of the Protestant "*Regni di Svezia, di*

[172] Possevino, *Biblioteca Selecta*, 401 (Book V, Chapter VII).
[173] *Ibid*., 403 (Book V, Chapter VIII).

Gothia, di Dania, d'Ingilterra, di Scotia, di Germania e d'Ungeria,"[174] Possevino in the fifteenth book also included the entry entitled '*Ars militaris inter mathematica numeranda*.' He here emphasised the importance of reading Nicolò Tartaglia's famous book on fortifications and ballistics entitled *Quesiti, et inventioni diverse* (1546).[175]—Possevino was himself the author of two earlier manuscripts on military history entitled *Commentario della guerra di Fiandia* (undated) and *Belli Monferratensis historia* (1637).[176]

Possevino's third work also concerned his views about a just war against 'heretics', His *Iudicium*[177] was essentially an aggressive treatise written in the wake of the publication of a Protestant best-seller entitled *Discours Politique et Militaires* (1587) which had an enormous counterbalancing influence on soldiers in the late sixteenth century. His main target was its author Francois de la Noue (1531–1591)[178]—a respected Huguenot military leader who had participated in many sieges in 1567–1570, later penetrating the Spanish Netherlands where he was caught by the Spaniards after their recapture of Mons in 1572. Permitted to return to France, Francois had acted as general of the Huguenot stronghold of La Rochelle for a time, only to return to the fray in the Netherlands where, after re-capturing several towns, he had again been made prisoner for five years. It was then that he found time to write his book, describing war as an abominable but necessary human drama. In his *Iudicium* Possevino also targeted his anger on other writings by Jean Bodin (1530–1596)[179]—a French jurist and political philosopher who wrote three 'heretical' volumes entitled *Les six livres de la Republique* (1576), *Methodus historica ad facilem historiarum cognitionem* (1566) and *La Demonomanie des Sorciers* (1580). Another target was Philippe de Duplessis-Mornay (1549–1623)[180] who was a leading Huguenot propa-

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[174] Possevino, *Coltura de gl'Ingegni,* 93.

[175] Possevino, *Biblioteca Selecta*, 201 (Book XV, Chapter VIII).

[176] D'Ayala, *Bibliografia,* 323.

[177] Possevino, *Iudicium* (1592).

[178] For biographical information about Noue see Amirault, *Seigneur de La Noue* (1661) and Hauser, *Francois de la Noue* (1892). An English translation of Noue's book by Orwin was published in 1587.

[179] Bodin's works suggested that governments had an obligation to tolerate dissenting religious groups, blaming the Catholic Church for the French religious wars. He was the main target of Possevino's *Iuditium* which led to the inclusion of all his works in the infamous Index of Forbidden Books due to the "bizarre, inconsistent and superficial nature of their author" (1628).

[180] Duplessis-Mornay was a leading Calvinist propagandist in France in the wake of the infamous massacre of French Protestants on St. Bartholomew's Day (1572). He contradicted the Jesuit Order's world view hinged on absolute Papal authority, by advocating, like Bodin, a toleration of religious differences.

gandist known as the 'Pope of the Huguenots'and who, as governor of the Protestant stronghold of Saumur, had built one of the greatest Huguenot academies of learning, at the same time also producing a monumental work entitled *Traite de la verite de la religion Chretienne contre les athees, epicuriens, payens, juifs, mahometans et autres infideles* (1581). There was then Nicolò Machiavelli's, *The Prince* (1513) and his *Dell' Arte della Guerra* (1519–1520),[181] both described by Possevino as "vile works".

Of great interest in Possevino's *ludicium* was his focused attack on Francois de la Noue's book where he refuted the Huguenot's suggestions that Catholics should be allowed to mix freely with 'heretics' since Christ had the same meaning to both parties, that a National Council should be formed in France dealing exclusively with the religious conflict which was dividing the country, and that this Council should assume responsibility to form an army of both Catholic and Protestant soldiers to attack the Turks, setting up in the process military academies and recruitment centres which would rise above religious differences. It was the prospect of such an 'unholy' alliance between Catholic and Protestant forces in France that goaded Possevino to encourage the incorporation of military instruction in the mathematical curriculum of colleges and seminaries for nobles under Jesuit control.

The spark that was lit by Possevino's zealous writings was kept alive by the works of other distinguished Jesuits, most of whom were directly associated with the religious wars that were being waged by the kings of France and Spain and which matured in the 1618–1648 Thirty Years War. One of these Jesuits was the confessor of King Henry III of France (1574–1589), Émond Auger[182] who authored a book about military instruction entitled *Le Pedagogue d'armes pour instruire un Prince Chrestien* (1568). This work revealed a biased account of the French wars of religion, where every Catholic success and every Protestant setback was perceived as the result of divine intervention. Another distinguished Jesuit was Thomas Sailly[183] who had accompanied Possevino on his mission to the Kings of Sweden and Poland and to the Czar of Russia in 1578–1582. Sailly wrote an important book entitled *Guidon et Pratique Spirituelle du Soldat Chrestie* (1590) for distribution among the troops of His Catholic Majesty in the

181 See n. 163 and translations by Whitehome and Lynch of Machiavelli's work on war.

182 O'Neill and Dominguez (ed.), *Diccionario* 268–270 (*Auger*). According to Martin, *The Jesuit Mind*, 96, Auger (1530–1591) was a master of invective terminology against 'heretics', calling the Huguenot leader Gaspard de Coligny "that Attila admiral" and Huguenot pastors "the excrement of the world".

183 ARSI, SMV, VII, 403–406 gives a concise biography of Sailly (1558–1623).

Netherlands, then led by Alessandro Farnese to whom Sailly's work was dedicated. Another important contemporary work on Jesuit war ethics was Francisco Antonio's *Avisos Para Soldados* (1590).[184] Other 'just war' expositions were also forthcoming from the distinguished Jesuit philosophers Luis de Molina[185] and Francisco Suarez,[186] who both emphasised the need of the Jesuit Order to support wholeheartedly the wars that were being waged on many fronts against the forces of Protestantism and Islam. In 1604, Possevino's friend Pedro Ribadeneira published his *Princeps Christianus* further fuelling Jesuit militancy against the 'plague' and 'venom' of heresy.

In 1609, a remarkable book entitled *Il Soldato Christiano overo Christiani Ricordi* was published in the Bertoni press in Venice. Its author, the Spanish Jesuit Francisco Arias, introduced this work in four chapters entitled '*Che molte volte è lecito a far guerra*'; '*Delle circostantie necessarie perche una guerra sia lecita*'; '*Della terza circostanza necessaria, acciochè la guerra sia giusta*' and '*Della quarta conditione, perchè la guerra sia lecita*'. In the first and second chapters, Arias evoked Augustine by writing that, as a first requirement for a war to be just, the leader should have the vested authority to do so, adding that since "kings, princes, dukes, lords and communes" normally lacked legal remedies to rectify any injury done to them (unlike their subjects who often had to seek them) it was then only fair that they would be considered to have absolute authority on all issues concerning war. As a second requirement for a 'just war', Arias again evoked Augustine by writing that such a war had to have a just cause such as the correction of an inflicted injury or, better still, the defence of the laws or religion of people to be contracted with such unjust causes of war marked by greed for new territory and added wealth. Arias devoted the entire third chapter of his work to discussing the third requirement for a 'just war', this being the presence of a good intention keeping in mind that the aim of such belligerency was that of conserving peace which in turn guaranteed the tranquillity of a community and the healing of any injury caused. Quoting John the Baptist who had once had

184 ARSI, SMV, I, 442. See also O'Neill and Dominguez (ed.), *Diccionario*, 1246–1248 (*Enseñanza Militar*). Antonio (1535–1610) was the preacher of the Empress Maria of Austria, sister of King Philip II of Spain.

185 For Molina's *De Iustitia et Iure* (1614) see Reichberg *et al. Ethics of War*, 333–338. Molina (1530–1600) justified military offensives to avenge inflicted injury and to recover property intensifying a generally intolerant Jesuit attitude towards 'heretics' and 'infidels'.

186 For Suárez's *De Bello* (1621), see Reichberg *et al. Ethics of War*, 339–370. Suárez (1548–1617) advocated the principle that the 'punishment' of war had to be inflicted with utmost restraint and caution, in view of its detrimental effects on mankind.

told a group of soldiers "Do not use men roughly, do not lay false information against them, and be content with your pay",[187] Arias in the fourth chapter of his work defined a fourth requirement of a 'just war'—that of avoiding harm to innocent people who had no blame in the hostilities. According to him all forms of beatings, rapes, burning of residences and other forms of injury (directed primarily at children, the old and the infirm, women, clerics, merchants, workers and even innocent animals used to cultivate the fields) were condemnable since "St. Ambrose excommunicated the Emperor Theodosius when he ordered the massacre of both the guilty and the innocent inhabitants of Thessaloniki."[188] In this context Arias also referred to the Book of Deuteronomy which mentioned that the sack of a city should never lead to the massacre of children, women and animals.[189]

It is to the credit of Francisco Arias that he managed to offer a sensitive Jesuit exposition of the so-called '*post bellum*' aspect of contemporary perceptions about the just war theory which reflected the concerns of many in the Catholic and Protestant camps—for the safeguarding of innocent people who were, more often than not, suffering greatly at the hands of leaderless and unpaid mercenary soldiers roaming the countryside of Europe.[190] Considered from this angle, one can conclude that Arias was in 1609 offering a much-needed counterbalance to the radical 'total elimination of heretics' views of Possevino, advocating instead a more 'moderate' stance. The contrasting viewpoints of these Jesuits as reflected in their writings do suggest that their thoughts about war ethics were relatively unaffected by internal disciplinary mechanisms of the Jesuit Order, allowing them sufficient space to freely express their differing views —unlike the much more rigid situation in the Dominican Order as seen in its handling of the Campanella case. Considered in the context of Jesuit writings on war ethics, the military-related exploits of Voltaire's German Jesuit in Paraguay and of many others directly or indirectly involved in the battlefields and fortification of Baroque Europe, starts becoming justified and understandable.

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187 The Holy Bible—New Testament (Gospel acc. to St. Luke, III, 14).

188 Arias is here referring to the massacre of more than 7000 persons in Thessalonika by the troops of Theodosius (390).

189 Arias is here quoting The Holy Bible—Old Testament (Book of Deuteronomy, XX, 10–14).

190 Seyssel, *Monarchie*, 184 cited by Tallett. For contemporary codes of military conduct see Hale, *War and Society*, 169–171.

IL SOLDATO CHRISTIANO,

Ouero Chriſtiani Ricordi.

OPERA COMPOSTA DAL MOLTO R. P. Franceſco Arias della Compagnia di GIESV.

Nella quale con chiare, & viue ragioni de i Sacri Dottori, & con l'auttorità della Diuina Scrittura, ſi ricordà a i Principi, & a i Soldati Chriſtiani, quando li ſia lecito far guerra, & come in eſſa ſi debbano gouernare, per fuggire i graui & enormi peccati, che con l'occaſione della guerra da molti ſi commettono.

Tradotta nuouamente dalla lingua Spagnuola nell'Italiana da Emilio Satini.

Con Licenza de' Superiori, & Priuilegio.

IN VENETIA, M D C IX.

Preſſo Gio. Battiſta Bertoni.

19. Frontispiece of *Il Soldato Christiano overo Christiani Ricordi* by Francisco Arias [BNCR, 8-27.L.49]. Reproduced with the kind permission of the Italian *Ministero per i Beni e le Attività Culturali.*

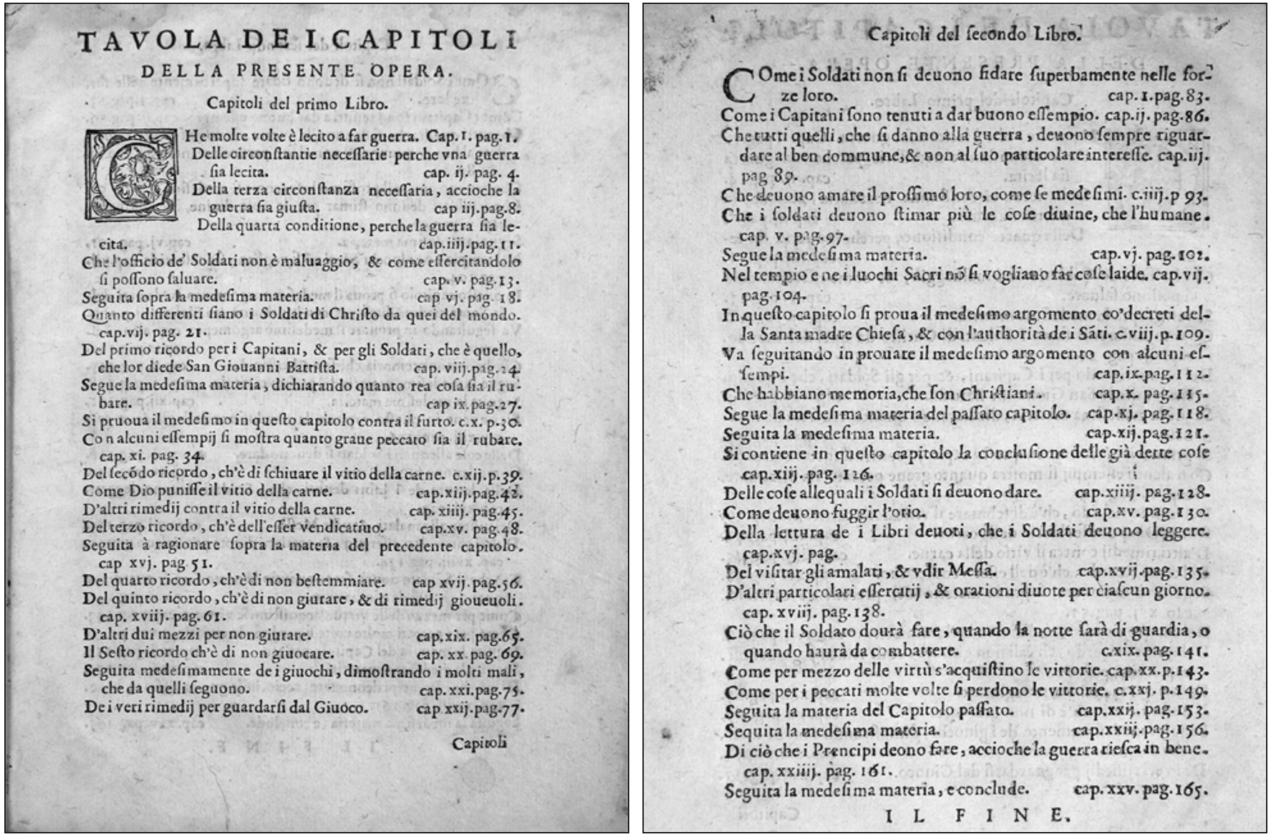

TAVOLA DE I CAPITOLI
DELLA PRESENTE OPERA.

Capitoli del primo Libro.

Che molte volte è lecito a far guerra. Cap. I. pag. I.
Delle circonſtantie neceſſarie perche vna guerra ſia lecita. cap. ij. pag. 4.
Della terza circonſtanza neceſſaria, accioche la guerra ſia giuſta. cap iij. pag. 8.
Della quarta conditione, perche la guerra ſia lecita. cap. iiij. pag. 11.
Che l'officio de' Soldati non è maluaggio, & come eſſercitandolo ſi poſſono ſaluare. cap. v. pag. 13.
Seguita ſopra la medeſima materia. cap vj. pag. 18.
Quanto differenti ſiano i Soldati di Chriſto da quei del mondo. cap. vij. pag. 21.
Del primo ricordo per i Capitani, & per gli Soldati, che è quello, che lor diede San Giouanni Battiſta. cap. viij. pag. 24.
Segue la medeſima materia, dichiarando quanto rea coſa ſia il rubare. cap ix. pag. 27.
Si pruoua il medeſimo in queſto capitolo contra il furto. c. x. p. 30.
Con alcuni eſſempij ſi moſtra quanto graue peccato ſia il rubare. cap. xi. pag. 34.
Del ſecõdo ricordo, ch'è di ſchiuare il vitio della carne. c. xij. p. 39.
Come Dio puniſſe il vitio della carne. cap. xiij. pag. 42.
D'altri rimedij contra il vitio della carne. cap. xiiij. pag. 45.
Del terzo ricordo, ch'è dell'eſſer vendicatiuo. cap. xv. pag. 48.
Seguita à ragionare ſopra la materia del precedente capitolo. cap xvj. pag 51.
Del quarto ricordo, ch'è di non beſtemmiare. cap xvij. pag. 56.
Del quinto ricordo, ch'è di non giurare, & di rimedij gioueuoli. cap. xviij. pag. 61.
D'altri dui mezzi per non giurare. cap. xix. pag. 65.
Il Seſto ricordo ch'è di non giuocare. cap. xx pag. 69.
Seguita medeſimamente de i giuochi, dimoſtrando i molti mali, che da quelli ſeguono. cap. xxi. pag. 75.
De i veri rimedij per guardarſi dal Giuoco. cap xxij. pag. 77.

Capitoli

Capitoli del ſecondo Libro.

Come i Soldati non ſi deuono fidare ſuperbamente nelle forze loro. cap. I. pag. 83.
Come i Capitani ſono tenuti a dar buono eſſempio. cap. ij. pag. 86.
Che tutti quelli, che ſi danno alla guerra, deuono ſempre riguardare al ben commune, & non al ſuo particolare intereſſe. cap. iij. pag 89.
Che deuono amare il proſſimo loro, come ſe medeſimi. c. iiij. p 93.
Che i ſoldati deuono ſtimar più le coſe diuine, che l'humane. cap. v. pag. 97.
Segue la medeſima materia. cap. vj. pag. 102.
Nel tempio e ne i luochi Sacri nõ ſi vogliano far coſe laide. cap. vij. pag. 104.
In queſto capitolo ſi proua il medeſimo argomento co'decreti della Santa madre Chieſa, & con l'authorità de i Sãti. c. viij. p. 109.
Va ſeguitando in prouare il medeſimo argomento con alcuni eſſempi. cap. ix. pag. 112.
Che habbiano memoria, che ſon Chriſtiani. cap. x. pag. 115.
Segue la medeſima materia del paſſato capitolo. cap. xj. pag. 118.
Seguita la medeſima materia. cap. xij. pag. 121.
Si contiene in queſto capitolo la concluſione delle già dette coſe cap. xiij. pag. 126.
Delle coſe alle quali i Soldati ſi deuono dare. cap. xiiij. pag. 128.
Come deuono fuggir l'otio. cap. xv. pag. 130.
Della lettura de i Libri deuoti, che i Soldati deuono leggere. cap. xvj. pag.
Del viſitar gli amalati, & vdir Meſſa. cap. xvij. pag. 135.
D'altri particolari eſſercitij, & orationi diuote per ciaſcun giorno. cap. xviij. pag. 138.
Ciò che il Soldato dourà fare, quando la notte ſarà di guardia, o quando haurà da combattere. c. xix. pag. 141.
Come per mezzo delle virtù s'acquiſtino le vittorie. cap. xx. p. 143.
Come per i peccati molte volte ſi perdono le vittorie. c. xxj. p. 149.
Seguita la materia del Capitolo paſſato. cap. xxij. pag. 153.
Sequita la medeſima materia. cap. xxiij. pag. 156.
Di ciò che i Prencipi deono fare, accioche la guerra rieſca in bene. cap. xxiiij. pag. 161.
Seguita la medeſima materia, e conclude. cap. xxv. pag. 165.

IL FINE.

20. Contents of *Il Soldato Christiano overo Christiani Ricordi* [BNCR, 8-27.I., 49]. Reproduced with the kind permission of the Italian *Ministero per i Beni e le Attività Culturali.*

21. The nobleman Fra Nicolas Cotoner, Grand Master of the Hospitaller Knights of Malta, 1663-1680, expressing his interest in new fortifications for the defence of Malta [De Lucca, 2003].

CHAPTER TWO

FROM THE CLASSROOM TO THE BATTLEFIELD—JESUIT TEACHINGS ON FORTIFICATION BUILDING IN EARLY MODERN EUROPE

Summary

The Jesuits of the Baroque age spared no effort to place their considerable mathematical knowledge at the service of the leading personalities of Catholic Europe in their 'just' wars against Protestants and Turks. By 1640, the Jesuit *mathematicus* in Italy, France and Portugal was not only directing classes of military architecture but also made himself available to serve the Catholic cause as a battlefield consultant. His attitude of 'accommodation' created problems for the Jesuit Order which reached a high point in Spain when a programme of studies concerned with *De Re Militari* was set up in the Madrid Imperial college at the instigation of the King of Spain. Some belligerent Jesuits teaching military architecture became trusted consultants in the Catholic armies of the Spanish Netherlands while others diffused their knowledge of the subject in territories that were directly or indirectly under Spanish influence. Jesuit knowledge on fortifications and artillery even reached exotic scenarios in South America, the Philippine archipelago and China where the controversial missionary policies of the Jesuit Order were threatened by armed forces that sought to eliminate them.

Accommodating the Demands of the Catholic Nobility of the Baroque Age

The historiography of the Jesuit Order suggests that the links between the Jesuits and the ruling Catholic nobility of Baroque Europe were strong. Many Jesuits were of noble extraction and the most influential 1540–1773 generals of the Order were the sons of influential noblemen—Francisco Borgia (1565–1572) was the Duke of Gandia, a Grandee of Spain who had, according to Martindale, taken great pains to develop the fortifications of Barcelona and Tarragona; Claudio Aquaviva (1581–1615) was the youngest son of the Duke of Asti; Muzio Vitelleschi (1615–1645) belonged to an ancient Roman family; Vincenzo Carafa (1646–1649) was the son of Duke Fabrizio Carafa; Francesco Piccolomini (1649–1651) belonged to a noble family from Siena; Ignazio Visconti (1751–1755) was a member of a very old

Milanese ruling family and Lorenzo Ricci (1758–1773) belonged to one of the most ancient and illustrious families of Tuscany—not to mention the noble lineage of Ignatius who, perhaps unforgetful of the blue blood that ran through his veins, deemed it fit to entrench the special relationship between his new creation and the titled nobility of Europe in two very specific articles of his Constitutions.[1] "First of all", Ignatius wrote in article 824 "every effort should be made to retain the benevolence of the temporal rulers and noble and powerful persons whose favour or disfavour does much towards opening or closing the gate to the service of God" so that "when an unfavourable attitude is perceived in some persons, especially in persons of importance, prayers ought to be offered to them and the suitable means should be employed to win their friendship, or at least, prevent them from being hostile" so that, in this way "God Our Lord may be more served and glorified in all things through the benevolence of these persons". Conscious of the need for great prudence in dealing with the nobility, Ignatius in article 823 stated that in so far as his Order was concerned "there should neither be, nor perceived to be, partiality to one side or another among Catholic Princes or rulers, but in its stead a universal love which embraces in Our Lord all parties, even though they may be adversaries to one another". It is clear that in these two articles of the Constitutions, Ignatius' intention had been to ensure a mutually beneficial benevolent attitude of the Jesuit Order towards nobles, underlining the necessity of adopting a stance of 'accommodation' and tactful diplomacy. In regulating the selection of candidates wishing to join the Jesuits, Ignatius again specified in article 161 of his Constitutions[2] that "the extrinsic gifts of the nobility, wealth, reputation and the like", although not necessary for admission if other qualities such as a promising intellect, good memory, a firm will, good communication skills, good health and an age above fourteen years for admission to probation were present, nonetheless these gifts would render the person concerned to be "more fit to be admitted" in the Jesuit Order.

The interest of the Jesuits to accommodate those who mattered in contemporary society, was perhaps nowhere better shown than in the 'accommodation' policies that were adopted by the Order in its overseas missions where, in far away India, to quote one example, Roberto de

[1] Ganss, *Constitutions*, 337. See also Martindale, *God's Army II*, 27 for Borgia's fortification achievements.

[2] Ganss, *Constitutions*, 130.

Nobili, on realizing that the best approach to convert the sub-continent would be to do away with western social norms, sent out his delegate Balthasar da Costa "wearing golden earrings and a yellow tunic" to convert the nobility of Madurai, Tangor and Sathiyamangalam.[3] The Jesuit *mathematicus* Matteo Ricci in China went even further when, in defiance of vociferous criticism from Rome, this brilliant student of Clavius, sought and received permission from the Ming Emperor to be admitted in the elite social class of Mandarins because of his profound knowledge of mathematics and astronomy. This move introduced a unique form of Jesuit apostolate that saw Ricci going about dressed in pink silk robes and wearing the tall black hat of a Mandarin, also assuming the Chinese name of Li Madou and spending much time explaining in Chinese some mathematical problem to assembled dignitaries who, conscious of the military potential of the Jesuit's knowledge, received him with open arms.[4] Another example of 'accommodation' occurred in the South American missions. The Jesuit *reducciones* of Paraguay represented a unique adaptation of the European 'warp and weft' orthogonal town planning method[5] to the living habits of Guarani Indios jungle communities, whose appreciation of the efforts of the Jesuit Antonio Ruiz de Montoya to arm them and protect them from *Paulistas* slave dealers was reflected in their enthusiastic participation in elaborate Catholic rites based on music and choir singing, as portrayed in the film 'The Mission'.[6] Despite constant pressures from Rome, Jesuit missionaries proved proved themselves to be very skilful in accommodating all those in power and in positions of influence, who could promote the legacy of Ignatius.

The situation in Europe was not dissimilar. The main thrust of Jesuit accommodation politics here was targeted at a proud ruling class that had, since Charlemagne, shown a fascination for state-of-the-art arms, armour and fortresses, as recognised by the Estates General of France in c.1600 which declared that "the nobility is the one among the Estates to which has been committed the possession and handling of arms for the defence and protection of the realm"[7] to which one must add the com-

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[3] Bangert, *Society of Jesus*, 238.

[4] Andreotti, *Matteo Ricci*, 93–98.

[5] Hardoy, *Cuidades Coloniales*, 8–34. See also Fagiolo, *Città Latino-Americane* and McEwen, *Socrates' Ancestor*.

[6] 'The Mission' (1986) was directed by Roland Joffé with the participation of actors Robert de Niro and Jeremy Irons. A significant sentence in the script read "We are not members of a democracy, Father—we are members of an Order".

[7] Tallett, *War and Society*, 101 citing Seyssel's *Monarchie*.

ments of a Venetian ambassador to the Court of Spain in 1683 that here, the "power and authority is totally in the hands of the Grandees".[8] Francois de la Noue put it succinctly: "war is my country, my armour is my house, and in every season, fighting is my life."[9] The French nobleman Blaise de Losseran-Massencóme, the Seigneur de Montluc (1500–1577)—who shared the view of most of his fellow nobles that the nobleman's main role should be military but who was also aware that the social changes of the time had made it necessary for the nobleman to receive good education[10]—was quoted to have said when boasting about the education of his children that "Their desire is to gain goods and honours and in the winning of them, to hazard their persons and lives, and even serve the Turk rather than remain idle. If they did otherwise, I should not look upon them as mine."[11] Such utterances underlined the assertion made by Parker and Smith that "the early modern European state was, to a large extent, a military institution."[12] Entrapped within this harsh military environment, the Jesuit Order would have been confronted with an unenviable scenario where the promotion of its very successful spiritual mission very much depended on the help of a ruling nobility which was intrinsically violent and armed. According to Hale[13] "a mental frontier" would have existed "between the man of war and the man of peace" the former upheld by a "hard-drinking, womanising and blaspheming" soldiery representing the nemesis of the exemplary lives of most Jesuits.

The *genre* of the demands of the nobility of Baroque Europe on the Jesuit Order had ironically been introduced by Machiavelli's book '*The Prince*'.[14] According to him, the subject of war and fortification building represented a top priority in the education of the Catholic nobility of Europe. The great importance of 'arms *versus* letters' issues[15] for a social class that was clearly determined to maintain its ancient privileges of birth and status, is also

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[8] Tallett, *War and Society*, 189 citing Thompson's *Habsburg Spain*. According to Sedgwick, *Loyola*, 5, the Spanish Nobility "delight greatly in the use of weapons and the blast of the trumpet in battle stirs them to the quick" so that the Spaniards "surpass all other nations in the art of war".

[9] Noue, *Militarie Discourses*, 211.

[10] Montluc, author of *Commentaires* (1592), had unsuccessfully defended Siena in 1555 against an imperial army for which see Pepper and Adams, *Firearms and Fortifications*, various pages.

[11] Whitehead, *Coligny*, 334.

[12] Parker and Smith, *General Crisis*, 14.

[13] Hale, *War and Society*, 129.

[14] Macchiavelli, *The Prince*, 37–39 and 55–58.

[15] Kagan, *Students and Society*, 2–4 consulted online.

indicated in many other books of the age that took the pride of place in many a nobleman's library, constituting a new *genre* of literature that gave precious information about the great commanders of history, their pre-battle speeches, old and new firearms, tactical formations, drill methods, fortification buildings and siegecraft, mining methods and logistics, defined by Van Creveld as that "practical art of moving armies and keeping them well supplied."[16] This was the type of 'military culture' knowledge which would have been useful to noblemen. In an age when kings distrusted most military engineers because of their middle-class origins and were also reluctant to entrust non-nobles with sensitive military commands, well-informed noblemen would have been better placed to secure high-level military appointments and promotions.

According to Tallett,[17] the motives that normally attracted the nobility of Europe to military service were, firstly, a burning desire to continue ancient family traditions which identified fighting with the old landed nobility of Mediaeval Europe (more so if 'crusading' ideals were involved); secondly, a perceived need for justifying their privileged position in contemporary society with inspired leadership and, thirdly, dreams of accumulating more wealth, lands, prestige and honours. Opportunities also existed to amass a great fortune as military contractors, as proved by the cases of the Protestant Count Peter Ernst von Mansfeld (1580–1626) who provided Frederick of the Palatinate with some 32,000 professional soldiers,[18] the Protestant Duke Bernard of Saxe-Weimer (1604–1639) who provided the French king with 18,000 trained troops,[19] and, on a larger scale, the Jesuit-trained Duke Albrecht von Wallenstein (1583–1634) who in the course of the Thirty Years War, had nearly 150,000 men on his muster lists which he placed at the disposal of the Catholic Emperor Ferdinand II—on the advice of his Jesuit confessor.[20]

In the prevailing military climate of early modern Europe, the wide spectrum mathematical knowledge contained within the walls of the Jesuit teaching and learning institutions would have proved an irresistible attraction to Catholic nobles who wanted to learn more about new mili-

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16 Van Creveld, *Supplying War*, 1.

17 Tallett, *War and Society*, 100. See also Redlich, *The German Military Enterpriser*, various pages.

18 Tallett, *War and Society*, 76.

19 *Ibid.*, 76–77.

20 *Ibid.*, 76. Bireley, *Thirty Years War*, 96 states that Wallenstein was an outstanding benefactor of the Jesuit Order, named by General Vitelleschi a 'Founder of the Society' (1628), this entitling him to a special share of Jesuit prayers.

tary technologies and the geometry of war, more so in the context of many unsatisfactory attempts to set up special lay military schools. The school of artillery in Milan founded soon after the conquest of that State by Charles V (1525) and Juan de Herrera's *Accademia de Matematica y Arquitectura* in Madrid (1583) had inspired the emergence of *ad hoc* Protestant court military academies in Tubingen, Cassel and other German centres (*c.*1600). Other military schools founded in the early seventeenth century were the Venetian *Accademie de' Cavalieri* in Padova, Udine, Treviso, Faenza and Verona (c.1608), the *Academie des Exercises* at Sedan (1606) founded by the Duke of Bouillon (described by Corvisier as "the first establishment which could be described as a military school") and John VII of Nassau's short-lived *Schola Militaris* at Siegen in Westphalia (1617–1623). The latter seems to have served as a model and a goad for Maurice of Hesse's military college at Kassel (1618), Albrecht von Wallenstein's military academies in Friedland and Gilschin and Cardinal Richelieu's *Academie royale des exercises de guerre* (1636). During the course of the seventeenth century and the beginning of the eighteenth, other military schools were founded in Paris (1629, 1670–1682) Kolberg (1653), Douai (1679), Bruxelles (1679), Berlin (1717), Vienna (1666 and 1717), La Fere (1720), Metz (1720), Strasbourg (1720), Perpignan (1720) and St. Petersburg (1721). In this context one can also mention Luis Serrao Pimentel's *Aula de Fortificacáo e Esquadria in Lisbon* (1647) which complimented the older Paco de Ribeira nautical school (where military architecture was also taught), the *Accademia Reale di Savoia* in Turin (1678), the *Escuela de Palas* in Milan (1693), the *Scuola d'Artiglieria e Architettura militar* in Baira, Brazil (1695) and the *Classe di Fortificare* in Rio de Janeiro (1699).[21] In the decades preceding the suppression of the Jesuit Order in 1773, more military schools for nobles were set up. These included the *Accademie di fortificationi in* Elvas and Almeida in Portugal (1701), the *Cuerpo de Ingenieros de los Esercitos, Plazas, Puertos y Fronteras* in Madrid (1711), the *Real Escuela Matematica Militar* in Barcelona (1716), the *Classe del 'Tercio'* and the *Classe del Reggimento d'Artiglieria* in Rio de Janeiro (1738), the *Academia y Escuela de Mathematica* in Naples (1745), the Royal Academy at Woolwich (1741), the military engineering school at Mezieres (1749), the military academy at Weiner-Neustadt (1751), the *Corps des Ingenieurs de la Maine* and the *Ecole Nationale superiore de*

[21] Tallett, *War and Society*, 42. See also Negro, *Scuole Militari,* 127–145; Childs, *Warfare*, 99–100 and Corvisier, *Armées et Societés*, various pages.

Minas in Paris (1765, 1778), the *Collegio Militare* in Verona (1759), the *Artillerie-Lyceum* in Vienna (1778), the *Escuelo di Ingenieros de Minas* in Almaden (1777) and the *Real Accademia Militare della Nunziatella* in Naples (1786).[22]

In contrast to their eighteenth-century counterparts, most of the seventeenth century military schools were occasional and short-lived. Their operations were normally hinged on well known military personalities who only provided a practical and limited type of education. On the other hand—and here lay their strength—the Jesuit institutions, offered a far wider spectrum of knowledge incorporating not only leadership skills but also those critical military and non-military formative subjects that interested the Catholic nobility, all in the spirit of Aquaviva's *Ratio Studiorum* of 1599. It was within the walls of the Jesuit colleges and here alone that young Catholic nobles aspiring to leadership and military careers could learn to understand Latin, to use rhetoric as a means of persuading politicians and exhorting soldiers about to engage in battle, to read about the achievements of the military heroes of the past. They could here also learn more about the multi-faceted applications of mathematical knowledge relevant to military campaigns—cartography, astronomy, horology, siege work operations, military instrumentation, fortification design and ballistics as well as logistics, geography, economics, drill geometry and even 'the art of dying well'. All this was happening at a crucial time where one can detect a major shift, (called a "revolution" by Roberts)[23] in battle tactics and fortification design.

A glance at the curricula of Jesuit colleges with mathematical chairs would seem to suggest the existence of a broad-based Jesuit undergraduate curricula supplemented by specialised *ad hoc* 'academies' dealing with specific areas of knowledge such as fortification building—co-ordinated by some renowned Jesuit *mathematicus* who would have purposely been posted at that college to 'accommodate' the demands of some prince.[24] There was then the widespread practice of Jesuit professors being appointed as private tutors to members of the higher nobility. In Spain, for example, the Jesuit tutor would have been expected to teach

[22] *Ibid*. See also Joào Mascarenhas Mateus' paper on *La Scienza delle Fortificazioni nel contesto europeo dei trattati e accademie* presented at an international seminar concerning '*Malta-baluardo d'Europa*' held in Bertinoro, Italy, 28–29 June 2002.
[23] Roberts, *The Military Revolution*, various pages.
[24] See chapter 4 of this work.

the aspirant ruler not only Catholic doctrine but also virtue and good habits (both associated with moral and natural philosophy), languages, mathematics, history and also chivalry, the martial arts, eloquence, poetry and all war-related subjects, his overall aim being to create a future leader of men who would be skilled in Latin and literature, as much versed in artistic appreciation as in the practical aspects of warfare.[25] Soon after the death of Ignatius in 1556, Pope Pius V Ghislieri had proposed to Philip II of Spain, the setting up of special military schools for the Catholic nobility of the realm.[26] This idea seems to have been developed with a twist by Ghislieri's successor, the Jesuit-trained Pope Gregory XIII Boncompagni, who had instructed Possevino to incorporate it in his *Biblioteca Selecta*. This was a direct response to La Noue's 1587 proposal, made in his fifth discourse,[27] for the establishment of military academies for the nobility of Paris, Bordeaux, Lyons and Angers where young nobles of fifteen years of age would be exposed to "many kinds of exercises as well for the body as the mind" such as learning to "back a horse , handle weapons, swimming and wrestling" and attending lectures "in our language" on "moral virtues, policy and the art of war" also receiving instruction in "mathematics, geography, fortifications and some most usual languages", adding that "when the affairs of France might thus be brought to better order", then the King could afford to discharge the clergy (meaning the Jesuits) from their present obligations to teach the nobility. In Noue's tenth discourse[28] entitled 'Against the violence of some clergymen' the Jesuits were also accused of goading princes to pursue wars against their fellow Frenchmen at a time when it would have been more profitable, as explained by Noue in his twenty-second discourse,[29] to "prepare for the siege of Constantinople by a united Christian army" incorporating both Catholics and Protestants.

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[25] Kagan, *Students and Society*, 5–7. For similar situations in Parma, Ferrara and Mantova in Italy see Brizzi and Greci, *Universita in Europa*, 230–231 (Chapter 15 on '*Politica e Istruzione alla Corte di Ranuccio Farnese: I gesuiti Mario Bettini e Jean Verviers*' by Denise Aricò). According to Carrugo, *L'insegnamento della matematica*, 151–200, private tuition to Italian noblemen was not an exclusively Jesuit domain. Galileo taught a large international class about perspective, fortifications, arithmetic, geometry, cosmography, mechanics and instrumentation. Another case was that of the Barnabite monk Giovanni Antonio Mazenta for which see Campbell, *Ancient Roman topography*, 766–767.

[26] Brizzi and Matteucci, *Gesuiti a Bologna*, 147.

[27] Noue, *Militarie Discourses*, 73.

[28] *Ibid.*, 149.

[29] *Ibid.*, 245–290.

22. Giovanni Battista Falda's engravings of the *Collegio Romano* (top) and the Church of St Ignatius (bottom) in Rome [Audino, 1996].

It may be therefore that one direct result of Protestant attempts to create exclusive institutions for the instruction of the French nobility, was a concerted Jesuit drive to promote or assume responsibility for *seminaria nobilium* based on model colleges for nobles that had already been set up at Coimbra, Prague, Vienna and Cologne during Ignatius' lifetime.[30] The first institution of this nature in Italy—the *Collegio di Santa Maria*—had been set up in 1574 by the Jesuits in Milan within the framework of the

30 Brizzi, *Classe dirigente*, 24–27.

ambitious education reforms envisaged by the Archbishop Borromeo.[31] In the period that followed the publication of *Biblioteca Selecta* (1593–1620), colleges for nobles were set up by Italian princes in Bologna, Siena, Ferrara, Parma, Mantova, Padua, Florence and Modena, most of them on the instigation of the influential Possevino except for the school in Modena which seems to have been the only one of its *genre* not to have been run by the Jesuits.[32] After 1660, further *seminaria nobilium* in and outside Italy were placed under the control of the Jesuits. These included those of Brescia, Naples, Torino, Cagliari, Palermo, Genova, Ravenna, Prato and Rome in Italy; Madrid, Barcelona and Valenzia in Spain; Graz, Sopron and Olanouc in Habsburg territory; Karchau in Hungary and Kalisz, Ostrog, Raiva and Warsaw in Poland.[33] Together with the colleges catering for the education of intelligent children of all classes of the social scale, the many Jesuit seminaries for nobles of Baroque Europe, completed the teaching and learning scenario of a Jesuit Order constantly adjusting itself to accommodate the demands of the ruling class.

The Role of the Jesuit *Mathematicus* in Italy, France and Portugal

The Italian Principalities

The contribution of the *Collegio Romano* towards the diffusion of knowledge about military architecture in those parts of Italy that were not directly controlled by Spain after 1600, has as yet been largely unexplored. The material that has been published about this college[34] does indicate, however, that by this date it had managed to achieve an international reputation for excellence in mathematical teaching and research. Among the eminent Jesuit professors who taught the subject then known as '*matematica*', '*mathesis*' or '*mathematicae scientiae*',[35] one name seems to stand out. Oratio Grassi (1583–1654) was the architect of the magnificent churches of

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[31] *Ibid.*

[32] *Ibid.* According to Brizzi and Greci, *Università in Europa*, 75 there was also in 1661 an aborted Jesuit attempt to set up a *seminarium nobilium* in Venice

[33] *Ibid.* See also Egido *et. al.*, *Jesuitas en Espãna*, 231–239 and Brizzi and Greci, *Universita in Europa*, 53–68, 213–242 and 243–256.

[34] Baldini, *Saggi*, 49–98. See also Baldini, *Legem impona subactis* and Dear, *Jesuit Mathematical Science* in 'Studies', 133–175.

[35] Baldini, *Saggi*, 54.

St. Ignatius in Rome and of the Assumption in Savona but also a much sought consultant in *De re militari* which resulted from his reputation as a professor of mathematics at the Roman college in the periods 1616–1624 and 1626–1628.[36] So well known was Grassi's encyclopaedic knowledge about all things military that his opinions about the new fortifications that were then being built in Malta to resist the Turks, had been the subject of long discussions held in September 1638 between the Jesuit, then residing in Savona, and the special envoy of Grand Master Jean-Paul Lascaris Castellar, Giovanni Battista Vertova.[37] Grassi's written report,[38] presented to the Grand Master following Vertova's return to Malta in February 1639, reveals that prior to his meeting with Vertova the Jesuit had already carefully evaluated the military situation in Malta from plans that had been sent to him by his friend Cardinal Francesco Barberini, nephew of the great Pope Urban VIII Barberini (1623–1644) and Cardinal Protector of the Hospitaller Knights of St. John in Malta. In his report, Grassi praised the military engineer Pietro Paolo Floriani's masterly treatment of the tenailles that he had introduced in his new line of defences, describing them as "*di forma reale e pezza di ottima difesa*" requiring "well trained musketeers" to defend them properly. The Jesuit *mathematicus* also expressed the urgent need to strengthen the earlier sixteenth-century defences of Valletta, stating that it would be opportune to add "*alcune opere esterne*" to them to further protect the city fortress. He added that it would also be necessary to effect some design changes to Laparelli's 1566 fortifications to counteract Turkish artillery fire. Grassi's extensive knowledge was however best shown in his endorsement of Vertova's proposal to enclose the then isolated Fort St. Elmo within the fortifications of Valletta by means of a massive bastioned girdle wall complete with a small evacuation harbour situated at the tip of the peninsula. The Jesuit concluded his erudite report by for the first time stressing the need to fortify the small island in Marsamxett harbour known as the "*izolotto*" so as to protect the northern flank of Floriani's new fortifications and also to build new fortifications composed of four bastions and four ravelins on the heights of S. Margherita (on the other side of the Grand Harbour of Malta) to likewise protect the southern flank.

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[36] AHSI 103, a.LII (1983), 84 and 88. For the career of Grassi, who joined the Jesuits on 18-10-1600, see ARSI, SMV, III, 1806.

[37] De Lucca, *Vertova*, 18–43.

[38] *Ibid*, Grassi's report is kept in the Vatican Secret Archives QIII 69, ff. 41v-46 where it was first identified by De Giorgio, *City by an Order*, 191 and 259.

The powerful military mind of Grassi was reflected in the classroom lectures of two other eminent Jesuit professors who taught at the *Collegio Romano* in the seventeenth century. These were Giuseppe Ferroni (1628–1709)[39] and Francesco Eschinardi (1623–1703).[40]

Ferroni, one of the more prominent post-Clavius mathematicians, was teaching mathematics at the Roman college during the period 1657–1660.[41] Among nine manuscripts revealing the nature of his lectures on such diverse subjects as algebra, horology, geometry, perspective and astronomy kept in the *Biblioteca Oliveriana di Pesaro*, one finds a manuscript[42] entitled *Architectura Militaris* (1658). It concerns the Jesuit's teaching of military architecture, as understood by one of his more talented students from Pesaro called Domenico degli Abbati Olivieri who was studying at the Roman college in the period 1652–1660 and who, on completion of his studies had decided to delve further into the subject of military architecture and artillery. In 1661 Domenico attended private lessons at Bologna given by a certain "*Padre Francesco Maria Minii de' Chierici minori*" who was the author of a manuscript entitled *Compendio di fortificazione si difensiva come offensiva*.[43] Domenico's classroom notes seem to cover only the first part of Ferroni's intensive course in military architecture which was introduced with a discussion on the usual subdivision of 'military architecture' into offensive (siege) and defensive (fortification) components and of 'fortifications' into regular and irregular types, moving on to a detailed step-by-step geometrical construction of an 'ideal citadel' of pentagonal form, explained both in plan and section.

Ferroni's typical schoolmaster's discourses seem to have represented only a fragment of a much wider and intensive investigation on military architecture. This is suggested by a second manuscript in the Pesaro library,—presumably also deposited there by the same Domenico degli Abbati Olivieri—authored by Eschinardi who later taught mathematics

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39 AHSI 103, a.LII (1983), 80, 82, 85 and 88. For the career of Ferroni, who joined the Jesuits on 22-10-1641 see ARSI, SMV, III, 696 and IX, 333 and Baldini, *Saggi*, 228, fn. 29. (Chapter VII on *Testi e corsi secenteschi del Collegio Romano della Compagnia di Gesu in Codici dell'Oliveriana*). See also Torrini, *Ferroni*, in 'Physis', 411–423.

40 AHSI 103, a.LII (1983) 85 and 88. For the career of Eschinardi, who joined the Jesuits on 04-10-1637, see ARSI, SMV, III, 431–435 and Baldini, *Saggi,* 230, fn 3 7.

41 AHSI 103, a.LII (1983) 85 and 88.

42 BOP, Ms. 490 cited in Baldini, *Saggi,* 233 who also mentions other Oliveriana manuscripts by Ferroni on algebra and astronomical observations (Ms.180), perspective (Ms. 490) and clocks (Ms. 491).

43 Baldini, *Saggi*, 215–216 and 234, fn. 49.

at the Roman college in 1665–1666 and 1684–1686.[44] This 1660 manuscript entitled *Trattato di fortificare alla moderna*,[45] forms but one of four precious bundles of classroom notes dealing with astronomy, metaphysics and mechanical engineering, all taught by the Jesuit. The contents, repeatedly using derivatives of the Italian word *insegnare* meaning 'to teach', explicitly reveal Eschinardi's approach to teaching military architecture to an international class of students. It is very logically organised in eight sections covering (1) nomenclature (2) basic geometry (3) necessary calculations and measurements to draw up a plan of a regularly shaped fortification complete with outworks comprising ravelins, lunettes, demilunes, covered ways, counterscarps, entrenchments and glaces (4) cross-sectional considerations (5) design details of bastions, curtain walls, cavaliers, parapets, gun enplacements, ditches, crown works, tenailles, casemates and double lines of fortifications (6) the advantages and disadvantages of irregularly shaped fortifications in plains, marshland, sea environments, river environments and mountainous terrain (7) mining operations and (8) artillery. In anticipation of eighteenth century interest in the subject, Eschinardi seems to have been very interested in '*Dell' Artegliaria, et altri pezzi'* since he describes and gives details about both culverin and cannon types of artillery used in contemporary warfare. He specifies fascinating weight, length, shot and range details for falconets, falcons, sakes, bastard culverins, demi-culverins, culverins, quarto-cannons, demi-cannons and cannons. Known to all as an excellent orator, one can here imagine the very Baroque theatrical scenario of Eschinardi giving a lecture to students attending the *Accademia di Mathematica*. They would have been impressed by his meticulous explanations and predrawn charts of fortifications, especially so if they had read a copy of their teacher's monumental volume on the ruins of Rome (1650) and other works on a wide range of subjects (including optics and horology) which he published in the second half of the seventeenth century, all dedicated to the people that mattered of his time.[46]

While Eschinardi seems to have spent most of his teaching time in Rome, Ferroni eventually moved out of Rome to take up teaching posts

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44 AHSI 103, a.LII (1983) 85 and 88.

45 BOP, Ms. 490 cited in Baldini, *Saggi,* 233 who mentions other Oliveriana manuscripts by Eschinardi on geography (Ms.184), metaphysics (Ms.189) and mechanics (Ms. 493). The last manuscript also contains the Minii *Compendio* mentioned in the text (BOP, Ms 493, ff. 1–71v)

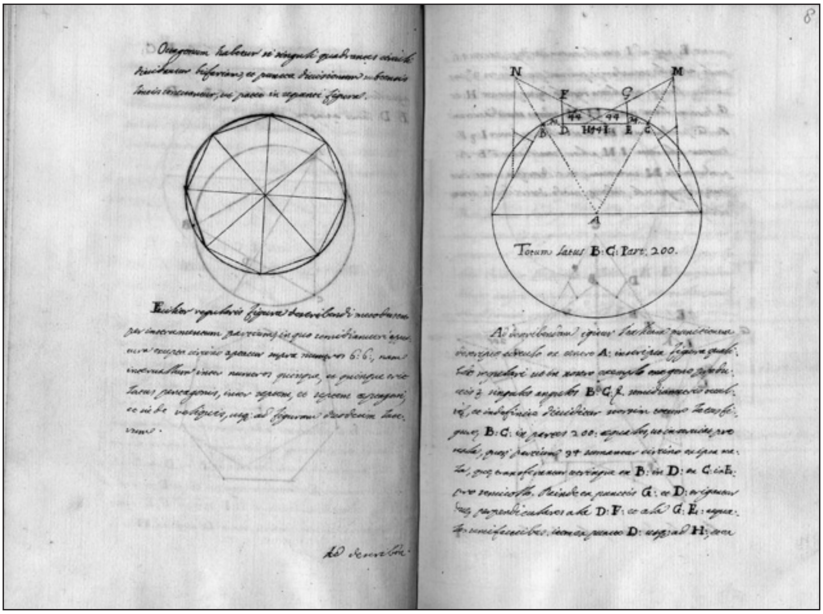
46 Eschinardi using the pseudonym Costanzo Amichevoli, also authored books on civil (1675) and military (1684) architecture mentioned in ARSI, SMV, III, 431–435.

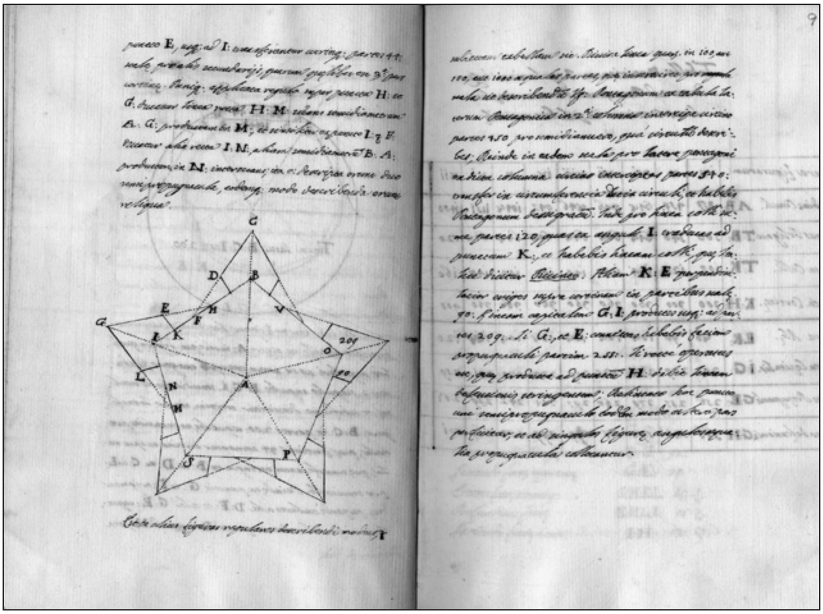
in Mantova (1660–1666), Bologna (1667–1686) and Siena (1686–1695) where he spent the last days of his life.[47] He was therefore responsible for diffusing Jesuit fortification teaching from Rome to the Jesuit colleges in the above-mentioned cities which, in the case of Bologna and Siena, was also extended to the Jesuit-run colleges for nobles. Ferroni's involvement in Bologna, where lectures in mathematics had been held since 1646 by the Jesuits Giovanni Battista Riccioli (1646–1648), Francesco Maria Grimaldi (1648–1663), Giovanni Paolo Tura (1664–1665) and Giovanni Macrini (1665–1667),[48] seems to have been particularly fruitful. Ferroni's immediate predecessor here, Giovanni Macrini (1632–1698) had himself been very interested in military architecture. He had produced a treatise about the subject entitled *De praxi in aggerum constructione* (1698)—one of twenty other treatises on diverse subjects which he later deposited in the library of the Jesuit library in the college of Ferrara where he passed away at the end of an illustrious teaching career which had started in Bologna and continued in Parma (1675–1681) and in Ferrara (1685–1694).[49] It was perhaps by no coincidence that the courts of Parma and Ferrara, together with that of Mantova were three important Italian principalities north of Rome which repeatedly hired Jesuit mathematicians to serve as military consultants in the seventeenth century.[50]

Following the departure of Macrini, Ferroni's activity in teaching military architecture in Bologna during the period 1667–1686 seems to have been highly successful, this being attested by the presence of five tables which were originally included in a manuscript of his teaching notes entitled *L'Arte del fortificare* (1674).[51] Bologna was indeed fertile ground for Ferroni's teaching. Apart from the Jesuit college of S. Luigi Gonzaga, the Order had here founded in 1598–1599 a *seminarium nobilium* dedicated to St. Francis Xavier which had in the 1660–1676 period become a venue for many noble students from the Papal States (29%), the Duchy of Milan (4%), the Republic of Genova (20%), the Republic of Venice (27%), the Duchy of Modena (2%), the Duchy of Parma (6%), the Duchy of Mantova (7%), other Italian States (2%) and other European countries (3%).[52] After Ferroni's transfer to Siena in 1686, the Bologna seminary for

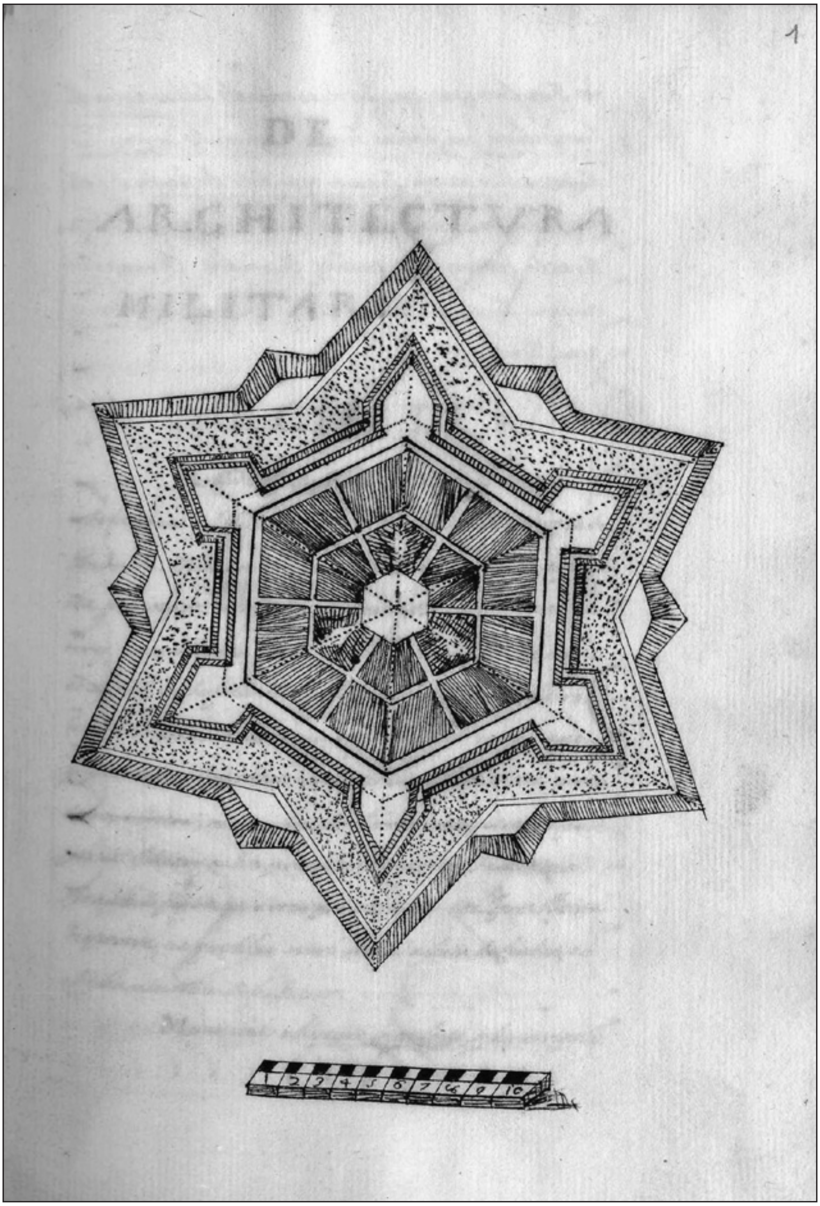
47 AHSI 103, a.LII (1983) 80, 82 85 and 88.
48 *Ibid.*
49 AHSI 103, a.LII (1983) 89. The treatise of Macrini, who joined the Jesuits on 22-11-1649, is mentioned in ARSI, SMV, V, 266.
50 Brizzi and Greci, *Università in Europa*, 230.
51 D'Ayala, *Bibliografia*, 130.
52 Brizzi and Matteucci, *Gesuiti a Bologna*, 154.

23. Frontispiece of Ferroni's *Architectura Militaris* manuscript of 1658 [BOP, Ms.490]. Reproduced with the kind permission of the *Biblioteca Oliveriana* in Pesaro.



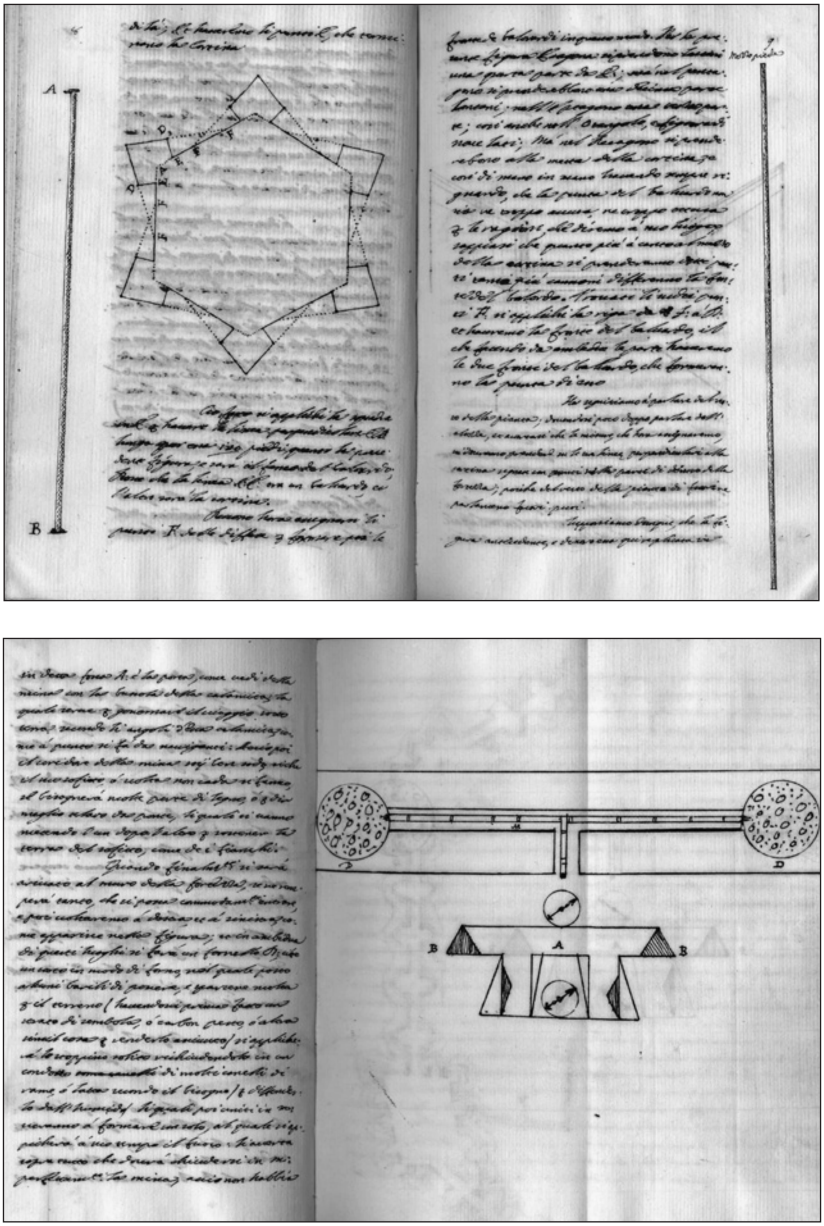


24. Extracts from Ferroni's *Architectura Militaris* manuscript [BOP, Ms.490]. Reproduced with the kind permission of the *Biblioteca Oliveriana* in Pesaro.



25. Extract from Ferroni's *Architectura Militaris* manuscript [BOP, Ms.490]. Reproduced with the kind permission of the *Biblioteca Oliveriana* in Pesaro.

26. Extract from Eschinardi's *Trattato di fortificare alla moderna* of 1660 [BOP, Ms.490]. Reproduced with the kind permission of the *Biblioteca Oliveriana* in Pesaro.



27. Extracts from Eschinardi's *Trattato di fortificare alla moderna* [BOP, Ms.490]. Reproduced with the kind permission of the *Biblioteca Oliveriana* in Pesaro.

nobles had continued to flourish. Not only was an important work on "*esercizi cavallereschi*" (outlining the achievement of its *Accademia degli esercizi cavallereschi*) published in July 1717 to commemorate the Imperial victory over the Turks marked by the fall of Belgrade,[53] but at about this time the Bologna Jesuits seem to have multiplied their efforts to prepare their students for war, drawing much inspiration from the *Ecole des Cadets-gentilshommes* set up by Louvois in Paris where mathematics, geography, history, French and German, fencing, design, fortifications, music and dance were taught to the lower and higher nobility.[54] For this purpose, the Jesuit Order hired a military expert from Modena called Francesco Vandelli. This person was requested to give practical instruction (as distinct from theoretical knowledge) in military architecture, focused on a more effective type of artillery about which he had authored a book about gunpowder entitled *Della polvere da fuoco* (1757).[55]

The military education given by the Jesuits at the *seminarium nobilium* of Bologna[56] was in the eighteenth century attested to by a number of distinguished students—Marquis Francesco Zambeccari (who supplemented his philosophical studies with "*esercizi di spada, sciabola, spadone, equitazione, ballo francese, aritmetica, matematica, lingue Francese, geografia e fortificazione*")[57]—Francesco Antonio Pugnetti (who supplemented his law studies with studies in arithmetic, mathematics, French, Italian and French dance, sword and halberk practice, horsemanship and fortifications)—Pietro Manci (who studied German and French, swordplay, French dance, geography and fortifications)—Giovanni Tommaso Puisserver (who studied French, swordplay, French dance, design, geography and fortifications)—Giovanni Francesco Nembrini (who studied French and German, horsemanship, weaponry, French dance, geography and fortifications)—Giovanni Francesco Morandi (who studied French, horsemanship, weaponry, geography and fortifications) and Ottavio Beltrame di Carpaco (who studied French, French dance, swordplay,

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53 ARSI, SMV, II, 1677.

54 Brizzi, *Classe dirigente*, 246 and fn. 389.

55 Brizzi, *Classe dirigente*, 246 and fn. 388. For Vandelli's work on artillery see D'Ayala, *Bibliografia*, 157.

56 Brizzi, *Classe dirigente*, 246 and fn. 390. The curriculum of studies provided to *seminarium nobilium* students in Bologna can be classified into (1) military subjects (2) cultural subjects including history from a Catholic viewpoint, languages, geneaology and heraldry and (3) 'good manners' subjects including the art of writing, drawing, court manners, dance, song and music.

57 *Ibid.*

horsemanship, geography and fortifications). Other topics taught by Vandelli in the eighteenth century Bologna *seminarium nobilium* were arithmetic, algebra, geometry, civil architecture and perspective representation.These constituted the main themes of a wide range of some sixty different subjects offered by this institution—one particularly popular subject was music using diverse Baroque musical instruments such as the violin, violincello, viola, clarinet, flute, oboe, mandolin, French guitar and clavicembalo. All courses in military architecture held at the Bologna seminary were well supported by an impressive library of books about the subject[58] which included Jean Le Prestre de Vauban's *Essais sur le fortifications* (1739), Lescuyer de la Jonchère's *Nouvelle méthode de fortifier* (1718) and Leblond's two works entitled *Elémens de fortification* (1739) and *Elémens de la guerre des sièges* (1743). These books together with Vignola's classic work on the five orders of architecture (1611) were regularly consulted by the students for the preparation of fifteen minute presentations about military architecture which they were repeatedly asked to give to select audiences on specific days, under the critical scrutiny of their Jesuit professors.

Another important seminary for nobles responsible for the diffusion of military knowledge in the Jesuit *Provincia Veneta*[59] was that of Parma, dedicated to S. Caterina. This institution had been set up in 1604 by Duke Ranuccio I Farnese (1569–1622), son of the famous Italian general Alessandro Farnese who had once boasted to the King of Spain that: "Your Majesty desired me to build a fortified citadel at Maastrich but I thought that a college of Jesuits would be a fortress more effective to protect the inhabitants against the enemies of the altar and the throne. I have therefore built it." [60]

During the 1604–1773 period some 1000 nobles from Germanic countries attended the Parma Jesuit seminary, which, for good measure, was also fitted with a grand '*sala de armas*' or armoury. This reflected a remarkable Jesuit influence north of Rome that had been brought about by the concerted effort of four Habsburg noblewomen all having Jesuit confes-

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[58] Brizzi, *Classe dirigente*, 246 and fn. 392–394. See also Brizzi and Matteucci, *Gesuiti a Bologna*, 148 who reproduce a lithograph entitled 'A lesson of military architecture' held in Bologna, from Zoepfl's *Deutsche Kulturgeschichte*.

[59] The Jesuit *Provincia Veneta* incorporated five colleges having mathematical faculties at Bologna, Brescia, Ferrara, Mantova and Parma, also including, after 1657, a *domus professa* in Venice where mathematics started being taught in 1744.

[60] AHSI 101, a.LI (1982), 47 (article on '*The Jesuit College at Padua: Growth, Suppression Attempts and Restoration*' by John Patrick Donnelly S.J.).

sors—Margherita, daughter of the Emperor Charles V and wife of Duke Ottavio Farnese of Parma; Eleonora, daughter of the Emperor Ferdinand I and wife of Duke Guglielmo I Gonzaga of Mantova; Barbara, daughter of the Emperor Ferdinand I and wife of Duke Alfonso II d'Este of Modena and Giovanna, daughter of the Emperor Ferdinand I and wife of the powerful Grand Duke Francesco I de' Medici of Tuscany.[61] The Jesuit involvement in Parma was dominated by the mathematicians Bettini (1582–1657)[62] and Macrini who had arrived here in 1675 or thereabouts. Mario Bettini, a colourful figure who besides being the mentor of Guarino Guarini (1624–1683) was also a close friend of Prince Raimondo Montecuccoli (1609–1680)—the latter had even sent him a copy of his work on fortifications from Hohenneg on 15 July 1652[63]—was responsible for teaching military architecture in Parma during the period 1624–1630. Among the students attending his classes at the *seminarium nobilium* were the two sons of Duke Ranuccio, Ottavio and Odoardo. According to Silvestri, the Duke was informed in 1612 that Ottavio had already attained full proficiency in "forming squadrons and ordering an army, well prepared to fire bombards and manage artillery... also very good in geometry and arithmetic, in the fine art of fortification but also in metaphysics and in human and natural philosophy."[64] Besides being Ottavio's teacher of military mathematics, Bettini also served as military consultant to the courts of Parma (1612–1613), Modena (1617–1618) and again Parma (1626–1627), and as a military architect at Novellara (1618–1619), seat of the novitiate of the Jesuit '*Provincia Veneta*'. He also authored a book about mathematical curiosities (1654) in which '*auctoria militaria*' featured prominently.[65] His machines of war were mentioned by Montecuccoli, by the famous Jesuit mathematicians Athanasius Kircher and Jacques Ozanam and by the Polish master of artillery, Casimir Semenowycz.[66]

The efforts of the Jesuits Bettini and Macrini in Parma in the first and second half of the seventeenth century were crystallised in 1684–1691

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61 The role of the Habsburg noblewomen mentioned in the text is explained in Baldini, *Saggi*, 172, fn. 3.

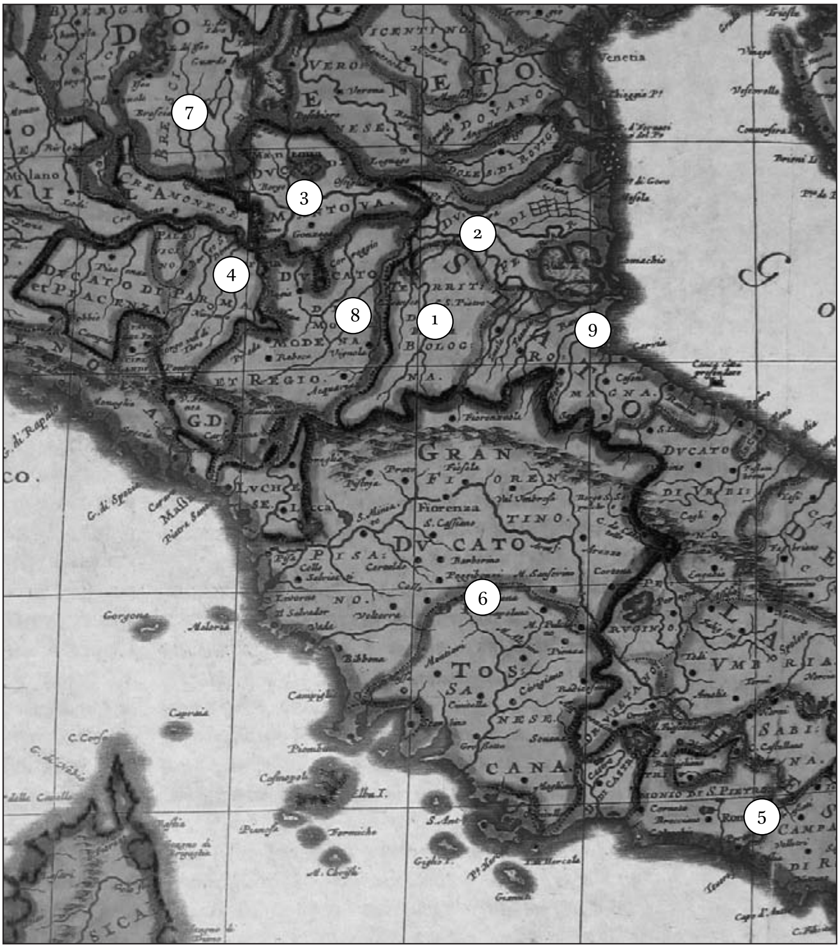
62 AHSI 103, a.LII (1983) 84 and 86. For the career of Bettini, who joined the Jesuits on 11-11-1598 see ARSI, SMV, I, 1426–1429 and Aricò, *Bettini*, all pages.

63 Brizzi and Greci, *Università in Europa*, 231 and fn. 30.

64 Silvestri, *Principe Infante*, 252–253 cited by Denise Aricò in her contribution entitled '*Politica e Istruzione alla corte di Ranuccio Farnese: i gesuiti Mario Bettini e Jean Verviers*' to the book Brizzi and Greci, *Universita in Europa*, 213–242.

65 ARSI, SMV, I, 1427–1428. For Bettini's consultancies see Baldini, *Saggi*, 185, 194–195 and 202.

66 Brizzi and Greci, *Università in Europa*, 231.



Names and teaching dates of Jesuit mathematicians providing fortification instruction:

1. Bologna (Giovanni Macrini, 1665-1667; Giuseppe Ferroni, 1667-1686 and Carlo Antonio Santi, 1689-1690).
2. Ferrara (Giovanni Macrini, 1685-1694).
3. Mantova (Giuseppe Ferroni, 1660-1666 and Carlo Antonio Santi, 1703-1706).
4. Parma (Mario Bettini, 1624-1630; Giovanni Macrini, 1675-1681 and Carlo Antonio Santi, 1682-1686).
5. Rome (Orazio Grassi, 1616-1624 and 1626-1628; Giuseppe Ferroni, 1657-1660 and Francesco Eschinardi, 1665-1686).
6. Siena (Giuseppe Ferroni, 1686-1695).

Other Jesuit institutions providing instruction in military architecture were those of Brescia (7), Modena (8), Ravenna (9), and Trent (not shown).

28. Jesuit institutions in Italy providing fortification instruction in the Baroque age (excluding those in territories ruled by Spain), superimposed on Joan Blaeu's 1665 map of Italy.

when three sets of fortification tables covering the lessons of Giuseppe Ruta "*maestro di fortificazione nel suddetto collegio*" were published in Parma for use by the noble students attending the Jesuit *seminarium nobilium* of that city.[67] The first and second set of tables (1684) were respectively entitled *Nuova aggiunta di Tavole di fortificazione moderna* and *Fortificazione Olandesa, calcolate nel terzo modo, con la proportione sesquialtera della faccia della Cortina*. The third set (1691) dealt with the design of regularly and irregularly shaped fortresses with precise instructions as to how to design a typical Vauban fortress—*Tavole di fortificazione, con il modo d'addoprarle per delinear le piante delle Fortezze regolari e irregolari, cavate dalle maniere più moderne che si praticano oggidì, con le Tavole del profilo per l'elevazione di dette e delle fortificazione esteriori, e con una breve aggiunta di far' i fianchi alla moderna e il modo di delineare le fortezze di Monsieur de' Vauban.* Ruta's focus on Vauban gives an indication of the nature of the updated knowledge that was being diffused by Jesuit schools in late seventeenth century Italy. Further evidence for this state-of-the-art situation is provided by the prestigious Jesuit *seminarium nobilium* of S. Antonio that had been founded in Brescia in 1660. In 1749, a Venetian nobleman called Julius Cornelius who had been studying here, presented a thesis entitled *Selectas ex pyrotechnia militari propositiones*[68] focusing on 'modern' artillery.

The seminaries for nobles in Parma, Bologna, Siena and Modena, managed to diffuse in 1660–1773 the most up-to-date knowledge about military architecture in 1600–1773 to estimated intakes of some 200–250 students from the Duchy of Savoy and Switzerland, 250–500 from the Duchy of Modena, 500–750 from the Grand Duchy of Tuscany and the Duchy of Parma, 750–1000 from the Duchy of Milan and the Republic of Genoa, 1000–1500 students from the Papal States and the Holy Roman empire and 1500–2000 students from the Republic of Venice.[69] The notes on *De re militari* of the little known Jesuit *mathematicus* Alberto de Albertis that were at one time circulating in Trent and a manuscript revealing the private lessons in military architecture that were being given at the Jesuit college of S. Rocco in Parma by the Bergamese Jesuit Carlo Antonio Santi (1663–1729) who had authored a manuscript entitled

[67] ARSI, SMV, VI, 281.
[68] ARSI, SMV, II, 115.
[69] Brizzi, *Classe dirigente*, 45.

Names and teaching dates of Jesuit mathematicians providing fortification instruction:

1. Paris (Jean Francois, 1620-1623; Pierre Bourdin, 1634-1649; Francois Derand, c. 1640; Jean du Breuil, c. 1660; Ignace Gaston Pardies, 1670-1673 and Claude Francois Milliet de Chales, 1673-1675).
2. La Flèche (Jean Francois, 1612-1616; Georges Fournier, 1628-1634; Pierre Bourdin, 1633-1634 and Pierre Ango, 1668-1669 and 1678-1685).
3. Bordeaux (Ignace Gaston Pardies, 1668-1670).
4. Toulouse (Barthelemey Labarthe, 1643-1647).
5. Lyon (Claude Richard, 1622-1629; Claude Francois Milliet de Chales, 1657-1660 and 1671-1673 and Jean Berthet, 1661-1665).
6. Pont-á-Mousson (Jacques de Billy, 1629-1630).
7. Aix (Jean Berthet, 1658-1660; Jean Baptiste de St.Just, 1699-1710 and Joannes Claude Ignace Morand, 1738-1741).
8. Avignon (Claude Francois Milliet de Chales, 1655-1656 and Joannes Claude Ignace Morand, 1741-1762).
9. Caen (Michel Aubert, 1708-1712 and Yves André, 1726-1759).
10. Dieppe (Georges Fournier, 1634-1636).
11. Dijon (Jacques de Billy, 1665-1668 and Bernard Fiacrius Durand, 1698-1701).
12. Dôle (Juan Carlos de la Faille, 1620-1629).
13. Hesdin (Georges Fournier, 1639-1644).
14. La Rochelle (Ignace Gaston Pardies, 1666-1668).
15. Marseille (Claude Francois Milliet de Chales, 1669-1670).
16. Nantes (Joseph Michel Aubert, 1715-1717).
17. Rheims (Jacques de Billy, 1631-1633).
18. Strasbourg (Jacques Antoine Fevre, 1716-1717).
19. Tournon (Claude Richard, 1616-1621; Barthelemy Labarthe, 1638-1643 and Louis Antoine Lozeran Du Fesc, 1731-1752).

29. Jesuit institutions in France providing fortification instruction in the Baroque age, superimposed on Joan Blaeu's 1665 map of France.

Compendio dell'Arte Militare,[70] would also suggest that some Jesuits were also supplementing their classroom teaching by private lessons in military architecture in very much the same way as Galileo had done. To complete the picture of the tremendous influence of the Jesuit *seminarium nobilium* in seventeenth century non-Spanish Italy, it would be relevant to mention the Jesuit seminary in Ravenna where instruction seems to have been focused on '*Esercizi Cavallereschi*'. This subject was considered to be "the ornament of a well born person" and it was the declared desire of the noble parents of the students that their children would be taught by the Jesuits how "to handle the sword, the pike and the flag, to ride well a horse, to dance elegantly in both the French and Italian manner, to sing, to play different musical instruments, to write and speak different languages and to understand well arithmetic, geometry and all about fortifications."[71]

The Kingdom of France

France was one of Europe's larger centralised states, but one that was in the second half of the sixteenth century riven by wars of religion. The absolute power of the French monarchy had resulted in King Henry IV's 1603 directive to the Jesuit provinces in France to only accept 'natural French citizens' within their ranks,[72] this explaining the 'containment' of Jesuit mathematical knowledge in the country after that date. Once assured of the loyalty of his French Jesuits, King Louis XIV (1643–1715) would later openly consult several French Jesuit professors of mathematics with regards to diverse fortification and naval issues.[73] Onerous royal demands did not constitute the only problem facing the Jesuit Order in France. A worse problem was the threat posed by an influential lobby of Calvinist Huguenots, mainly concentrated in the Southern part of the country. A letter written by the Jesuit Provincial Paschase Broët to General Laynez saying that "he was writing this letter so that he and all other fathers and brothers will pray to His Divine Majesty to combat and anni-

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[70] For Albertis see AHSI 103, a.LII (1983), 86 and Neill and Dominguez (ed.), *Diccionario*, 1246–1248 (*Enseñanza Militar*). For Santi, who joined the Jesuits on 02-12-1680, see ARSI, SMV, VII, 589.

[71] Brizzi, *Classe dirigente*, 288 and fn. 402 quoting from a Jesuit document entitled '*Informazione per chi desidera mandar figliuoli nel Collegio di Nobili... in Ravenna*'.

[72] ARSI, *Gal.* 61, II, 405–410 (document 197) mentioned in Brizzi and Greci, *Università in Europa*, 441 (Chapter 26 on *Les jésuites dans la culture scientifique Francaise de l'epoque moderne: Bilans et perspectives* by Antonella Romano).

[73] Neill and Dominguez (ed.), *Diccionario*, 1506 (*Francia*).

hilate the heresies that are (in France) advancing by the day,"[74] the unfortunate events marked by the St. Bartholomew's day massacre (1572) and the assassination of Henry III (1589), had put the Jesuits in a bad light. They were accused of provoking civil strife which many thought would have delivered France into the hands of the King of Spain. It is therefore understandable that after a short exile from Paris (1595–1603) in the wake of Jean Chastel's first assassination attempt on King Henry IV, the Jesuits in France would have focused their activities on providing assurances of loyalty to the political unity invested in the person of the monarch stressing, however, their universal obligation and right to wage a 'just war' to eradicate those troublesome Calvinists. In the perspective of a united stand to gain royal favour at any price, the French Jesuit *mathematicus* received much encouragement and achieved—normally free from any interference from Rome—outstanding success in the diffusion of military knowledge among a largely Catholic French nobility, especially so after 1650 when new mathematical chairs were founded at Pau (1653), Dijon, (1665), La Rochelle (1666), Caen (1666), Marseilles (1669), Nantes (1672) Chambéry (1672), Rennes (1673), Brest (1686), Cahors (1686), Strasbourg (1693), Perpignan (1722), Montpellier (1741) and Nancy (1760).[75] All this formed part of King Louis XIV's policy to ensure the formation of competent and loyal officers for the army and the navy.

The key Jesuit colleges in France associated with the diffusion of knowledge about military architecture were those of Paris, La Flèche, Bordeaux, Toulouse, Lyons, Pont-á-Mousson, Aix, Avignon, Caen, Dieppe, Dijon, Dole, Hesdin, La Rochelle, Marseille, Nantes, Rheims, Strasbourg and Tournon.[76] Such was the reputation of the Jesuit mathematicians teaching in these institutions that Renè Descartes, one of the first students at La Flèche in 1607–1615, remarked in his celebrated *Discours de la Méthode* that "I have been at one of the most famous schools in Europe."[77] These sentiments were echoed by one of the most famous military products of the *Collegium Flexiense*, Jean-Baptist Budes, the Comte de Guébriant (1602–1643) who as Marshal of France and a hero of the Thirty Years War distinguished himself at the siege of Breisach in 1638. All

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[74] Martin, *The Jesuit mind*, 90.

[75] AHSI 103, a.LII (1983), 57–66.

[76] *Ibid.*

[77] The whole sentence, as translated by Paul Brian, reads: "I have been at one of the most famous schools in Europe where I thought there must be wise men if such existed anywhere on earth."

sources suggest that the three major Jesuit protagonists of the teaching and learning scenario of military architecture in Baroque France were Pierre Bourdin (1593–1653), Georges Fournier (1595–1652) and Claude François Milliet de Chales (1621–1678).[78] They provided a model and a goad for the involvement of French Jesuits in military affairs.

The mathematics course taught by Bourdin at the College of Clermont in Rue Saint-Jacques, Paris during the period 1634–1649—presumably identical to other courses that he would have taught publicly as professor of mathematics at La Flèche in 1625–1626 and privately as professor of rhetoric at Rennes in 1627–1628, Rouen in 1628–1629, Bourges in 1629–1633 and La Flèche in 1633–1634—is revealed in an interesting manuscript entitled *Cours de Mathématiques professé au College de Clermont à Paris* (1636).[79] The first volume of this manuscript[80]—containing 792 folios—seems to cover one part of the course of mathematics followed by the student Paul Le Mercier in the academic year 1637–1638 while the second volume of the same manuscript[81]—containing 989 folios—seems to cover (as indicated on folio 263), another part of the same course followed by the same student in the previous academic year. Of great interest is the content of this second volume which, unlike the first volume on geometry and optics, treats in great detail geometrical applications to military architecture. It is here revealed that the Jesuit's course in military architecture evolved according to a specified list of contents (folios 1–2). The course started with an illustrated introduction to geometry (folios 3–91v) which was classified into three parts (*Apparatus Geometricus pars prima*, *Apparatus Geometricus pars secunda* and *Apparatus Geometricus pars tertia*, concluded with twenty problems). It then progressed into a short discussion on mechanics (folios 92–107) which was followed by a long, well illustrated section concerning the application of geometry to fortification design (folios 108–486) entitled *Tractatus Quartus: Praxis Geometriae Militaris*. This section consisted of a first subsection (folios 108–217) dealing with organic geometry (*geometria organica*), linear geometry (*geometria linearis*), the geometry of planes (*geometria superficiales*), the geometry of solids (*geometria solida*), rational geometry (*geometria rationalis*) and scenographic representation

[78] See ARSI, SMV, II, 29 for Bourdin, who joined the Jesuits on 17-11-1612; III, 910 for Fournier who joined the Jesuits on 01-10-1617 and II, 1044 for Milliet de Chales who joined the Jesuits on 21-09-1635. See also Romano, *Contre-réforme mathématique,* 563–564 and 575–576.

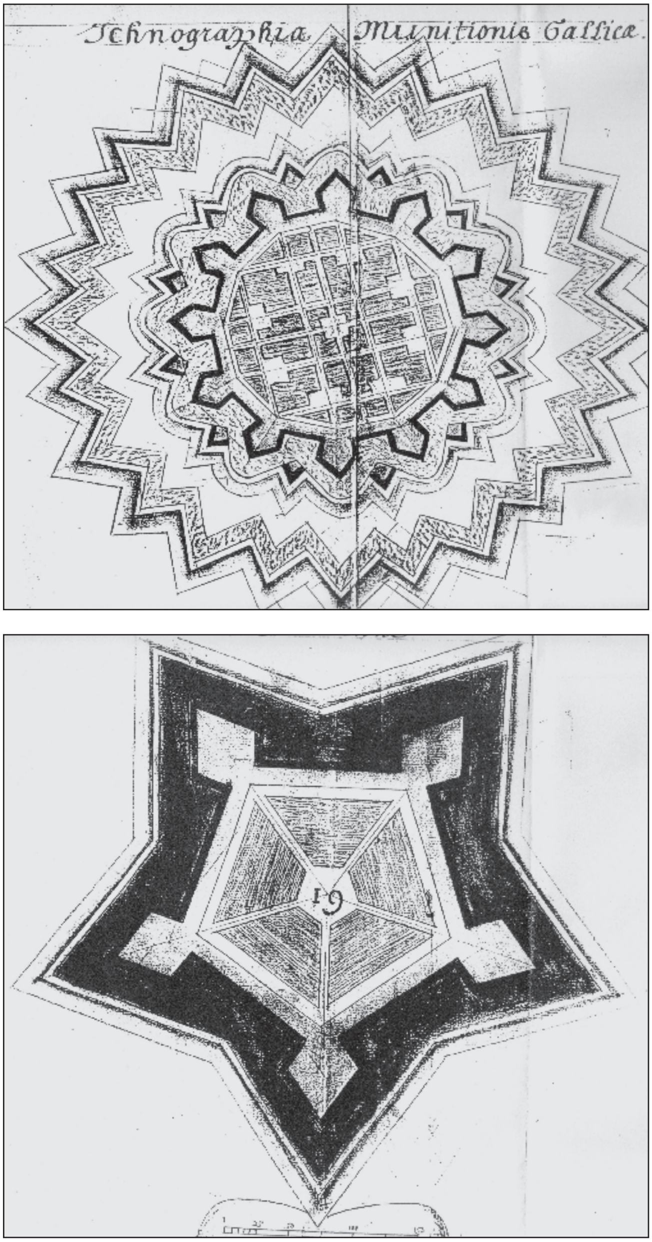
[79] ARSI, SMV, II, 30.

[80] BNF, Ms.Lat. 17861, 1–792.

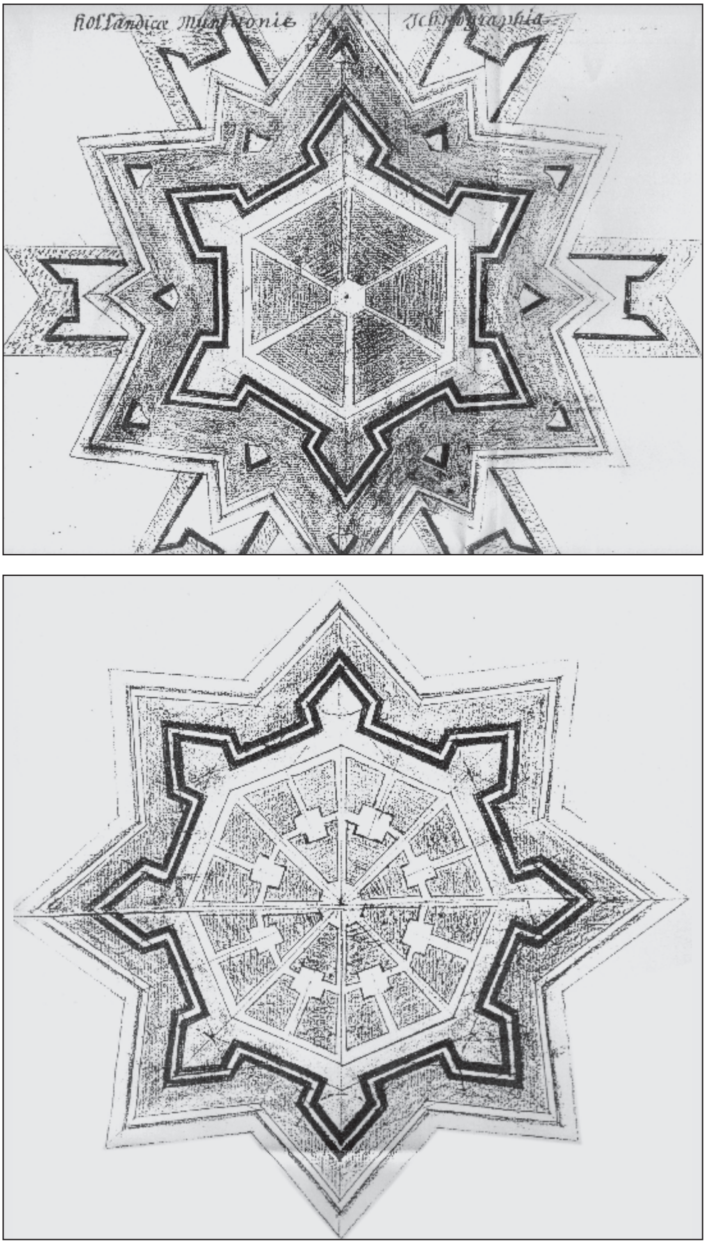
[81] BNF, Ms.Lat. 17862, 1–989.

(*scenographia*), showing relevant applications to regularly and irregularly shaped bastioned fronts on folios 169–170; a second subsection entitled *Fabricatio: Nota in Geometriam ad Fabricationem* (folios 218–233) dealing with helical forms (*helicem*), instrumentation (*instrumentum*), altimetry (*altimetria*), planimetry (*planimetria*) and stereotomy (*stereotomia*); a third subsection entitled *Arithmeticus Militaris Tractatus* (folios 234–261v) dealing with the use of arithmetic in military environments and a fourth subsection entitled *Tractatus de Munitionibus* (folios 262–417v) which is introduced by another list of contents on folios 262–263. This last treatise reveals the topics of military architecture that were sequentially taught by Pierre Bourdin. These are classified into a first part—the *Tractatus Primus*—covering an introduction to the art of fortification (*artus munitionium*), nomenclature aspects (*nomenclator militaris*), practical principles to be observed (*principia practica*) and maxims (*leges munitiones*); a second part—the *Tractatus Secundus*—covering regularly shaped fortification design and implementation (*praxis munitionum regularium*); a third part—the *Tractatus Tertius*—covering external works (*externa opera les dehors*) and a fourth part—the *Tractatus Quartus*—covering irregularly shaped fortifications (*praxis munitionum irregularium*), all concluded with an elaborate index on folios 418–428.

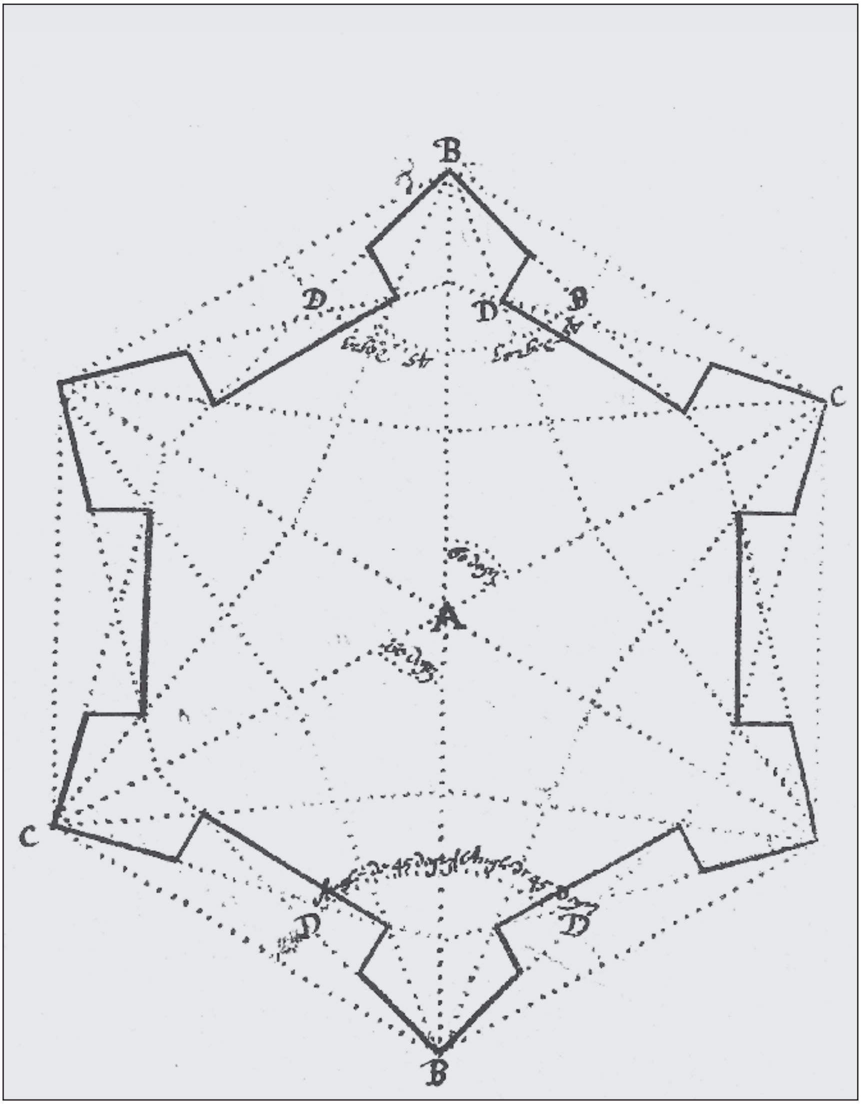
The two most interesting parts of Le Mercier's notes were the differences that were explained by Bourdin on folio 292 between the French, Dutch, Italian, 'composite' and 'recent' systems of fortification design that were then being used and the observations made by the Jesuit on folios 293–359 about the relationship between fortification systems and 'orthogonal' *versus* 'radial' town plans, the first described as applicable to the French and 'composite' systems, the second as applicable to the Dutch, Italian and 'mixed' systems. All this would have been copied by Le Mercier from the Jesuit's classroom demonstration charts that, in accordance with pedagogical approaches in the Baroque world, would have been previously prepared by the *mathematicus* for the purpose. A less colourful part of Le Mercier's notes concerns the explanations that he would have heard with regards to outworks, here lacking the sophistication of the work of Pagan and Vauban. The second volume of Bourdin's course was concluded by the inclusion of taught material covering a variety of topics such as astronomy, cosmography, hydraulics, gnomonics and optics, (folios 486–989v). One can speculate that all the topics mentioned in the Le Mercier manuscript, would have been explained to the students in a two-year course following the sequence that was given in Bourdin's later



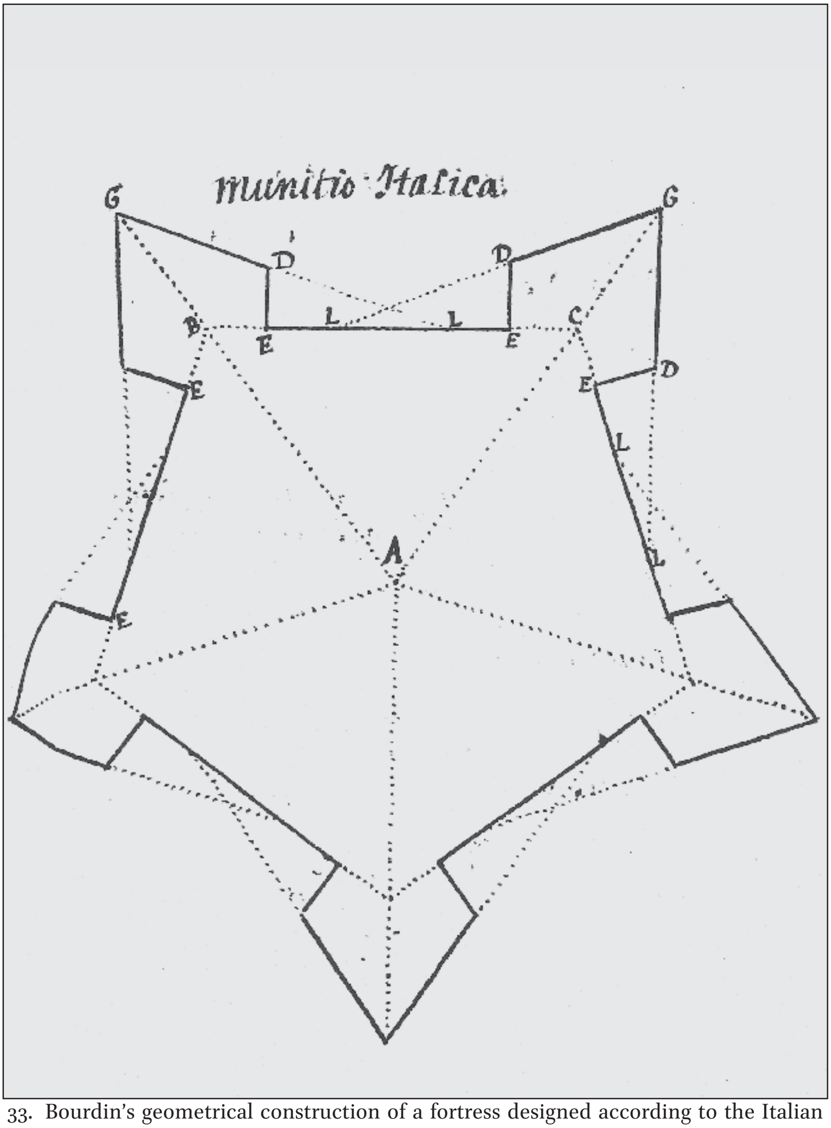
30. Bourdin's classroom explanations of the French (top) and Italian (bottom) systems of fortification design [BNF, Ms.Lat. 17862]. Reproduced with the kind permission of the *Bibliothèque nationale de France*.



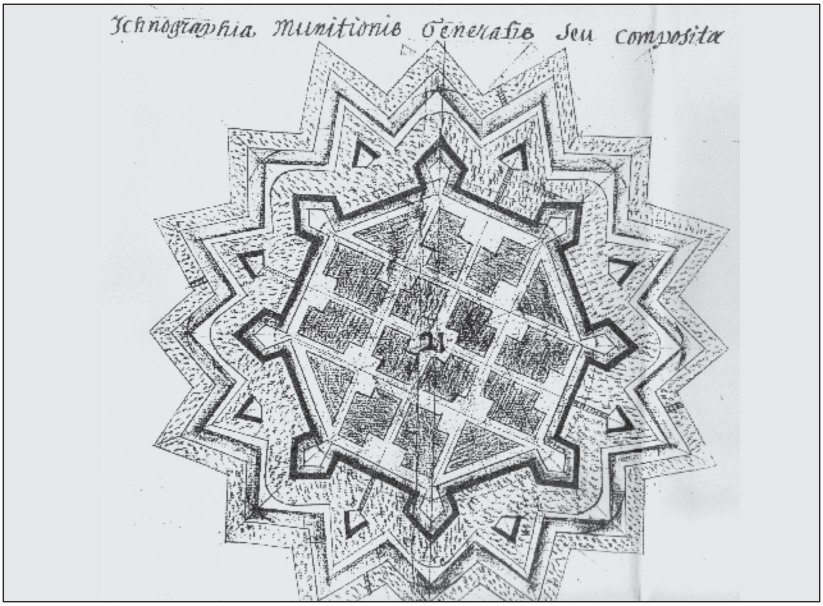
31. Bourdin's classroom explanation of the Dutch system of fortification design [BNF, Ms.Lat. 17862]. Reproduced with the kind permission of the *Bibliothèque nationale de France*.

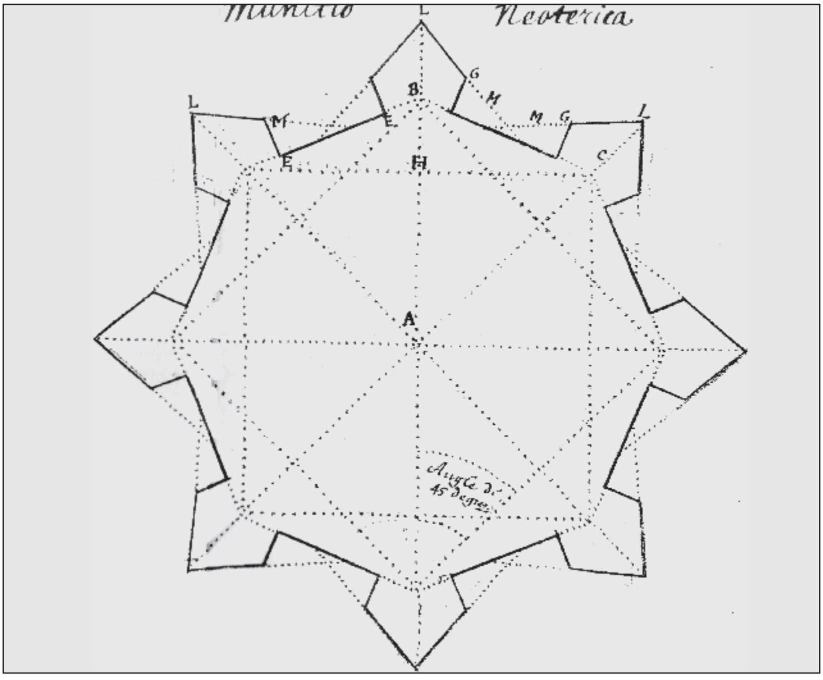


32. Bourdin's geometrical construction of a fortress designed according to the French system [BNF, Ms.Lat. 17862]. Reproduced with the kind permission of the *Bibliothèque nationale de France*.



33. Bourdin's geometrical construction of a fortress designed according to the Italian system [BNF, Ms.Lat. 17862]. Reproduced with the kind permission of the *Bibliothèque nationale de France*.





34. Bourdin's 'composite' (top) and 'recent' (bottom) fortification systems [BNF, Ms.Lat. 17862]. Reproduced with the kind permission of the *Bibliothèque nationale de France*.

textbook on mathematical teaching entitled *Le Cours de Mathématiques* (1642),[82] this being but one of five publications on the mathematical disciplines that Bourdin authored in 1640–1650.[83]

The classroom activity of Bourdin seems to have constituted the basis of another manuscript kept at the Jesuit archives in Vanves entitled *l'Art de Fortifier les places regulaires et irregulaires. Expliqué, Pratiqué, et Demontré d'une façon facile et agreable, à la noblesse Francois* (1653).[84] This manuscript seems to have been prepared just before the Jesuit's death on 27 December 1653 in Paris from where it was taken to the library of the Jesuit college of Tolouse. It has been suggested that Bourdin could have intended it as a first draft of one of his two posthumously-published books about military architecture entitled *L'architecture militaire, ou l'art de fortifier les places regulieres et irregulieres* (1655) and *Le dessein ou la Perspective militaire* (1655).[85] Another possible explanation is that this manuscript represented an authoritative abridged text on 'what to teach' and 'what not to teach' about military architecture, for universal application in the French Jesuit colleges, this view being supported by the similar approach to teaching the subject adopted by other French Jesuits: definitions, nomenclature, principles and maxims, regular fortifications, outworks and irregular fortifications. Bourdin's contribution to military architecture must also be seen in the context of the complete picture of Jesuit mathematical education in France, from its starting point as revealed in the notes of Jacques Valentin—a Jesuit professor of logic at the Paris college in 1567–1586 who was teaching a primitive form of mixed mathematics covering only geometry, arithmetic and astronomy (there is no mention at this stage of military architecture)[86]—to a second stage of development as revealed in the notes of the Jesuit *mathematicus* Jean François in 1621 where machines, hydraulics and gnomonics now entered

[82] ARSI, SMV, II, 30. According to Romano writing in Brizzi and Greci, *Universitá in Europa*, 411, this textbook proposed a sequential plan of study based on a course "made up of six main parts: arithmetic, geometry, music, ingeniousness or mechanics, optics and cosmography, each of which has its parts". He introduces 'mechanics' by observing that "the military sets up machines, erects bridges and moving towers, constructs ports and all that is necessary for war".

[83] ARSI, SMV, II, 29–30 mentions five mathematical works by Bourdin, one of them piling criticism of Descartes' work.

[84] JAV, Ms. H223.94.

[85] ARSI, SMV, II, 29–30 mentions that both books were published under royal privilege after permission was obtained on 9 February 1655 from the Jesuit Provincial Louis Cellot.

[86] O'Malley *et.al., The Jesuits II*, 355–370 (Chapter 16 on '*Teaching Mathematics in Jesuit schools: Programs, Course Content and Classroom Practices*' by Antonella Romano).

the scenario[87]—and, finally, to a third stage when Bourdin conscious of the growing demands of King of France, started focusing his classroom and written output on matters military, as is well reflected in the words of the publisher of his first 1655 work:

> This is the work of a fine mind, who, being capable of delving into the subtlest parts of mathematics, deemed that his time would be put to good use if he were to employ it to compose this work, since he clearly foresaw that, in penning in the space of a few pages all the greatest lessons contained in the large volumes of other authors, and in offering them using a very easy method, this work would be most useful to many a nobleman now desiring to join the army to serve the King and the glory of France. For this author's dearest wish was to serve, after God's interests, his Prince and his Country with all his might.[88]

Bourdin perhaps received the greatest credit for his contribution when a summary of it was recorded in the *Escuela de Palas*,[89] of which more below. His teachings concerning the building of a bastioned landfront were here compared with the similar views of the two Spanish military engineers Pedro Brolini and Manuel Alvarez who seem to have been both influenced by his ideas. According to his so-called 'reinforced method', Bourdin's bastions are covered by defensive cannon fire from two pairs of second flanks (instead of one pair as was normal practice) this being achieved by receding the central part of the interposed curtain wall so as to better protect the bastion faces (as Antonio da Sangallo had done in the Porta Ardeatina bastions, Rome[90] in 1542). All this was based on an elaborate geometrical construction of the type that was so much loved at the time by any Jesuit *mathematicus* that was worth his salt. In *Escuela de Palas*, Bourdin's approach to fortification teachings were also compared to those of Fournier and Milliet de Chales who respectively opted for 'ideal' geometrical solutions and dimensions based on the French and Dutch and on the French, Dutch, Italian and Spanish ways of fortifying a place, agreeing on their preference for the French system.

Fournier, professor of mathematics at La Flèche (1628–1634), Dieppe (1634–1636) and Hesdin (1639–1644) and prefect of studies at Caen (1644–1645) after which he was attached to the Jesuit college of Orleans (1649–1650), was a teacher, a writer and a man of action. In 1633 he was advising

87 *Ibid.*
88 *Ibid.*
89 BNE, *Escuela de Palas* (1693).
90 Pepper and Adams, *Firearms and Fortifications*, 25.

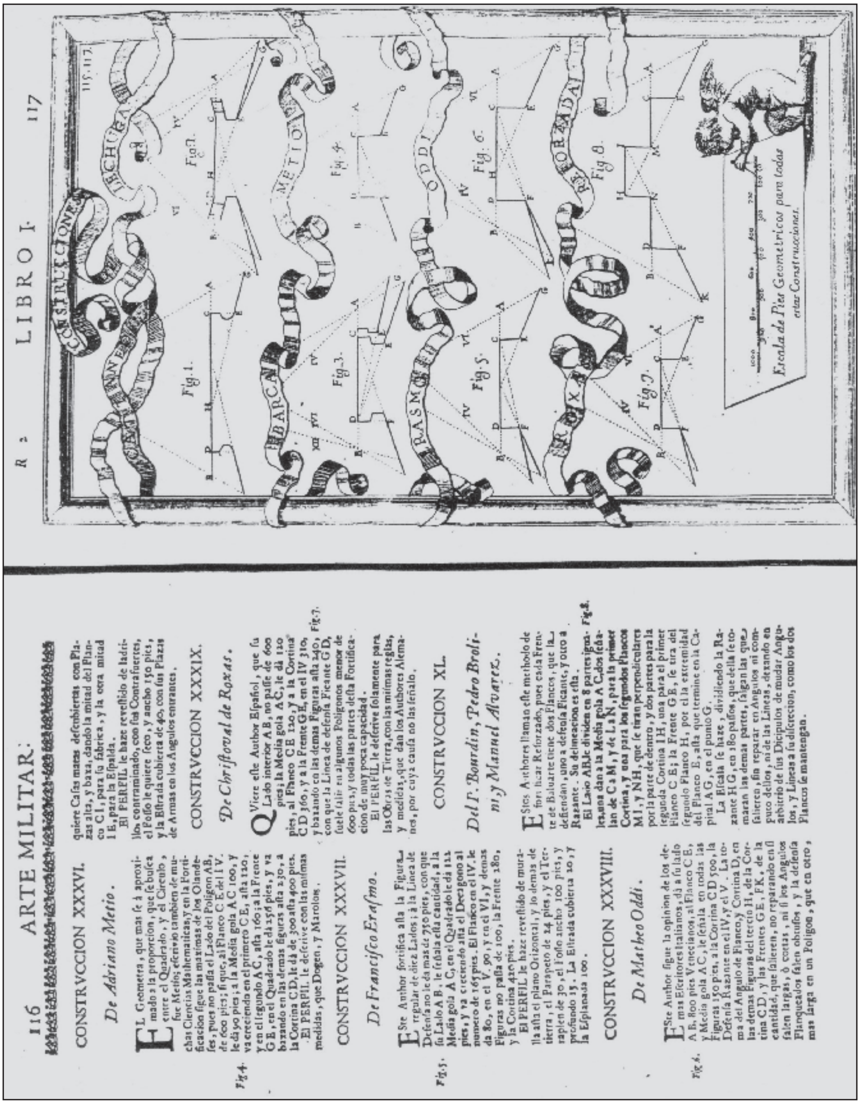
the military commander and archbishop of Bordeaux, Henri d'Escoubleau de Sourdis (1593–1645) with whom he participated in a disastrous sea battle with Spanish forces at Fuenterrabia in 1638. The Jesuit also served France in several Mediterranean patrols on board the French warships the *Corail* and *Saint-Louis* (1640–1641).[91] He afterwards recorded his great knowledge about sea and land warfare in two books that he started writing after the fall into disgrace of Sourdis. These were entitled *Hydographie* (1643) and *Traité des Fortifications* (1648).[92] He published nine other books—including a book of prayers for use on French warships entitled *Prières pour dire pendant la Messe*.[93]

Fournier's book on fortification, reproduced in '*duodecimo*' format to resemble a Jesuit missal, bridged the gap between the classroom teaching of the Jesuit *mathematicus* in France and the print culture for which French Jesuits had become famous. Dedicated to Monseigneur Francois de L'Aubespine, the Marquis of Hauterive and Ruffec (1584–1670) who was the governor of Breda and the commander of all French Catholic troops serving in the Spanish Netherlands, Fournier's work is divided into two sections. The first section concerned the building of the type of strong defences outlined in the drawings "*pour en faire de semblabes*" while the second presenting a veritable visual feast of plans, sections and drawings of places which were renowned for their strong defences. As expected from a Jesuit who would have been interested in the ethics of war, the first section of the work was introduced by a preface (folios 7–28) composed of ten chapters respectively entitled (1) 'That the exercise of arms in the most noble occupation of civil life' (2) 'The aims of the exercise of arms' (3) 'Who can declare war' (4) 'Who gave the sovereign this power and who removed it from other individuals' (5) 'Regarding duels' (6) 'About remedies to rectify disorders' (7) 'About things that are necessary so as to succeed and advance in the military profession' (8) 'At what age must one take up arms' (9) 'A summary of all military art' and (10) 'What branches of mathematics should one be conversant with to design fortifications'. In this last chapter, Fournier discussed the need of French nobles to have

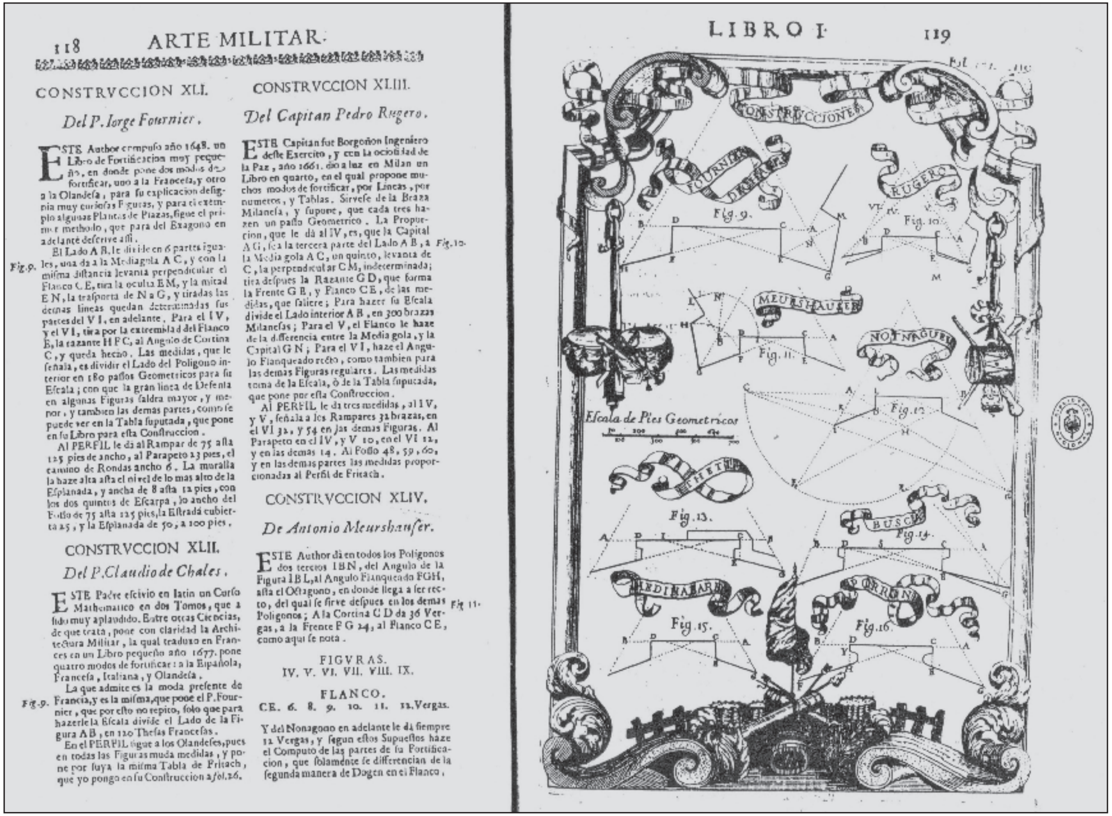
[91] Vergé-Franceschi, *Marine et education*, 8. See also Romano, *Contre-reforme mathématique*, 575–576 and Frasca, *Potere Marittimo*, 6, 12–13 and 119 where reference is made to the Jesuit *mathematicus* Paul Hoste (1652–1700) who taught naval construction and battle tactics at Toulon and authored two treatises on the subject entitled *'Recueil des traités mathematiques'* (1692) and *'Art des Armées navales'* (1693), also mentioned by Depeyre.

[92] ARSI, SMV, III, 910. The folio numbers given in the text are those of a 1667 French edition kept in NLM, *Libr*.AA.1.58.

[93] ARSI, SMV, II, 910. The book of prayers was first published in Dieppe in 1649 and re-published in Le Havre in 1723 when it was renamed '*Priéres et dévotions des gens de mer*'.



35. The *Escuela de Palas* entry recording Bourdin's valuable contribution to military architecture [BNE, R/15043]. Reproduced with the kind permission of the *Biblioteca Nacional de España.*



118 ARTE MILITAR.

CONSTRVCCION XLI.

Del P. Iorge Fournier.

ESTE Author compuſo año 1648. un Libro de Fortificacion muy pequeño, en donde pone dos modos de fortificar, uno a la Franceſa, y otro a la Olandeſa, para ſu explicacion deſignia muy curioſas Figuras, y para el exemplo algunas Plantas de Plazas, ſigue el primer methodo, que para del Exagono en adelante deſcrive aſſi.

Fig. 9. El Lado A B, le divide en 6 partes iguales, una da a la Mediagola A C, y con la miſma diſtancia levanta perpendicular el Flanco C E, tira la oculta E M, y la mitad E N, la traſporta de N a G, y tiradas las demas lineas quedan determinadas ſus partes del V I, en adelante. Para el I V, y el V I, tira por la extremidad del Flanco E, la razante H F C, al Angulo de Cortina C, y queda hecho. Las medidas, que le ſeñala, es dividir el Lado del Poligono interior en 180 paſſos Geometricos para ſu Eſcala; con que la gran linea de Defenſa en algunas Figuras ſaldra mayor, y menor, y tambien las demas partes, como ſe puede ver en la Tabla ſuputada, que pone en ſu Libro para eſta Conſtruccion.

Al PERFIL le da al Rampar de 75 aſta 125 pies de ancho, al Parapeto 23 pies, el camino de Rondas ancho 6. La muralla la haze alta aſta el nivel de lo mas alto de la Eſplanada, y ancha de 8 aſta 12 pies, con los dos quintos de Eſcarpa, lo ancho del Foſſo de 75 aſta 125 pies, la Eſtrada cubierta 25, y la Eſplanada de 50, a 100 pies.

CONSTRVCCION XLII.

Del P. Claudio de Chales.

ESTE Padre eſcrivio en latin un Curſo Mathematico en dos Tomos, que a ſido muy aplaudido. Entre otras Ciencias, de que trata, pone con claridad la Archi-tectura Militar, la qual traduxo en Frances en un Libro pequeño año 1677. pone quatro modos de fortificar: a la Eſpañola, Franceſa, Italiana, y Olandeſa.

Fig. 9. La que admite es la moda preſente de Francia, y es la miſma, que pone el P. Fournier, que por eſto no repito, ſolo que para hazerle la Eſcala divide el Lado de la Figura A B, en 120 Theſas Franceſas.

En el PERFIL ſigue a los Olandeſes, pues en todas las Figuras muda medidas, y pone por ſuya la miſma Tabla de Fritach, que yo pongo en ſu Conſtruccion a fol. 26.

CONSTRVCCION XLIII.

Del Capitan Pedro Rugero.

ESTE Capitan fue Borgoñon Ingeniero deſte Exercito, y con la ocioſidad de la Paz, año 1661. dio a luz en Milan un Libro en quarto, en el qual propone muchos modos de fortificar, por Lineas, por numeros, y Tablas. Sirveſe de la Braza Milaneſa, y ſupone, que cada tres hazen un paſſo Geometrico. La Propuercion, que le da al IV, es, que la Capital A G, ſea la tercera parte del Lado A B, a la Media gola A C, un quinto, levanta de C, la perpendicular C M, indeterminada; tira deſpues la Razante G D, que forma la Frente G B, y Flanco C E, de las medidas, que ſaliere; Para hazer ſu Eſcala divide el Lado interior A B, en 300 brazas Milaneſas; Para el V, el Flanco le haze de la differencia entre la Media gola, y la Capital G N; Para el V I, haze el Angulo Flanqueado recto, como tambien para las demas Figuras regulares. Las medidas toma de la Eſcala, ò de la Tabla ſupucada, que pone por eſta Conſtruccion. Fig. 10.

Al PERFIL le da tres medidas, al I V, y V, ſeñala a los Rampares 32 brazas, en el VI 32, y 54 en las demas Figuras. Al Parapeto en el IV, y V 10, en el VI 12, y en las demas 14. Al Foſſo 48, 59, 60, y en las demas partes las medidas proporcionadas al Perfil de Fritach.

CONSTRVCCION XLIV.

De Antonio Meurshauſer.

ESTE Author da en todos los Poligonos dos tercios I B N, del Angulo de la Figura I B L, al Angulo Flanqueado F G H, aſta el Octagono, en donde llega a ſer recto, del qual ſe ſirve deſpues en los demas Poligonos; A la Cortina C D da 36 Vergas, a la Frente F G 24, al Flanco C E, como aqui ſe nota. Fig. 11.

FIGVRAS.
IV. V. VI. VII. VIII. IX.

FLANCO.
CE. 6. 8. 9. 10. 11. 12. Vergas.

Y del Nonagono en adelante le da ſiempre 12 Vergas, y ſegun eſtos Supueſtos haze el Computo de las partes de ſu Fortificacion, que ſolamente ſe differencian de la ſegunda manera de Dogen en el Flanco.

36. The *Escuela de Palas* entry recording Fournier's and Milliet de Chales' contribution to military architecture [BNE, R/15043]. Reproduced with the kind permission of the *Biblioteca Nacional de España.*

a thorough knowledge of the four main subjects that he taught, namely arithmetic (necessary for logistics, for counting troops, for distributing lodging in a military camp, for organising lines of battle, for calculating the time needed for various tasks); geometry (necessary to measure the heights of fortifications, the sizes of breaches and ditches, the angles of bastions, the drawing of plans and their translation into practice); mechanics (necessary to design war machines and bridges) and, finally, cosmography and geography (necessary to establish directions and to have a knowledge of the terrain as applicable to the movement and lodging of troops).

Fournier's preface was followed by the contents of his first treatise entitled *Traité des Fortifications—Livre Premiere* (folios 29–121) where his lecture notes on the theory of military architecture are organised in twenty-six chapters concerned with (1) Nomenclature (2) General design principles (3) Maxims (4) Why should there not be any place on the front of a fortification that is not flanked (5) Why should a main line of defence not be longer than 200 geometric paces (6) Why should a demi-gorge (of a bastion) be of 21 paces (7) Why one should devote 21 paces to each (bastion) flank (8) About the salient parts of bastions (9) About maxims 5, 6 and 7 (10) Differences between the fortifications of France, Italy and Holland (11) five things to consider when designing any fortification (12) On siting (13) Advantages and disadvantages concerning the position of a fortress (14) How must one treat flanks and curtain walls (15) How can one establish the principal trace of a fortification (16) Manual to draw up the plan of a fortified place (17) The merits of this practice (18) The use of the given tables (19) How to draw up the plan of the interior parts of a fortified place (20) How to draw up the plan of outworks beyond the main line of fortifications (21) How to draw up a geometric plan (22) Means of establishing what has been missed when drawing up a plan of a fortified place (23) How to translate a planimetric drawing (of a fortification) on site (24) About irregularly shaped fortifications (25) About fortified places build in the form of a triangle and (26) About countryside forts. The most interesting chapter in Fournier's first treatise is the tenth where he explains the differences between the French, Dutch and Italians systems of fortification, praising the French way of doing things because in France, he says "God blesses the armies of our King."[94] The Jesuit's second treatise

[94] NLM, *Libr.*AA.1.58. According to Fournier, the French had since the times of Francis I always followed a rule that all angles should either be right angles or obtuse, that flanking fire had great value and that the main line of defence should never exceed 120 *toises*. The Dutch favoured acute angles of 60° or more for the meeting point of the bastion faces,

entitled *Traité des Fortifications—Livre second* (folios 122–186) concerns technicalities of fortification elements treated in another impressive array of seventeen chapters dealing with curtain walls, foundations, ramparts, cavaliers, fausse-brayes, orillions and flanks of bastions, the planning of streets, sortie points, storage and gunpowder magazines, barracks, guard posts, gateways, ditches and counterscarps and, lastly, covered way and glacis features.

The second section of Fournier's book concerns a visual representation of various fortifications in the Baroque world, introduced by an explanatory list of contents based on eight parts concerning (1) Fortifications situated in naturally impregnable sites (2) Fortified places which had become famous because of their regularly shaped fortifications (3) Fortified places which were greatly respected despite their irregularly shaped fortifications (4) Tables to be used for building fortifications, mentioning the French and Dutch methods and the contribution of the military engineer, the Conte de Pagan (5) Plans and elevations of major and minor fortified positions (6) Outwork drawings (7) The building of fortifications using planimetric and perspective drawings and (8) the design of entrance gateways and avenues of a fortified place. All these themes were treated in a way that would have been easily understood by the members of the French nobility who would have followed the Jesuit's classroom teachings.

Fournier's manual on fortification mathematics can be compared to the *Tractatus XIII Architectura Militaris* of Milliet de Chales' *Cursus seu Mundus Mathematicus*. This formidable work was first published in Lyons in 1674.[95] It was dedicated to Duke Carlo Emmanuele II of Savoy (1638–1675), whose son Duke Vittorio Amedeo (1675–1730) appointed its Jesuit author to occupy the chair of mathematics in Turin (1676), just two years before his death in that city on 28 March 1678. Milliet de Chales, who had been teaching military architecture in Avignon (1655–1656), Lyon (1657–1660), Chambéry (1661–1668), Marseilles (1669–1670), Lyons (11671–1673)

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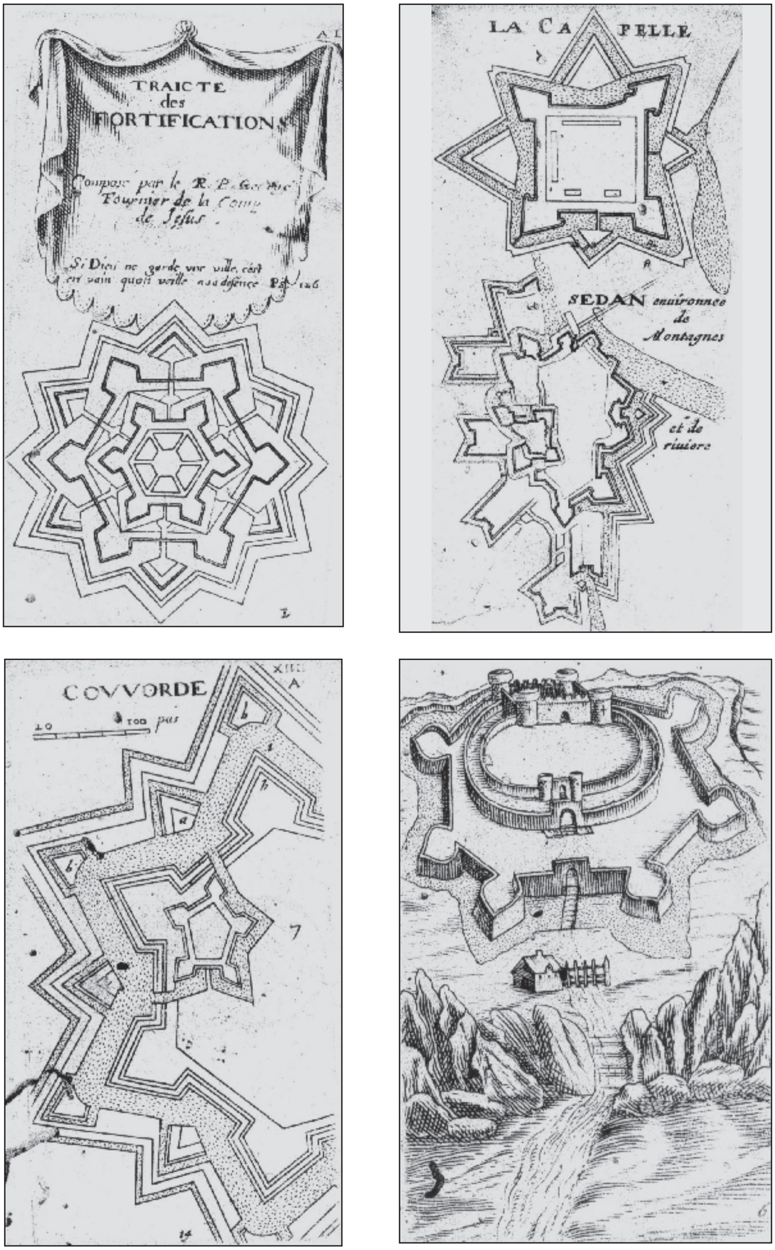
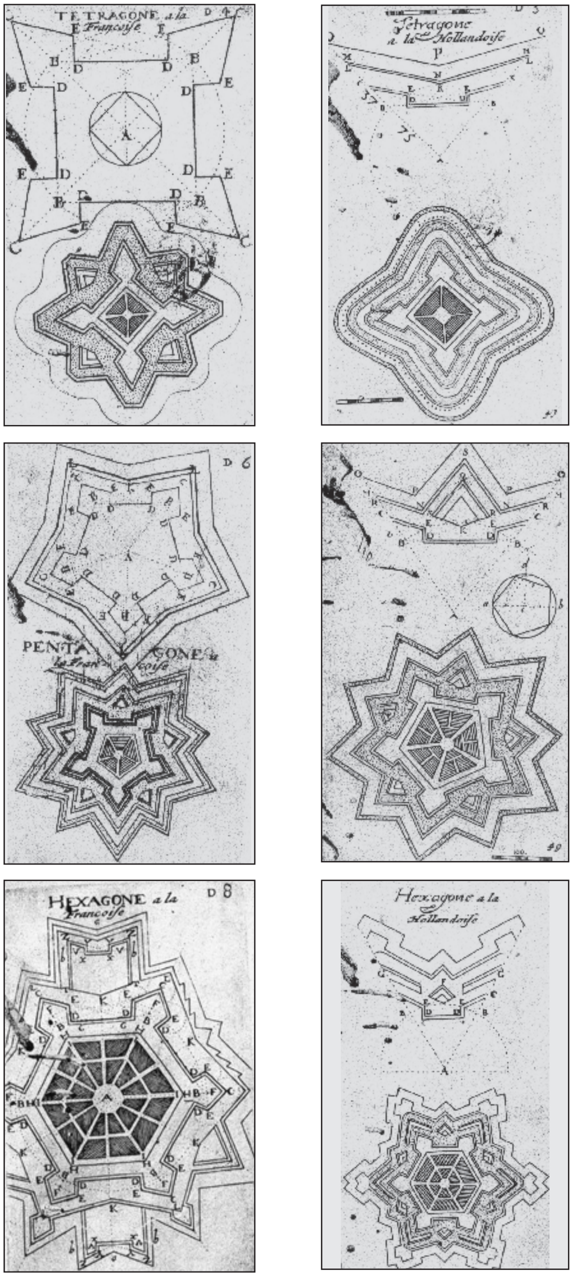
specifying that the dimensions of curtain walls and bastion faces would not exceed 72 and 48 *toises* respectively while the Italians accepted all angles above 60º. Fournier specifies a maximum dimension of 200 paces for the main line of defence, based, he observes, "on recent siege experiences when the lives of several soldiers had been needlessly sacrified".

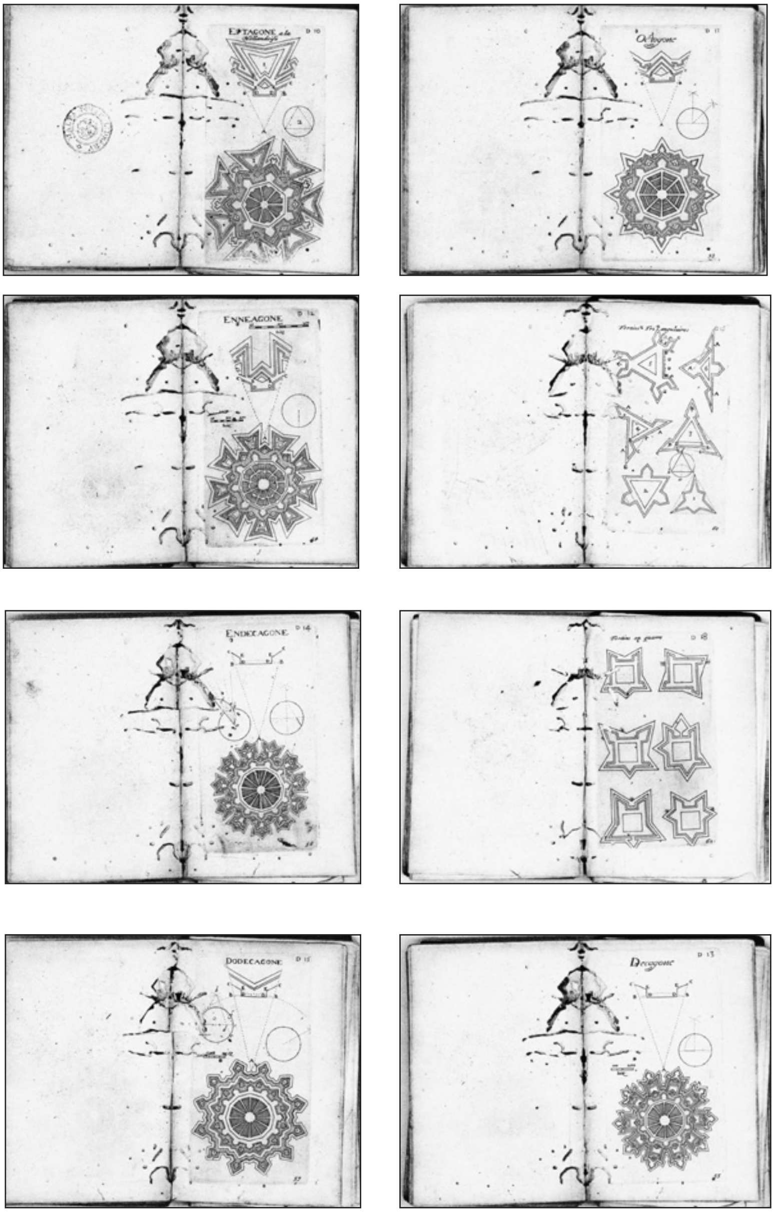
95 According to the 22-10-2002 Blumenthal lecture at Cornell University delivered by Stephane Van Damme entitled '*Education, Sociability and written culture: the case of the Society of Jesus in France*', the Jesuit college in Lyons had been described by the Jesuit C.F. Menestrier as "a community of pious men of letters".



37. Extracts from 1667 edition of Fournier's *Traite des Fortifications* giving examples of fortified places that were renowned for their [1] naturally defensive position, [2] their regular design and [3] their irregular design [NLM, *Libr*.AA.1.58]. Reproduced with the kind permission of the National Library of Malta.



38. Extracts from the 1667 edition of Fournier's *Traite des Fortifications* showing different forms of fortresses designed according to tabled dimensions [NLM, *Libr*.AA.1.58]. Reproduced with the kind permission of the National Library of Malta.



39. Extracts from the 1667 edition of Fournier's *Traite des Fortifications* showing more complex forms of fortresses designed according to tabled dimensions [NLM, *Libr.*AA.1.58]. Reproduced with the kind permission of the National Library of Malta.

40. Extracts from the 1667 edition of Fournier's *Traite des Fortifications* showing planimetric and perspective depictions of fortifications and a typical entrance gateway [NLM, *Libr*.AA.1.58]. Reproduced with the kind permission of the National Library of Malta.

and Paris (1673–1675),[96] supplemented his teaching activity by two books entitled *L'art de fortifier* and *L'art de naviger*, both published in Paris in 1677.[97] While teaching in packed classrooms in Marseilles this Jesuit *mathematicus* had been honoured by King Louis XIV who had appointed him Professor Royal of Hydrography in an attempt to revamp the French Mediterranean fleet of war galleys. The presence of Milliet de Chales in no less than five Jesuit colleges having chairs of mathematics may be indicative of the need that was felt for fortification courses in the age of Vauban who, however, was not mentioned in the Jesuit's *Cursus* unlike Pagan, whose achievements were repeatedly cited. It is probable that Vauban was not liked by the Jesuits because of his criticism about their 'theoretical' teaching and his unorthodox views on the treatment of Protestants in France.[98] It is also probable that the Jesuits were suspicious of Vauban's corps of military engineers which was, before Louis XIV's revocation of the Edict of Nantes in 1685, heavily infiltrated by Protestants. This would have led Chales to adopt a conservative view of military matters, airbrushing Vauban out of the picture.

The course of military architecture explained in chapter 13 of the second volume of the mathematical work of Milliet de Chales is expounded and developed in 7 sections, the first with 31 subsections (folios 79–90) dealing with the universal principles of military architecture (*Principia universalia Architecturae Militaris*); the second with 42 subsections (folios 92–123) dealing with regularly shaped fortifications (*De munitioribus regularibus*); the third with 19 subsections (folios 125–133) with external works (*De operibus externis, seu praetenturis*); the fourth with 19 subsections (folios 135–143) dealing with irregularly shaped fortifications (*De munitionibus irregularibus*); the fifth with 13 subsections (folios 144–152) dealing with siege works (*Urbium oppugnatio*); the sixth with 7 subsections (folios 153–157) dealing with defensive measures (*Defensio*) and the seventh with 6 subsections (folios 157–159) dealing with military perspec-

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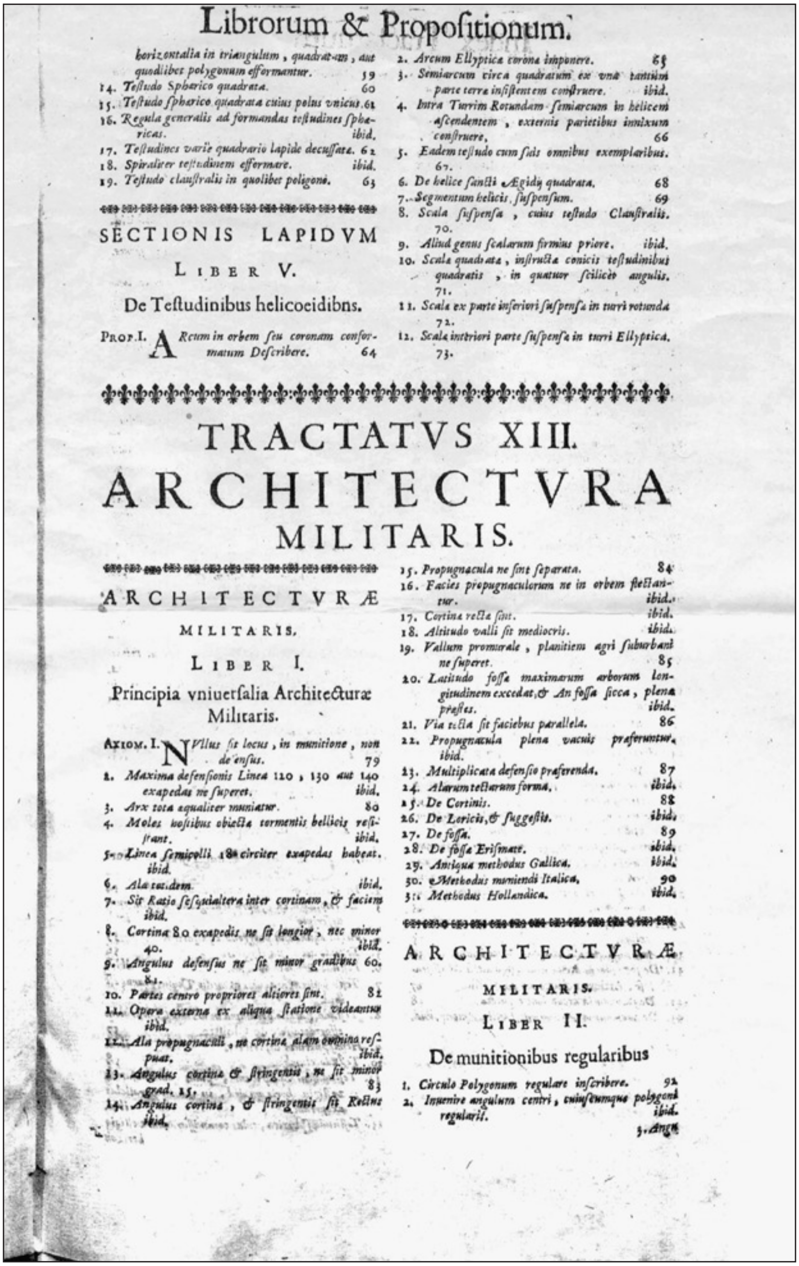
[96] AHSI 103, a.LII (1983) 69. See also ARSI, SMV, II, 1044 and MacDonnell, *Jesuit Geometers*, chapters 1–3.

[97] O'Connor and Robertson, *Dechales*, consulted online.

[98] Virol, *Vauban*, 55 states that Vauban rejected the theoretical approach to the dissemination of fortification knowledge which, he alleged, were adopted by Chales, Breuil and other Jesuit mathematicians, on the grounds of his good sense and experience. Citing Dainville, *L'enseignement des mathématiques dans les collèges jésuites de France*, t.vii, 6–21, professor Virol further states that Vauban had once said: "it is not at all necessary to depend on theoretical rules with regards to fortification, especially so if they contradict experience and terrain conditions."



Librorum & Propositionum.

horizontalia in triangulum, quadratum, aut quodlibet polygonum efformantur. 59
14. Testudo Spharico quadrata. 60
15. Testudo spharico quadrata cuius polus unicus. 61
16. Regula generalis ad formandas testudines sphaericas. ibid.
17. Testudines varie quadrario lapide decussata. 62
18. Spiraliter testudinem efformare. ibid.
19. Testudo claustralis in quolibet poligono. 63

SECTIONIS LAPIDVM

LIBER V.

De Testudinibus helicoeidibus.

PROP. I. ARcum in orbem seu coronam conformatum Describere. 64
2. Arcum Ellyptica corona imponere. 65
3. Semiarcum circa quadratum ex una tantum parte terra insistentem construere. ibid.
4. Intra Turrim Rotundam semiarcum in helicem ascendentem, externis parietibus innixum construere, 66
5. Eadem testudo cum suis omnibus exemplaribus. 67.
6. De helice sancti Ægidij quadrata. 68
7. Segmentum helicis suspensum. 69
8. Scala suspensa, cuius testudo Claustralis. 70.
9. Aliud genus scalarum firmius priore. ibid.
10. Scala quadrata, instructa conicis testudinibus quadratis, in quatuor scilicet angulis. 71.
11. Scala ex parte inferiori suspensa in turri rotunda 72.
12. Scala interiori parte suspensa in turri Ellyptica. 73.

TRACTATVS XIII.

ARCHITECTVRA MILITARIS.

ARCHITECTVRÆ MILITARIS.

LIBER I.

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AXIOM. I. NVllus sit locus, in munitione, non defensus. 79
2. Maxima defensionis Linea 120, 130 aut 140 exapedas ne superet. ibid.
3. Arx tota aqualiter muniatur. 80
4. Moles hostibus obiecta tormentis bellicis resistant. ibid.
5. Linea semigolli 18 circiter exapedas habeat. ibid.
6. Ala tandem. ibid.
7. Sit Ratio sesquialtera inter cortinam, & faciem ibid.
8. Cortina 80 exapedis ne sit longior, nec minor 40. ibid.
9. Angulus defensus ne sit minor gradibus 60. 81.
10. Partes centro propriores altiores sint. 82
11. Opera externa ex aliqua statione videantur ibid.
12. Ala propugnaculi, ne cortina alam omnino respuat. ibid.
13. Angulus cortina & stringentis, ne sit minor grad. 15. 83
14. Angulus cortina, & stringentis sit Rectus ibid.
15. Propugnacula ne sint separata. 84
16. Facies propugnaculorum ne in orbem flectantur. ibid.
17. Cortina recta sint. ibid.
18. Altitudo valli sit mediocris. ibid.
19. Vallum promurale, planitiem agri suburbani ne superet. 85
20. Latitudo fossa maximarum arborum longitudinem excedat, & An fossa sicca, plena prestet. ibid.
21. Via tecta sit faciebus parallela. 86
22. Propugnacula plena vacuis praferuntur. ibid.
23. Multiplicata defensio praferenda. 87
24. Alarum tectarum forma. ibid.
25. De Cortinis. 88
26. De Loricis, & suggestis. ibid.
27. De fossa. 89
28. De fossa Erismate. ibid.
29. Antiqua methodus Gallica. ibid.
30. Methodus muniendi Italica. 90
31. Methodus Hollandica. ibid.

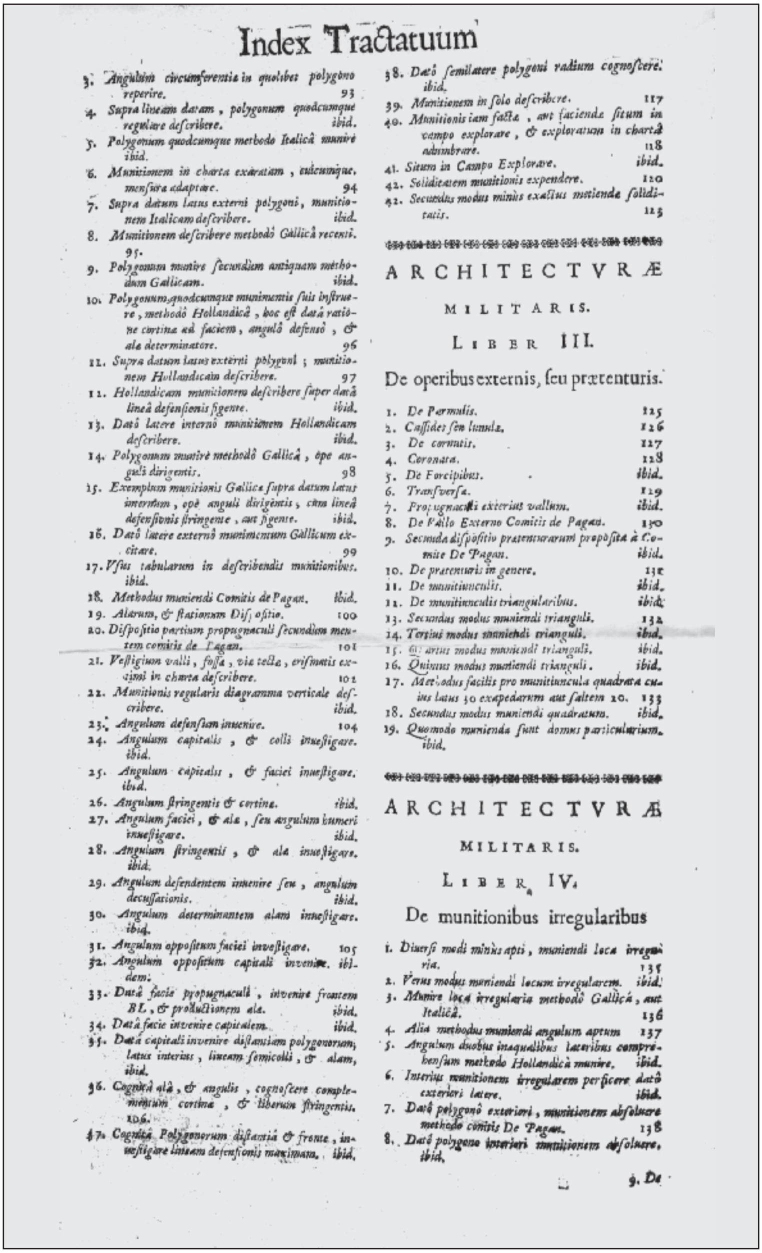
ARCHITECTVRÆ MILITARIS.

LIBER II.

De munitionibus regularibus

1. Circulo Polygonum regulare inscribere. 92
2. Inuenire angulum centri, cuiuscumque polygoni regularis. ibid.
3. Angu

41. *Liber I and II* contents page of the military architecture section of Milliet de Chales' *Cursus seu Mundus Mathematicus* [BL, C.64.i.8]. Reproduced with the kind permission of the British Library Board.



Index Tractatuum

3. Angulum circumferentiæ in quolibet polygono reperire. 93
4. Supra lineam datam, polygonum quodcumque regulare deſcribere. ibid.
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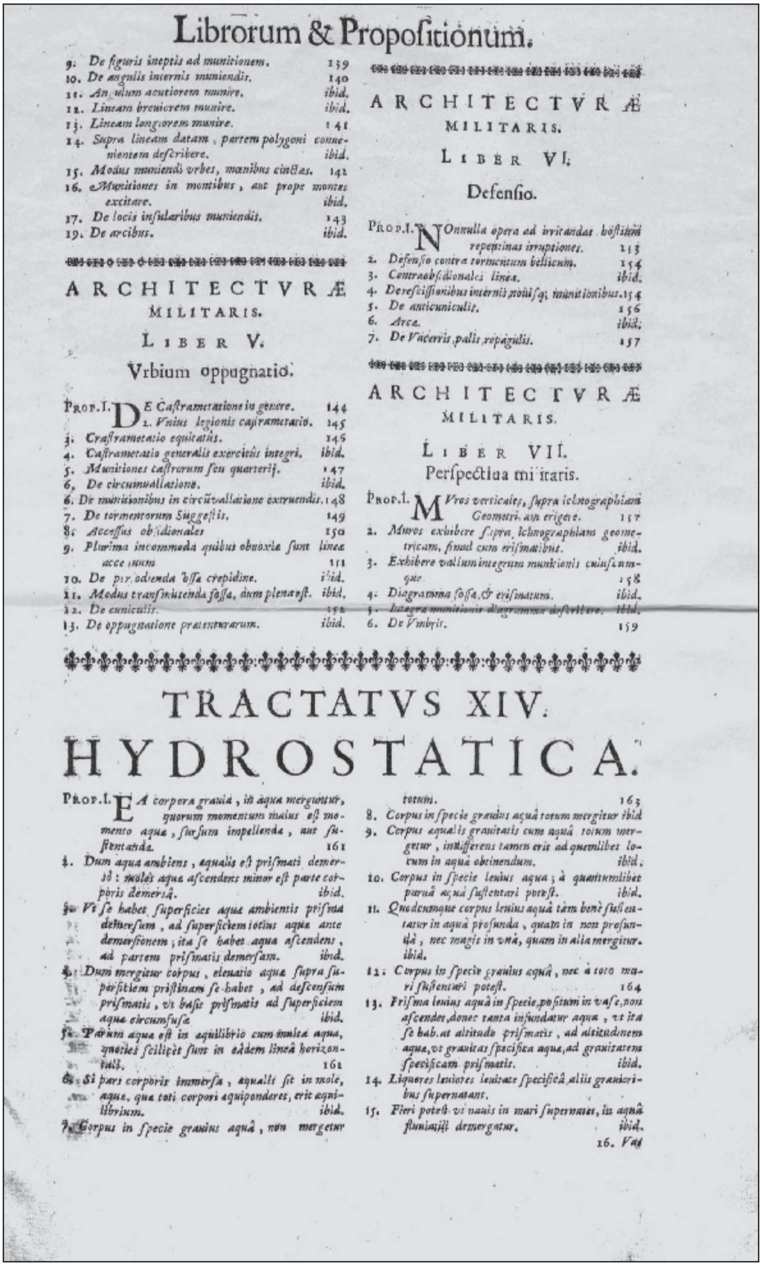
9. De

42. *Liber III* and *IV* contents page of the military architecture section of the *Cursus seu Mundus Mathematicus* [BL, C.64.i.8]. Reproduced with the kind permission of the British Library Board.



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2. Dum aqua ambiens, æqualis est prismati demerso: moles aquæ ascendens minor est parte corporis demersâ. ibid.
3. Vt se habet superficies aquæ ambientis prisma demersum, ad superficiem totius aquæ ante demersionem; ita se habet aqua ascendens, ad partem prismatis demersam. ibid.
4. Dum mergitur corpus, eleuatio aquæ supra superficiem pristinam se habet, ad descensum prismatis, vt basis prismatis ad superficiem aquæ circumfusæ ibid.
5. Parum aquæ est in æquilibrio cum multa aqua, quoties scilicet sunt in eadem lineâ horizontali. 162
6. Si pars corporis immersa, æqualis sit in mole, aquæ, quæ toti corpori æquiponderet, erit æquilibrium. ibid.
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8. Corpus in specie grauius aquâ totum mergitur ibid
9. Corpus æqualis grauitatis cum aquâ totum mergetur, indifferens tamen erit ad quemlibet locum in aquâ obtinendum. ibid.
10. Corpus in specie leuius aqua; à quantumlibet paruâ aquâ sustentari potest. ibid.
11. Quodcumque corpus leuius aquâ tàm benè sustentatur in aquâ profunda, quam in non profundâ, nec magis in vnâ, quam in alia mergitur. ibid.
12. Corpus in specie grauius aquâ, nec à toto mari sustentari potest. 164
13. Prisma leuius aquâ in specie, positum in vase, non ascendet, donec tanta infundatur aqua, vt ita se habeat altitudo prismatis, ad altitudinem aquæ, vt grauitas specifica aquæ, ad grauitatem specificam prismatis. ibid.
14. Liquores leuiores leuitate specificâ aliis grauioribus supernatant.
15. Fieri potest vt nauis in mari supernatet, in aquâ fluuiatili demergatur. ibid.

16. Vas

43. *Liber V, VI* and *VII* contents page of the military architecture section of the *Cursus seu Mundus Mathematicus* [BL, C.64.i.8]. Reproduced with the kind permission of the British Library Board.

tive (*Perspectiva militaris*). Each section contained an orderly and detailed illustrated explanation of Milliet de Chales' thinking, again emphasising in the second section the differences between the French, Dutch and Italian (but not the Spanish) methods of fortification and the valuable contribution towards a truly 'Gallican' military architecture, of Blaise François, the Comte de Pagan whose name repeatedly appears in sections 2, 3 and 4 under the headings "*Methodus muniendi Comitis de Pagan*", "*De Vallo Externo Comitis de Pagan*" and "*Dato Polygono exteriori, munitionem absolvere methodo comitis de Pagan*". The Jesuit, it would seem, was an admirer of Pagan!

While Bourdin, Fournier and Milliet de Chales clearly emerge as the 'gurus' of classroom teaching about military architecture in Baroque France, their influential efforts must be seen in the proper perspective of the activity of other Jesuit mathematicians, all authors of books on the subject, who were teaching in the different Jesuit colleges having chairs of mathematics throughout the country. In this respect fourteen personalities have been identified during the preparatory stages of this work, these being Jean François (1582–1668), Jean Berthet (1622–1692), Jean Baptiste de St. Just (1638–1710), Ignace Gaston Pardies (1636–1673), Pierre Ango (1640–1694), Joseph Michel Aubert (1676–1749), Yves Andrè (1675–1764), Bernard Durand (1645–1701), Jean Claude Ignace Morand (1707–1780), Louis Antoine Lozeran Du Fesc (1691–1755), Barthelemy Labarthe (1602–1682), Jacques Antoine Fevre (1688–1767) and finally the remarkable Jean du Breuil (1602–1670) and Francois Derand (1588–1644)—two Jesuits who were associated with the Paris college where they taught and wrote about both civil and military architecture and their graphic representation.[99] A summary of Breuil's contribution appears in the *Escuela de Palas* book under the name of his pseudonym (Silvére de) Bitainvieu. To this long list of illustrious names, one must surely add those of the *mathematicus* Jacques de Billy (1602–1679), who judging by his history book about the siege of Landrecy,[100] supplemented his classroom duties at Pont-a-Mousson, Rheins and Dijon with active service during the siege as

[99] AHSI 103, a.LII (1983) 57–78. See also Romano, *Contre-reforme mathématique*, 560–590; ARSI, SMV, *Index Analytique* III, 838–841 and MacDonnell, *Jesuit Geometers*, chapters 1–3. For Breuil (pseudonymn 'Silvere de Bitanvieu') see ARSI, SMV, I, 144–147 where Sommervogel mentions his books on perspective (1642) and fortifications (1665). For Derand, see ARSI, SMV, II, 1938.

[100] ARSI, SMV, I, 1477. Billy's *Le siege de Landrecy* (Paris, 1637) was dedicated to Louis XIII of France, who was personally directing military operations there in 1637. Another account was written by the military engineer Antoine de Ville (1596–1657).

44. The *Escuela de Palas* entry recording Breuil's contribution to military architecture [BNE, R 15043]. Reproduced with the kind permission of the *Biblioteca Nacional de España*.

military adviser to the French commander, the Vicomte de Turenne. There was then Claude Richard (1588–1664), who followed up his classroom explanations at Tournon and Lyon (where the Jesuit college de la Trinitè was soon afterwards in 1669 defined by one Jesuit as "a community of pious men of letters" with a track record of 527 books by eighty-two authors in 1769)[101] with a long service at the Jesuit *Colegio Imperial* in Madrid where he died in 1667.[102] Juan Carlos de la Faille (1597–1652) followed up his teaching activity at Dole by active service at Louvain and Liege in the Spanish Netherlands. He afterwards also served the Jesuit Order at the *Colegio Imperial* in Madrid, passing away in Barcelona in 1654.[103]

France in the second half of the seventeenth century soon emerged as the prime European military power, surpassing Italy and Holland in its development of fortifications and siege works. The prevailing air of triumph is reflected in the many academic theses about military architecture that were presented in festive scenarios at several Jesuit colleges in France. The college of Aix in 1668 produced one such work that was successfully defended by its author, the nobleman Poncet de Paroy, entitled *Des fortifications*.[104] The Paris college in the same year produced a thesis entitled *De architectura militari positionis mathematicae* (1668) as well as another entitled *De architectura militari* (1689). On the 28th May 1756 at 3 o'clock in the afternoon, the nobleman Francois-Yves Thybault de la Rivierre de Bretagne successfully defended his thesis entitled *Theses de mathématique, sur les fortifications et l'attaque des places*[105] before a panel of Jesuit professors. It is recorded that the Jesuit college of Perpignan in 1726 hosted four brilliant orations about French military history and fortification design, the first delivered on 23 July at three o'clock in the afternoon by Gerard Domo and Francois Aurés, the second delivered on 24 July at three o'clock in the afternoon by Jean d'Ortaffa and Joseph de Reart, the third delivered on 25 July at three o'clock in the afternoon by Jacques Devenise Déchaux and the fourth delivered on 9 August, also at three o'clock in the afternoon by Pierre Amat. These orations were respectively dedicated to H.R.H Monseigneur Louis Auguste de Bourbon, the Duke of Maine; H.E. Monseigneur Adrien Maurice, the Duke of Noailles;

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[101] See n. 95.
[102] Romano, *Contre-reforme mathématique*, 599.
[103] *Ibid*, 571.
[104] ARSI, SMV, VII, 1581.
[105] ARSI, SMV, VI, 228 and 274. See also IX, 754.

H.E. Monseigneur le Marquis de Fimarcon, governor of Mont-Louis and H.E. Monseigneur François le Gras, the Marquis of Luart and military commander of Roussillon.[106]

The Kingdom of Portugal

The appointment of one of the first companions of Ignatius, the Portuguese Simao Rodriquez, to serve as the private tutor of the favourite son of King Joao III 'the Pious' (1502–1577) of Portugal in 1541, marked the beginning of an absolute Jesuit dominance on education in that country. This monopoly reached a salient point towards the end of the sixteenth century when the leading Jesuit colleges at Coimbra, Lisbon and Évora, respectively training some 2000, 1800 and 1600 students,[107] assumed responsibility for teaching all those aspects of mathematical knowledge that were then considered necessary to enhance the effectiveness of those navigational skills for which Portugal was renowned—skills which were primarily intended to improve communications between the Jesuits in Portugal and their overseas missionary stations. The utilitarian Jesuit educational policy in Portugal seems to have been maintained during the Spanish domination of 1590–1640 despite problems that were created when General Aquaviva's refused to let any Jesuits join the Spanish armada that in 1590 made its way up the Tagus to occupy Lisbon, since "Jesuits would only accompany Catholic armadas directed against infidels and heretics, certainly not against fellow Catholics."[108] As a result the Kings of Spain Philip II (1556–1598), Philip III (1598–1621) and Philip IV (1621–1665) had made it a point not to allow any Portuguese Jesuits to take part in all regency and advisory councils that were appointed to govern Portugal and many were those Jesuits who were exiled for exhorting rebellion by "appealing to Portuguese nationalistic sentiments". This became explicit on 6 December 1640 when King João IV of Bragança, the '*Restaurador*' (1640–1656) triumphantly entered Lisbon amidst the enthusiastic welcome of all the students of the Jesuit college of Santo Antão-o-Novo who were even 'offered' by their Jesuit professors to the king as the new defend-

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106 ARSI, SMV, VI, 546–547.

107 Feingold, *Jesuit Science*, 233 (article on '*Jesuit Mathematical Practice in Portugal*' by Henrique Leitão).

108 Alden, *Making of an Enterprise*, 91 fn. 56. One example had happened in 1588 when several Jesuits accompanied the Spanish armada against England, for which see AHSI 115, a.LVIII (1989), 3–45 (article on '*Jesuitas en la armada contra Inglaterra, 1588*' by Francisco de Borja de Medina).

ers of the fatherland.[109] The Portuguese nobility, grateful to the Jesuits for upholding Portuguese anti-Spanish sentiments during the 1590–1640 occupation and conscious of the fact that the newly restored Kingdom was "without an army, without soldiers, without armadas and without fortifications,"[110] lost no time in appealing to the Jesuit colleges of the country with mathematical chairs, to supplement their traditional courses on navigational matters with specialised instruction in strictly military subjects. The king also appointed several Jesuits to act not only as councillors, diplomats, confessors and orators but also as military advisers, field engineers and, on one occasion, even as 'superintendents of war'.[111] All this had then been considered as necessary to face an expected military confrontation with Spain in 1640–1668. So grave was the situation that one of the first actions taken by the newly-established Portuguese war council and its Jesuit advisers was to divide Portugal into six military provinces: Minho controlled from Viana, Trás-os-Montes controlled from Chaves, Beira controlled from Almeida, Alentejo controlled from Élvas, Estremadura and Algarve.[112] Each of these provinces was, on the further advice of Jesuit military advisers, placed under the responsibility of an Inspector-General who was assisted by Jesuit mathematicians purposely liberated from their classroom duties.[113] The benevolent attitude towards the Jesuit *mathematicus* in a resurrected Portugal seems to have reached a salient point in 1651 when Prince Teodosio of Bragança (1634–1653), the king's brother, went out of his way to provide all the necessary funding to the Jesuit college of San Tiago at Élvas to there set up a chair of military architecture on the Madrid model, with a mission statement to train technicians in the art of war.[114] As was to be expected, this unprecedented Jesuit involvement in military matters for the defence of a Catholic country pitted against another Catholic country (which, incidentally, happened to be Ignatius' birth place) soon led to eyebrows being raised in

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[109] *Ibid*, 106.

[110] *Ibid*, 102 fn. 5. Words pronounced by the Chanter of Évora according to Faria Severim, *Observacão*, 341–343.

[111] Rodriquez, *Historia*, 363–365 writes that the Jesuit Francisco Cabral (1588–1652), sent out by the King to bring about the capitulation of the Spanish-held 100-gun fortress of Angra, was given a warrant designating him as "superintendent of war" for the Island of Terceira. Alden, quoting Rodriquez, writes that Cabral, after a one-year siege, had the satisfaction of witnessing the peaceful surrender of the fortress, afterwards preaching in true Jesuit style, a victory sermon in honour of the King of Portugal.

[112] Tavares, *Praca de guerra*, 825–840.

[113] *Ibid.*

[114] Baldini, *Teaching of Mathematics*, 309.

Rome, this culminating in 1659 when the rector of the college of Élvas, Francisco Soares, and two fellow Jesuits were blown up defending "the lines of Élvas", before the eyes of their students who were then defending that frontier town from a Spanish attack.[115] The Jesuit General Vitelleschi, foreseeing all these problems, had in 1640 already warned his "brethren in Portugal" that "in no way, neither by word nor by script, nor in the pulpit or in private conversations, were they to express incendiary feelings", remembering "what the company of Jesus owes to his Most Catholic Majesty and his progenitors."[116] It is clear that this warning—clearly designed not to upset Spain—seems to have been largely ignored because soon afterwards the Jesuit *mathematicus* Jan Ciermans (1602–1648) was more than enthusiastically fulfilling his duties towards King João to fortify frontier towns and fortresses against Spanish attack,[117] only to find himself confronted on the opposite side by Juan Carlos de la Faille, who, like him had studied mathematics in the Spanish Netherlands under the direction of the famous Jesuit *mathematicus* Gregorius Saint-Vincent (1584–1667).[118] An ironic situation was therefore unexpectedly created where two Jesuit mathematicians with a flair for military architecture but unfortunately belonging to the same Order—one an eminent professor at the Jesuit college in Lisbon, the other an equally respected professor at the Jesuit college in Madrid—found themselves serving two Catholic kings at war!

The origin of Jesuit military instruction in Portugal seems to have preceded the 1640 revolution against Spanish rule. Despite Spanish mistrust of any form of Jesuit military teaching that would have provided dangerous ideas of insurrection, there is much evidence to indicate that some limited form of military instruction was already being offered at the college of Santo Antão-o-novo during the period 1590–1640. The English Jesuit Inácio Stafford (1599–1642) born in Staffordshire, left a manuscript

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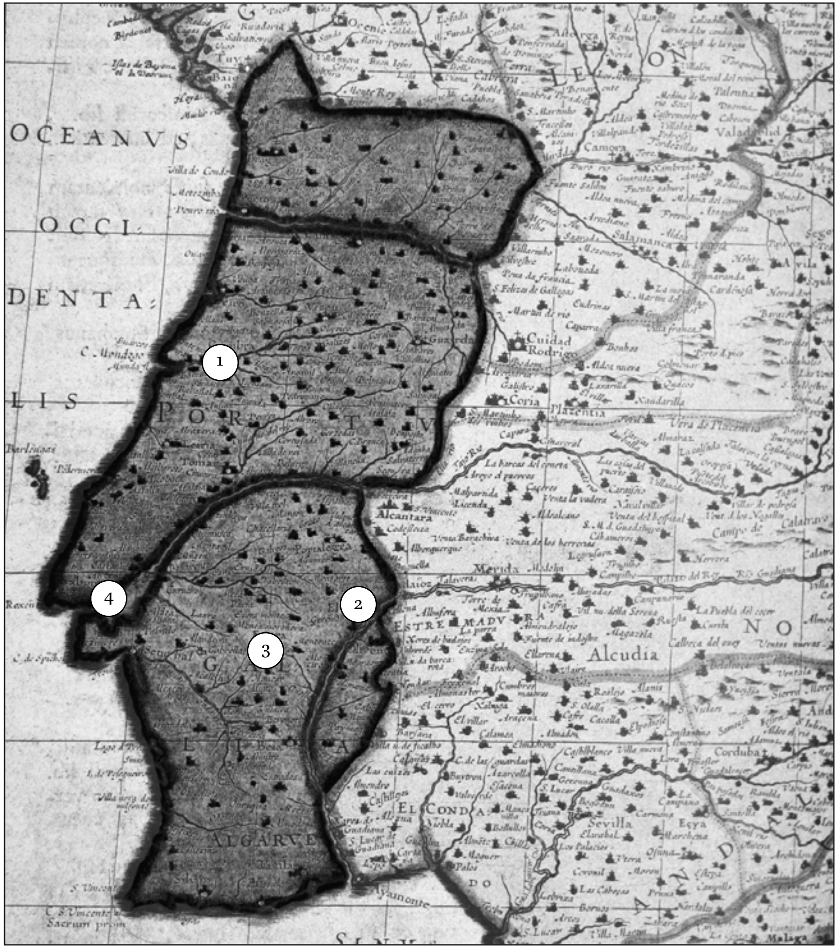
115 Alden, *Making of an Enterprise*, 107.

116 *Ibid.* According to Alden, the war-related activities of Portuguese Jesuits caused great embarassment to generals Vitelleschi, Carafa, Piccolomini, Gottifredi, Nickel and Oliva.

117 For Ciermans, who joined the Jesuits on 06-11-1619, see O'Neill and Dominguez (ed.), *Diccionario*, 817–819 (*Ciermans*); AHSI 97, a.XLIX (1980), 265–278 (article on *L'école de Mathématiques des Jésuites de la province Flando-Belge au XVII^e siécle* by Omer Van De Vyver S.J.) and Bruycher, *Matter of Opportunities?*. See also ARSI, SMV, II, 1185–1186; Rodriquez, *Historia*, III, 172, 187 and 408–412; Feingold, *Jesuit Science*, 398–403 (article on '*Jesuit Science in the Spanish Netherlands*' by G.H.W. Vanpaemel) and Baldini, *Teaching of Mathematics*, 385–386.

118 Meskens, *Joannes della Faille*, 162 n. 228.



Names and teaching dates of Jesuit mathematicians providing fortification instruction:

1. Coimbra (Simão Fallon, 1627-1633; Luís Gonzaga, 1695-1698; Inácio Vieira, 1705-1708 and Paulo de Mesquita, 1719-1723).
2. Élvas (Thomas Owen, 1651-1652; Hugh Collan, 1653-1657; Valentin Stansel, 1657-1658; André Mendes, 1658-1660; George Gelarte, 1660-1663 and António de Almeyda, 1663-1665).
3. Évora (André Mendes, 1664-1665; Luís Gonzaga, 1692-1693; Inácio Vieira, 1699-1700).
4. Lisbon (Francesco da Costa, 1602-1604; Inácio Stafford, 1630-1636; Simão Fallon, 1638-1640; Jan Ciermans, 1641-1642; Hendrick Uwens, 1642-1646; Thomas Barton, 1648-1650; John Rishton, 1651-1652; João de Costa, 1654-1655; Bartolomeu Duarte, 1655-1658; Valentin Stansel, 1658-1663; John Marques, 1664-1665; George Gelarte, 1668-1686, 1692-1700, 1708-1711 and 1719-1720; Ludovico da Gama, 1684-1685; Franz Xavier Schildenhofen, 1686-1687; Luís Gonzaga, 1706 and 1725-1726; João Garção, 1706-1707 and 1710-1713; Juan de Carvalhal, 1707-1708; Inácio Vieira, 1708-1712 and 1715-1719; António Simões, 1708-1711; Rodrigo da Costa, 1708-1711; Manuel de Campos, 1719-1721 and 1733-1742; Diego Soares, 1719-1722; Giovanni Battista Carboni, 1722-1749; Bernardo de Abreu and Francisco dos Santos, 1725-1726; João de Faro, 1730-1733; Marcelo Leitão, 1733-1737; Inácio de Silveira, 1739-1740; Francisco Gião and Francisco Ribeiro, 1742-1743; João de Borja, 1743-1748; Tomas de Campos, 1748-1757; Inácio de Carvalho, 1753-1754 and Eusébio da Veiga, 1753-1759).

45. Jesuit institutions in Portugal providing fortification instruction in the Baroque age superimposed on Joan Blaeu's 1665 map of Portugal.

of classroom notes entitled *Tratado da Milicía* (1638) revealing, under the heading *'La Architectura Militar'* (folios 505–642), his thorough knowledge of the works of Samuel Marolois, Jean Errard de Bar-le-Duc and Antoine de Ville.[119] Apart from teaching fortification mathematics at the Lisbon college, Stafford had also served the Marquis of Monte Albano as a military adviser, even accompanying him to Brazil to take up the position of viceroy in 1640.[120] Military art and military architecture were both included in the mathematics syllabus of the college of Santo Antão-o-novo[121] (which had in 1579 replaced a smaller and older college building founded in about 1550 called Santo Antão-o-velho) where they had been intermittently taught within the syllabus of the mathematical courses that had commenced here in 1590 when the Portuguese Jesuit João Delgado (1553–1612)—a student of Clavius and the architect of the new college—had been purposely transferred to Lisbon from Coimbra to set up the so-called *Aula da Esfera* chair of mathematics.[122] All this had happened just a few years after the former Jesuit student João Baptista Lavanha had been nominated *cosmógrafo-mor* by the Spanish government to inaugurate a new state-run course in navigation at the *Lição de Matemática* (1582).[123] As they did elsewhere, the Jesuits seem to have responded in kind by intensifying the navigation content of their own mathematical syllabus, as revealed in seven manuscripts on the subject, authored by the Jesuit *mathematicus* Francesco da Costa (1567–1604)[124] who was teaching here in 1602–1604.[125] Stafford's successor, the Irish Jesuit Simão Fallon (1604–1642) was not only a devout and committed

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[119] Baldini, *Collegio di S. Antão*, 293 writes that this manuscript by Stafford forms part of a larger corpus of manuscripts entitled '*Varias obras mathematicas*' (BNP, PBA 240).

[120] Baldini, *Collegio di S. Antão*, 287, fn. 46. See also ARSI, SMV, VII, 1472–1473 and IX, 858 and Rodriquez, *Historia*, III, 1, 166, 190–191 and 292–293.

[121] Baldini, *Collegio di S. Antão*, 294–295.

[122] *Ibid.* 281–284 and Fn 20. According to Albuquerque, the name '*Aula da Esfera*' originated from a medieval text by Joâo de Sacrobosco, much admired by Clavius, which explained the principles of cosmography focused on the sphere.

[123] Albuquerque, *Aula de Esfera*, fn. 7. One of the first persons to run a mathematical course here was Pedro Nunes (1568). In 1572–1577, military architecture was here taught by Antonio Rodrigues, "Master of the Construction of Fortifications of the Realm" in 1564 and "Master of Fortifications of the Realm" in 1579, who had studied in Italy.

[124] Baldini, *Collegio di S. Antão,* 290–291 and Fn. 23 writes that Costa had been assisting Delgado since 1591. An architect, he wrote treatises on geography (1594–1595), navigation (1596), astronomy (1601–1602), cosmography (1601–1602), the sphere (1601–1602), hydrography (undated) and astrology (undated).

[125] *Ibid.* 281–288 lists all the Jesuit mathematicians who were teaching at Santo Antão-o-novo in 1590–1640.

priest but also a very talented military engineer who, besides entrenching the fortification writings of Marolois (1613), Errard (1600) and De Ville (1628) into the college syllabus and library—itself an indication that the Jesuit was well aware of the contemporary shift in military education from the Italian to the Dutch and French schools of thought—was, in 1640, also appointed *engenheiro-mor* by King João IV with the responsibility for designing and supervising together with Jan Ciermans, the building of all frontier fortifications of the resurrected Portuguese kingdom.[126] It was at this point in time that the king asked Fallon to upgrade all military orientated courses run by the Jesuits. He also requested him to help an ex-college student, the new *cosmógrafo-mor* Luís Serrão Pimentel to set up a complementary *Aula de Fortificação* (1647) where all aspects of offensive and defensive military operations were taught.[127]

The intensive educational drive in all matters military initiated by King João IV reached a salient point in 1651–1666 when six Jesuit mathematicians were in quick succession appointed to occupy the new chair of military architecture that had been purposely set up at the college of Élvas to train the officer class of the Portuguese army stationed along the long border with Spain. They were the Englishman Thomas Owen who was teaching in 1651–1652, the Irishman Hugh Collan in 1653–1657, the Moravian Valentin Stansel in 1657–1658, the Portuguese André Mendes in 1658–1660, the Englishman George Gelarte in 1660–1663 and the Portuguese António de Almeyda in 1663–1665.[128] In the meantime, most of Fallon's successors at the *Aula da Esfera* in Lisbon,[129] were also showing a keen interest in military tuition—some were also summoned to teach fortification mathematics at the Jesuit colleges of Coimbra and Évora where this subject was taught on an irregular basis (and many times privately) to small groups of students in 1665–1692.[130] Among these Jesuit protagonists of military knowledge, one can mention Luís Gonzaga (1666–1747) and Inácio Vieira (1678–1739), who bequeathed to posterity the manuscripts entitled *Tratado de Architectura* (1701)[131] and *Tratado Mathematico da Pirothecnica*

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[126] *Ibid.,* 288 fn. 47. See also Tavares, *Aprendizagens*, 30.

[127] *Ibid.,* 36. See also Feingold, *Jesuit Science,* 237. In 1680 Pimentel wrote a book on Portuguese fortification methods.

[128] Baldini, *Teaching of Mathematics*, 309–310, fn. 21.

[129] *Ibid.,* 384–465 for biographical details of post-Fallon Jesuit mathematicians at *Aula de Esfera*.

[130] *Ibid,* 384–465.

[131] BAL, Cod. Ms.46-VIII-23, ff. 1–21.

(1705).[132] The many theses on military architecture defended by students attending Jesuit mathematics classes at Lisbon, Évora and Coimbra in the period 1701–1738[133] bear testimony to the intensive teaching sessions on the subject which seem to have taken place in these three Jesuit institutions of learning in Portugal at the dawn of the eighteenth century. The evidence reveals that five students of military architecture were young Jesuits—In 1721, Paulo de Mesquitta presided over the examining board of a Jesuit scholastic called Xavier Franciscus in the college of Coimbra—this giving an indication of the priority being given by the Jesuit Order to military education in late Baroque Portugal, even within its own ranks.

The 'gurus' of fortification instruction in the Jesuit Portuguese province after 1640 were undoubtedly Jan Ciermans, Luís Gonzaga and Inácio Vieira, all eminent professors of mathematics who taught, wrote about and practised their speciality.

The first of these, Ciermans (1602–1648)[134] was born at the repeatedly besieged town of S-Hertogenbosch in Brabant, dangerously interposed between the Catholic Spanish Netherlands and the Protestant United Provinces. After studying mathematics under Gregorius Saint-Vincent in 1623–1624, Ciermans started teaching mathematics in Louvain in 1637–1641, spending much time in Antwerp where he gave private lessons in military architecture, even helping on 25 June 1641 Jean-Antoine Tucher to defend his thesis on military architecture in a purposely organised public hearing. He afterwards decided to transfer his mathematical skills to the China missions and together with another Jesuit called Hendrick Uwens, left his country for Portugal from where he intended to depart for China. It seems that on reaching Lisbon, a forewarned King João IV, desperate to obtain the services of the best possible Jesuit mathematicians, found ways and means to keep both Flemish Jesuits in the country. As tutor in military architecture to the Prince Theodosio of Bragança, Ciermans soon found himself occupying the chair of mathematics at the *Aula da Esfera*. He was also employed by the king to fortify several frontier

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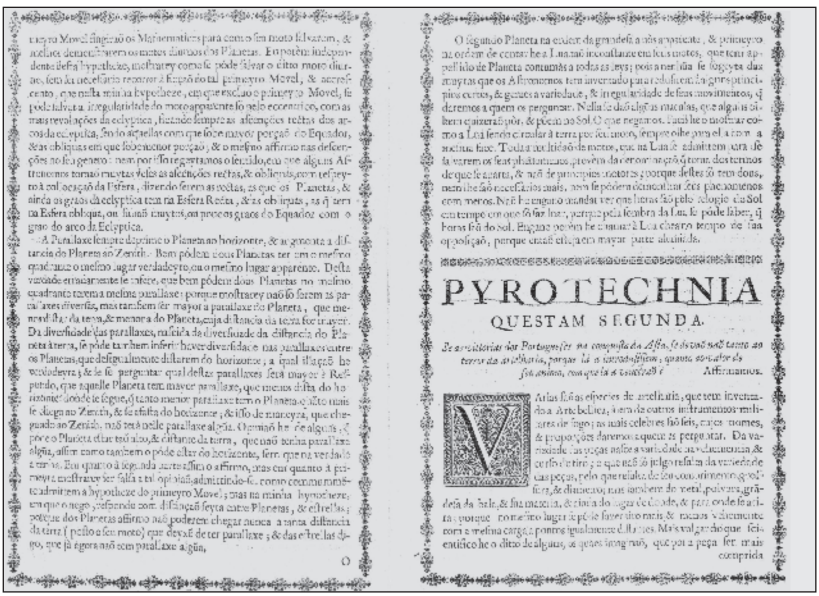
132 BNP, Cod. Ms.22 n. 54, ff. 1–12 cited by Baldini.

133 BAL, Cod. Ms. 46-VIII-23 (Joachim Freyre de Andrada, 1701); BAL, Cod. Ms.46-VIII-23 (Antonio Dantas Barbosa 1702); BAL, Cod. Ms. 46-VIII-23 (Hieronymo Nunes, 1703); BAL, Cod. 1601 (Antonio Gomez de Faro, 1710); Baldini, *Teaching of Mathematics*, 731 (Luis Savier Bernardo, 1712); *Ibid.*, 734 (Paulus de Mesquitta S.J., 1719); *Ibid.*, 735 (Xavier Franciscus S.J., 1721); *Ibid.*, 736 (Francisco dos Santos S.J., 1725); *Ibid.*, 742 (Emmanuel Ferreyra S.J., 1738) and BGUC, Ms. 677 (1) (Eugenio dos Santos, 1736).

134 See n. 117.

46. Frontispiece of a collection of mathematical theses conclusions dedicated to King Pedro II of Portugal by graduates of the Jesuit college of Lisbon at the dawn of the eighteenth century [BAL, Cod.Ms.46-VII-23]. Reproduced with the kind permission of the *Biblioteca da Ajuda* in Lisbon.



47. Extracts from mathematical theses conclusions concerning fortifications and artillery, presented by Hieronymo Nunes (top) and Antonio Dantes Barbosa (bottom), both students of the Jesuit college of Lisbon [BAL, Cod.Ms.46-VII-23]. The examining board was presided by the Jesuit professor Luís Gonzaga. Reproduced with the kind permission of the *Biblioteca da Ajuda* in Lisbon.

positions[135] which included the city fortresses of Olivenza and Élvas, the fortresses of Praça-Forte (Olivenza), Santa Luzia (Élvas), Sant' Iago (Sesimbra), Castelo Muralhas (Estremoz), Castelo de Vide, Castelo de Campo Maior (Portalegre), Castelo de Alfaiates (Sabugal), Castelo de Amieira and the fortifications of Vila Viçosa and Villanueva del Fréno (Badajoz). The grateful king soon appointed Ciermans to act as his '*fortificationibus regis praefecto*' with the military rank of colonel commanding a handsome pay of 160 ducats per month (3 January 1645)[136]—an appointment which however proved to be the last straw for his Jesuit superiors. On reading reports about his zealous military activities, General Vitelleschi first exhorted him to exercise "more sobriety in his Portuguese engagements"[137] and then to go to China.[138] Following Ciermans' flat refusal to do so, Vitelleschi's successor, the pro-Spanish General Vincenzo Carafa was left with no option but to expel him from the Jesuit Order on grounds of insubordination.[139] This move was designed to discourage other Jesuits from substituting their spiritual mission with a military one. Soon afterwards, the exiled Ciermans was captured by the Spaniards but, despite all efforts to have him released, he remained imprisoned in Madrid where he was eventually convinced to switch sides only to meet his death at Olivenza on 20 June 1648, leading an assault on the city walls that he had designed, while in the service of the Marquis of Leganés.[140] Ciermans, known in Portugal as João Pasásio Cosmander, had become so much involved in fortification building in 1641–1645 that Charles Lassart, a French military engineer once said: "One thing I find dangerous and belittling about the Portuguese, who by nature are a presumptuous and boastful people, is that they would entrust their entire warfare, from locations to campaigns, to a Jesuit born at S-Hertogenbosch."[141]

The second outstanding personality of the Jesuit military circle in Portugal, Gonzaga (1666–1747)[142] was, unlike Ciermans, a theoretician

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[135] *Ibid.*

[136] *Ibid.*

[137] O'Neill and Dominguez (ed.), *Diccionario*, 817–818 (*Ciermans*). See also Bruycker, *Matter of Opportunities?*, fn.iv.

[138] Bruycker, *Matter of Opportunities*?, fn. iv.

[139] *Ibid.*

[140] O'Neill and Dominguez (ed.), *Diccionario*, 817–818 (*Ciermans*).

[141] Bruycker, *Matter of Opportunities?*, fn. v (reference to Paar, *Jan Ciermans*, 201–216).

[142] ARSI, SMV, III, 1581 and IX, 420–421; Rodriguez, *Historia*, III, 1, 205–208 and IV, 427, 433, 436, 527 and 530–532 and Baldini, *Teaching of Mathematics*, 405. See also Albuquerque, *Aula de Esfera*, n. 91.

rather than a field military engineer. Having taught at Coimbra (1695–1698), Évora (1698–1699) and Lisbon (1700–1706 and 1725–1726) and having crowned his professional career by securing his appointment as private tutor to the three sons of King Pedro II (1667–1706) besides serving as rector of the Lisbon college in 1725–1726, Gonzaga bequeathed to posterity a fascinating manuscript of classroom notes entitled '*Tratado de Architectura*' complete with explanatory sketches, which forms part of a larger work entitled '*Exame militar* (1701), mentioned by Sommervogel and Albuquerque.[143] This manuscript was based on thirty-nine points of discussion or '*disputas*' and concluded with a detailed explanation of battlefield formations. The structure follows Italian and French Jesuit precedents. The arguments put forward, however, reveal a superior awareness of what was happening in the field since Pagan, Marolois, Dogen, De Ville, Bar-le-Duc, Lorini, Castriotto, Fratella, Busca, Tensin and even Durer feature repeatedly in the text. So do Vitruvius and Milliet de Chales, but not, surprisingly enough, the Frenchmen Bourdin, Fournier or even Vauban. Another unusual feature in Gonzaga's manuscript occurs at the end of the treatise where one finds a dedication to "*Deo, Virgini et Martiri*", perhaps reflective of the inner qualms of conscience that, according to Feingold,[144] many Catholic priests seem to have had regarding "the inordinate pursuit of secular learning".

The third Jesuit reference point in the teaching of military architecture in Portugal was a ballistics expert. Vieira (1678–1739)[145] taught military mathematics at Évora (1669–1701), Coimbra (1705–1708) and Lisbon (1708–1712 and 1715–1719). A manuscript kept in the Lisbon Archives reveals that this Jesuit—who also served as confessor to the *Infante* of Portugal, Don Pedro—organised his classroom notes in the form of a treatise on artillery entitled *Tratado mathematico da Pirothenica* (1705).[146] Matters in Portugal had now reached a stage which is perhaps best reflected in statements made by the Jesuit Generals Charles de Noyelle (1685) and Tirso Gonzáles (1692). Conscious of the controversial relationship that had been over the years developed in Portugal between royal demands and the enthusiastic response of Jesuit mathematicians, these

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143 BAL, Cod. Ms. 46-VIII-23. See also Albuquerque, *Aula de Esfera*, n. 91.

144 Feingold, *Science as a Calling?*, 79–119.

145 Rodriguez, *Historia*, IV, 10–11 and 451–452 and Baldini, *Teaching of Mathematics*, 415–419 and 755.

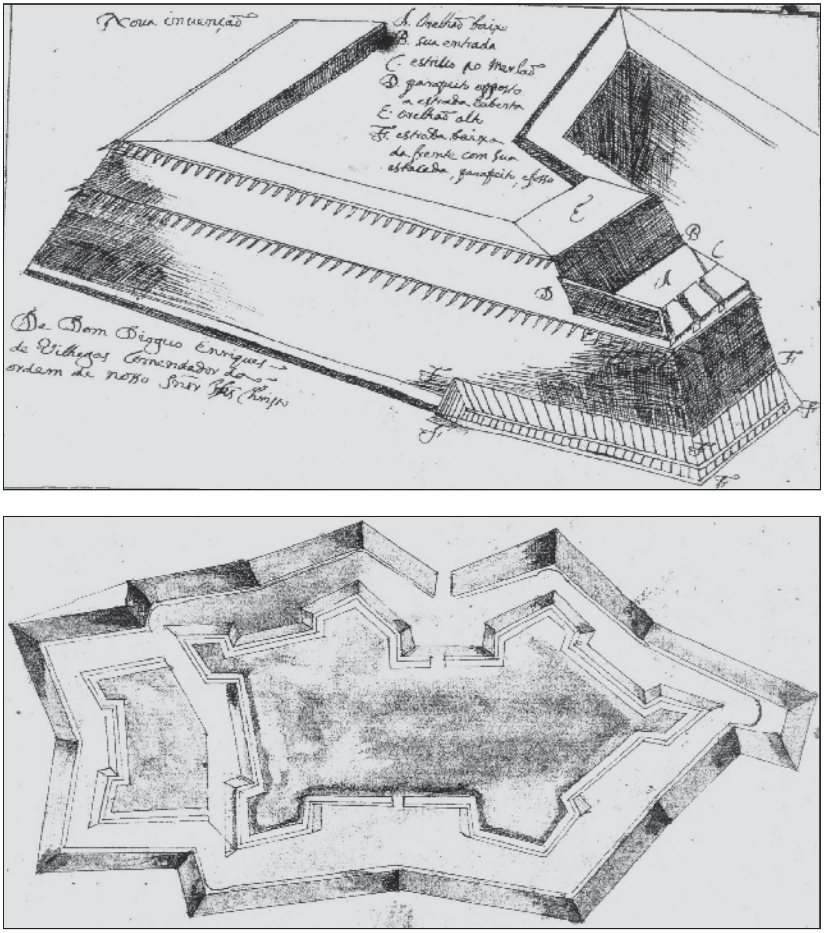
146 BNP, Ms. 22 n. 54.

Generals had unequivocally stated that the primary role of the Portuguese Jesuit *mathematicus* was not to supply the King with military advisers but to better prepare men for the Jesuit missions in China.[147] Considered in the light of further warnings by Gonzáles in 1702,[148] Vieira's continued involvement in fortification and artillery teaching (supplemented with an even more controversial course in astronomical chiromancy that he seems to have given in 1712 to attract more students to his lectures)[149] added considerably to the grave problems that the eighteenth century Jesuit Order faced in Portugal. Much could have been avoided had the disciplinary mechanisms that had so efficiently expelled Ciermans, been applied with equal rigour to other belligerent Portuguese Jesuit mathematicians who, like Vieira, were determined to continue exploring the multifaceted realm of military architecture in blatant contradiction of the spiritual mission advocated by Ignatius.

Classes on Fortification Building at the *Colegio Imperial* in Madrid and the Dissemination of Jesuit Military Knowledge in the European Dominions of His Catholic Majesty

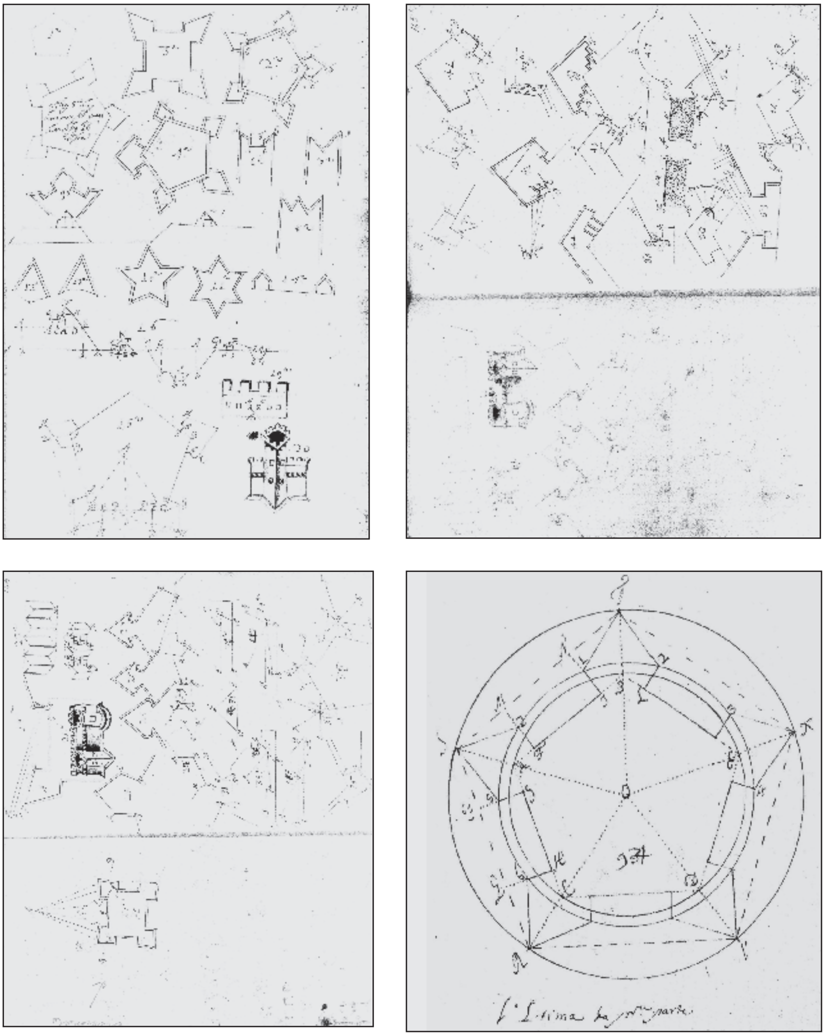
Catholic Spain was regarded by the Jesuit Order as a unique country which, as Ignatius' birthplace and as a staunch defender of all that was Catholic, was especially deserving of all the spiritual and material help that it could get to enable its monarchy to realise its ambitions. The political aims of Spanish Habsburgs were succinctly explained by Cardinal Richelieu in 1624 when he advised King Louis XIII of France that: "One cannot doubt that the Spaniards aspire to world domination and that the only obstacles they encountered up to now is the great distance between their scattered dominions and the lack of the manpower to do so."[150] Within the context of the strong links that existed between His Catholic Majesty of Spain and the Jesuit Order, the situation of having several Jesuit mathematicians in Spanish Europe explicitly involved in the teaching and practice of '*De re militari*' becomes explainable. It will be shown that matters escalated after the outbreak of hostilities associated with the

147 See n. 107.
148 *Ibid.*
149 O'Malley *et al.*, *The Jesuits II*, 385 (Chapter 17 on '*Entering dangerous ground: Jesuits teaching Astrology and Chiromancy in Lisbon*' by Henrique Leitáo).
150 Suarez, *El siglo de las Luces*, 469–518 (article on '*La fortificacion española en los siglos XVII y XVIII: Vauban, sin Vauban y contra Vauban'* by Fernando Cobos-Guerra).

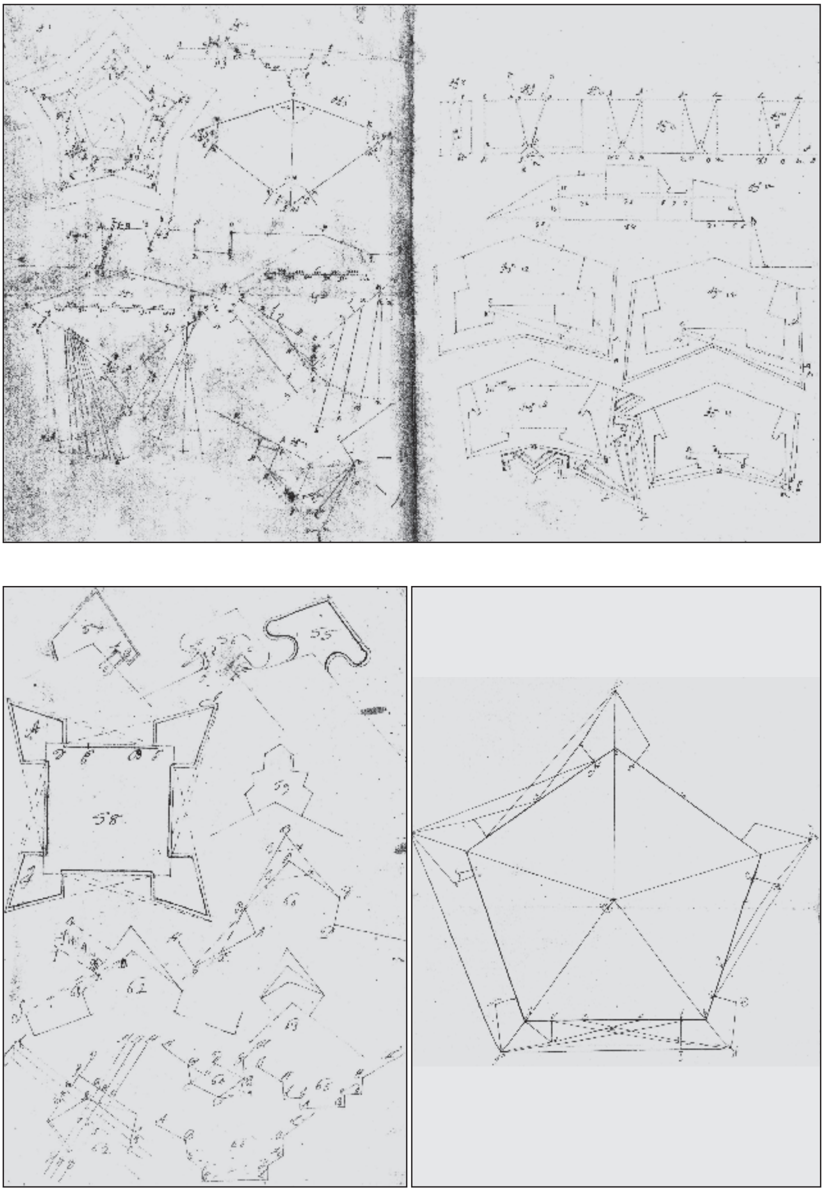


48. Extracts from Gonzaga's *Tratado de Architectura* [BAL, Cod. Ms.46-VII-23]. Reproduced with the kind permission of the *Biblioteca da Ajuda* in Lisbon.

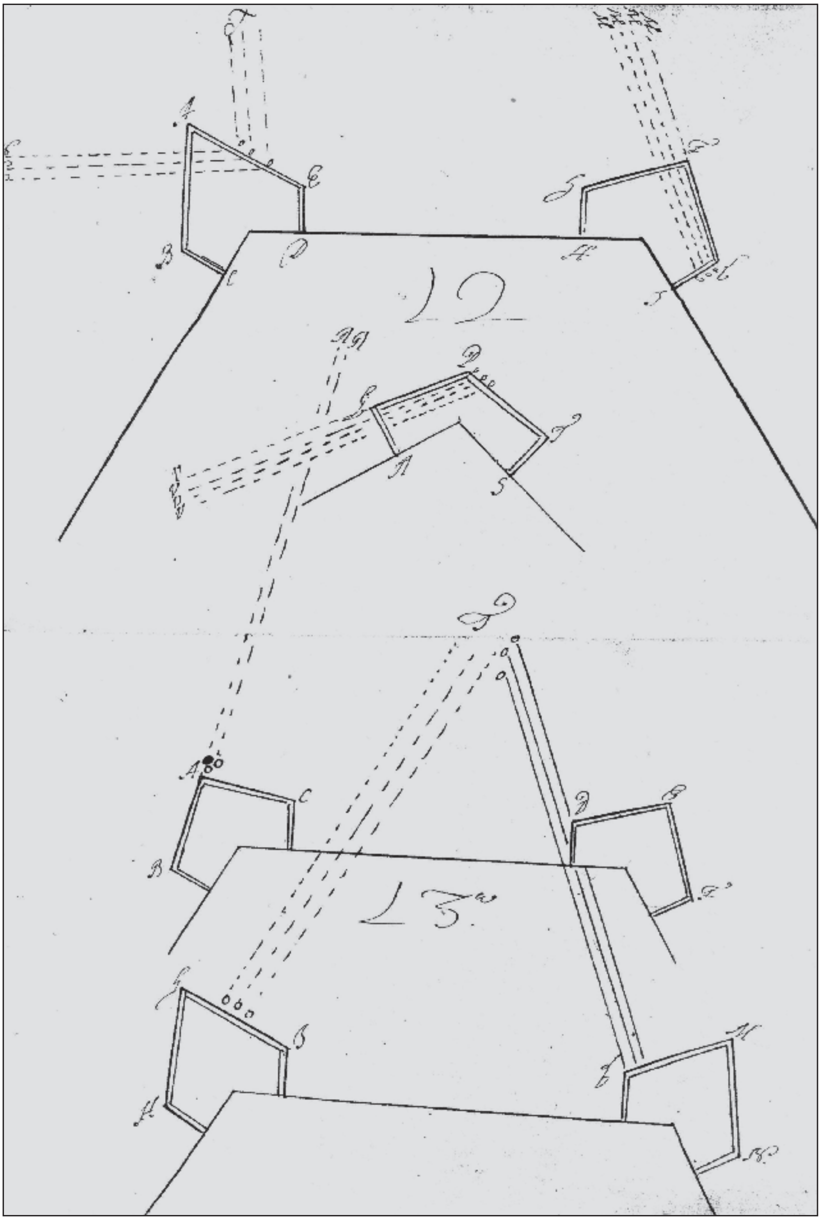
Thirty Year War (1618–1648) when the Spanish and Imperial branches of the Habsburg family repeatedly relied upon the advice of the Jesuits to counteract the offensives of the Protestant alliance. It was at this time of great peril for Catholicism that Spain became a great fortification builder, mainly inspired by knowledge on the subject contained in the Jesuit *Colegio Imperial* in Madrid. It will also be shown that by the time of the cessation of hostilities in 1648, the Spanish Jesuit involvement in military matters had reached sufficiently alarming and controversial proportions



49. Extracts from Gonzaga's *Tratado de Architectura* [BAL, Cod. Ms.46-VII-23]. Reproduced with the kind permission of the *Biblioteca da Ajuda* in Lisbon.



50. Extracts from Gonzaga's *Tratado de Architectura* [BAL, Cod. Ms.46-VII-23]. Reproduced with the kind permission of the *Biblioteca da Ajuda* in Lisbon.



51. Extract from Gonzaga's *Tratado de Architectura* [BAL, Cod.Ms.46-VII-23]. Reproduced with the kind permission of the *Biblioteca da Ajuda* in Lisbon.

to warrant a reaction from the Jesuit general in Rome Vincenzo Carafa (1585–1649) who issued a blanket prohibition of such activities.[151] This directive seems to have been largely ignored after Carafa's death, but it did manage to cause the gradual disappearance of a special chair of *De re militari* that had been set up in 1625 in the *Colegio Imperial* and also to slow down direct Jesuit involvement in battlefield action[152] although it is recorded that in the 1683 third Turkish siege of Habsburg Vienna[153] all the Jesuits in that city not only converted all their buildings into military hospitals but manually participated in the strengthening of the city walls setting an example to all by their courage and stamina in the intense July heat. They also constantly attended to the spiritual and decision-taking needs of the commander of the garrison, Count Ernst Rüdiger von Starhemberg who insisted on having a Jesuit confessor constantly at his side.[154]

The *Colegio Imperial* in Madrid was the end product of a process that had started in 1545 with the arrival of the first Jesuits in Madrid, Pietro Fabro and Antonio Araoz.[155] Soon afterwards, a Jesuit college had been founded (1560), achieving full status on 25 February 1609 when the Empress Maria of Austria (1528–1603), described in documents as the "*Patrona, Dotadora y Fundadora*" of the college, bequeathed to that institution the title of *Colegio Imperial* in remembrance of her admiration towards Ignatius' followers.[156] The most important landmarks in the development of the college situated in the *Calle de Toledo* were the official establishment in 1625 by King Philip IV (1605–1665) of a specialised programme of studies known as the *Reales Estudios* "for the proper education of many sons of Spanish nobility"[157] and the establishment in 1725 by King Philip V (1683–1746) of the *Real Seminario de Nobles* which was initially lodged adjacent to the college but which, after 1730, was transferred to a palatial residence belonging to the Dukes of Alba.[158] Governed by a series

151 See chapter 3.

152 According to ARSI, SMV, X, 838–841, Jesuit writings about '*Art Militaire*', however, seem to have been quite unaffected by Carafa's prohibition.

153 Finkel, *Osman's Dream*, gives a history of the events that led to the 1683 siege of Vienna.

154 AHSI 104 a.LII (1983), 275–285 (article on '*I gesuiti nell'assedio di Vienna del 1683*' by Mario Colpo S.J. and Wiktor Gramatowski S.J).

155 Diaz, *Colegio Imperial*, 15–16.

156 *Ibid.,* 55–56.

157 *Ibid.,* 150–153.

158 *Ibid.,* 237–239. See also Egido, *Jesuitas en España*, 231–235; Pinal, *Reales Seminarios de Nobles*, 329–349 and Lafuente, *Ensenanza di ciencias*, 477–495.

of regulations entitled the '*Costituciones de el Real Seminario de Nobles, fundado en el Colegio Imperial de la Campañia de Jesus de Madrid por el Señor Don Phelipe Quinto, Catholico Rey de las Españas*' (21 September 1725),[159] this Jesuit *seminarium nobilium* clearly drew inspiration from other similar institutions, particularly from the college in Paris. It in turn inspired other seminaries for nobles in Spain which mushroomed after the war of the Spanish succession (1701–1714). In the Valencia and Barcelona seminaries, traditional subjects (Latin, French, Italian, philosophy, mathematics and canon law) were supplemented by programmes in the military arts, fortifications, fencing, horsemanship and the dance.[160]

When King Philip IV set up the *Reales Estudios* in the Jesuit college in Madrid (which was thereafter called *El Colegio Imperial de Madrid y los Reales Estudios de San Isidro*) he believed that he had created a powerful instrument to further the cause of the Catholic church against its enemies, to support the House of Habsburg and to provide a moral justification to enable him to extend the dominions of his family, all three beliefs landing him in a situation of perpetual wars. Considered from this viewpoint, the *Reales Estudios* course of studies (officially established in 1625 but only operative after its inauguration in 1629) was based on the classification of studies envisaged in the Jesuit *Ratio Studiorum* but here expanded and more focused on 'utilitarian' themes to enable the children of Spanish nobility to better serve the interests of their king. While the lower studies programme included six chairs of Latin, Greek and Grammar,[161] the higher studies programme included three chairs for Greek, Hebrew and Chaldean, one chair for history, three chairs for philosophy, two chairs for mathematics, one chair for *De re militari*, one chair for ethics, one chair for political and economic studies, three chairs for theology and sacred scripture and one chair for natural history,[162] totalling an impressive twenty-three chairs, the most prominent among them being the two chairs of the mathematical disciplines where one professor was expected to teach the sphere, astronomy, astrology, the astrolabe, perspective and prognostics in the morning while another professor was expected to teach geometry, geography, hydrography and horology in the afternoon.[163] All this was topped by the

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[159] Diaz, *Colegio Imperial*, 238, fn. 3. These *Constituciones* were published in Madrid by Gabriel del Barro in the form of a 44-page book (1730).

[160] Egido, *Jesuitas en España*, 232 citing Sebold, *Visiones y visitas* which contains an account of Torres Villaroel's visit to the archetype *Seminarium Nobilium* in Madrid.

[161] Capel, *geografia*, 2–3.

[162] *Ibid.*

[163] *Ibid.*

explanations of the illustrious professor of *De re militari* where "the writings of Polybius and Vegetius were interpreted and where the antiquity and learning that there is about this subject-matter can be studied."[164]

The circumstances of the foundation of the *Reales Estudios* at the Madrid college are well recorded. The first concerns its origins in the form of five letters that were received by the Jesuit General Muzio Vitelleschi in Rome in December 1623.[165] In the first letter dated 4 November 1623, His Catholic Majesty Philip IV expressed his desire to set up a special course of studies to serve his court, to be run by the Jesuits. In the second letter, the king's prime minister, Don Gaspar de Guzmán y Pimentel, the Count-Duke of Olivares, expressed his full agreement with his master's wish. In the third letter, the Philip's preacher and Olivares' confessor, the Jesuit Hernando Chirino de Salazar marshalled several arguments to justify the king's dream to have a special course of studies run by the Jesuit Order. The fourth and fifth letters were from the rector of the *Colegio Imperial*, the Jesuit Pedro de la Paz (who specified in an attached mémoire all the new 'chairs' that would be needed in the Reales Estudios and their sources of funding) and from the influential Jesuit Francisco Diaz (who elaborated on the financial implications of the new educational venture). Vitelleschi's initial reaction to the unprecedented request of a Habsburg king to involve the Order in his political ambitions was negative but in January 1626 agreement seems to have been reached and all the subjects that had to be taught received the approval of all parties concerned, including that of Chirino de Salazar whom has been credited (or discredited) as having been the person who came up with the whole idea of the *Reales Estudios* in the first place,[166] perceiving it as a tool which would place all Jesuit knowledge in Spain at the service of His Catholic Majesty. It is recorded that an unhappy Vitelleschi had exclaimed that the subject of *De re militari* could have been better taught by "a soldier from Flanders."[167]

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164 Diaz, *Colegio Imperial*, 152–154.

165 *Ibid.*, 149–150. See also Astráin, *Historia*, 141 who writes that Vitelleschi had said "*No suena bien, dice, que se diga en el mundo que la compañia lee judiciaria, y aun Cátedra de fortificaciones ho dará poco que decir, porque una cosa es escribit un autor nuestro cuatro o seis horces deo esta materia, para llemar lo que va tratando de matemáticas, y otra leer e propósito todo un año un solo maestro esta materia, la cual leerá hanto mejor en tres meses un soldado de Flandes*".

166 *Ibid.,* 149 and 523. For biographical details on Chirino de Salazar (1576–1646) who joined the Jesuits in 1592, see ARSI, SMV, II, 1148–1151.

167 See n. 165.

This was not the only controversy. The foundation of the *Reales Estudios* prompted unprecedented opposition from the old Spanish Universities of Salamanca and Alcalá and from the University of Louvain in the Spanish Netherlands which even sent out the eminent Flemish scholar Cornelius Jansen (1585–1638) to Madrid in 1624 to join in the storm of protests against the Jesuits. In a forty-seven page public document written to the king in January 1627,[168] the professor of canon law at the University of Salamanca, Juan de Balboa, drew the attention of the monarch to the unconventional nature of the proposed Jesuit teachings in such 'profane' subjects as mathematics, astrology, marine arts and, above all, *De re bellica* implying that it would be most absurd for Jesuits to be teaching ways of "forming battlefield squadrons, opening trenches, building fortifications, ditches, ravelins, platforms and all other types of war structures" all this being neither decent, nor legal, nor safe for the Jesuits, who "with their rhetoric and writings have strongly criticised the use of comedies at Salamanca" so that: "what next, that a Religious would now appear in a classroom teaching soldiers how to carry out an assault, how to carry out mining operations, how to build platforms and even how to organise battle formations?". Balboa concluded his pleas with a veiled threat that the Jesuits in Spain should open their eyes to see "how harmful too much power can be for them, since this is invariably founded on very fragile foundations that can collapse tomorrow while the offended Universities, the offended church and the Kingdom (of Spain) are everlasting and there to stay".

Despite the defensive action taken by the Jesuits through the pen of the influential Jesuit Juan Baptista Poza, the attack on the chair of fortification mathematics continued unabatedly so that as late as in 1761 Lanz de Casafonda sarcastically referred to the chairs of *De re militari* and *De politicas y económicas* as follows:

> Two have particularly gratified my heart: that of *Re Bellica*, to interpret Polybius and Vegetius and that of Politics and Economics to interpret Aristotle. What would happen if one were to see a Jesuit explain in his classroom the ways of forming battle line squadrons, to open trenches, to excavate ditches, to erect traverses, barriers, palisades, stakes, fortifications, how even to move an army and plan a siege to conquer a city.[169]

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[168] Diaz, *Colegio Imperial*, 157–167.
[169] *Ibid.,* 212 citing Casafonda, *Dialogos*, 64.

Casafonda's criticism should perhaps be contrasted with Poza's defence quoted in the beginning of this book to which must be added the lines:

> …it also being a characteristic trait of Ours to explore the habits and obligations of the captains and soldiers of our armies in the light of moral philosophy and theology not only "most useful for a better understanding of the Old Testament that contains so many battle accounts" but also "so that they can better understand the causes and conditions of a just war. [170]

The Jesuit chosen to occupy the newly established chair of *De Re Militari* was a well-known *mathematicus* from the occupied Netherlands called Herman Hugo (1588–1629). He was a military chaplain of great courage who had seen active service in the armies of Ambrogio Spinola and even authored a book about the siege of Breda. Since Hugo had unexpectedly returned to Flanders after a brief stay in Madrid, the *De Re Militari* chair was on the advice of the king entrusted to the belligerent Jesuits (with impressive battlefield credentials) Francisco Isasi (1605–1650) and Francisco Antonio Camassa (1588–1646). Between them these Jesuits managed to create in 1630–1640 the first Jesuit classroom in Baroque Europe dealing with fortifications which, however, shortly afterwards fell into decline to disappear completely by 1650 when the subject matter seems to have been incorporated within the afternoon programme of the chairs of mathematics.[171] Here, the principal protagonists of mathematical applications to military knowledge were the Jesuits Juan Carlos de la Faille (1597–1652), Claude Richard (1589–1664), Hugh Semple (1589–1654), José Zaragoza y Vilanova (1627–1679), José Cassani (1673–1750) and Tomás Cerda (1715–1791).

Isasi,[172] the author of a treatise on military architecture which was later deposited in the *Biblioteca Publica de Leon*,[173] was born in 1605 at Eibar to a rich and influential Guipúzcoa family.[174] He became a member of the

170 Diaz*, Colegio Imperial,* 170–171 reproduces the entire contents of Poza's defence. For biographical details about the famous orator Poza (1588–1659) who joined the Jesuits on 29-03-1603, see ARSI, SMV, VI, 1135.

171 Diaz, *Colegio Imperial.*, 212.

172 Navarro Loidi, *Isasi*, 47–76. See also Diaz, *Colegio Imperial*, 210 and 530. This Jesuit's family counted among its military scions Diego, a colonel in the Guipúzcoa battalion who in 1638 heroically defended Fuenterrabia against the French; Antonio who had been appointed admiral of a powerful Spanish armada that was sent to Brazil in 1621; José who was a military captain and Domingo Tomás who had served His Catholic Majesty in the disputed Spanish Netherlands in 1667, afterwards promoted to serve as colonel of all Spanish troops stationed in Guipúzcoa.

173 Almirante, *Bibliografia Militar*, 398 citing Aparici y Garcia.

174 Navarro Loidi, *Isasi*, 49.

Jesuit Order in 1620 after which he taught German for one year, mathematics for several years and, during the period 1630–1640, *De re militari* for two years in the new *Reales Estudios* course when he also constructed an enormous astrolabe to explain his lessons on astronomy and military geography.[175] In 1638, this remarkable Jesuit seems to have been more than willing to carry his classroom notes to Fuenterrabía which was then about to be attacked by the French army and fleet under the command of the redoubtable Henri d'Escoubleau de Sourdes assisted by the French Jesuit Fournier—providing another unacceptable case of Jesuits at war because of their involvement in matters military!

During the siege of Fuenterrabía Isasi spent much time and energy not only replacing fallen parts of the fortifications and stiffening the defences in the area of the gates of S. Nicolás and S. María but also widening ditches, creating ingeniously planned outworks and forming countermines, even improving barracks accommodation and storage facilities[176] besides attending in an exemplary fashion to the spiritual needs of those who were defending the place, as Faille observed in a letter dated 8 September 1638 describing him "*Como un nuevo Arquimedes*."[177] After the French withdrawal, Isasi was involved in several projects for strengthening the defences of the city, transforming a 1640 project that had been prepared by the Spanish military engineer Don Juan de Garay, into a completely new design accompanied by signed explanatory notes which were forwarded for approval to the Spanish military authorities in 1641.[178] Isasi was also involved in drafting the designs of the side chapels and tower of the parish church of S. Andrés in his home town of Eibar (1646)[179] and in the building of new barracks, storage and hospital facilities in Fuenterrabía (1641).[180] He designed new harbour fortifications of Pentería (close to San Sebastián) where the name of the Jesuit was closely associated with that

[175] *Ibid.,* 55 mentions a letter from Faille to Michel Florent Van Langren saying that in September 1624, Isasi constructed an astrolobe which was larger than the one built by Gemma Frisius, recorded in his *De Astrolabo Catholico liber* (1556).

[176] Navarro Lodi, *Isasi*, 60–65.

[177] *Ibid.,* 60. This letter was addressed to Van Langren.

[178] *Ibid.*, 65–67. See also the 1640–1641 Fuenterrabia projects kept in AGS (Map Sections XXXIX-28 and XXXVI-13) reproduced in Cobos-Guerra and Castro Fernandez, *Arquitectura Militar española*, 83.

[179] Navarro Lodi, *Isasi*, 68 mentions a 1646 document confirming Isasi's authorship of the Eibar parish church designs.

[180] *Ibid.,* 65–67.

of the Spanish military engineer Don Antonio Gandolfo. By 1649, Isasi was back at the *Colegio Imperial* where he died soon afterwards.[181]

His successor to the chair of *De re militari* was Camassa,[182] an Italian born in Lecce in 1588. He is is described by Sommervogel as having a "*grandes connaissance dans l'art militaire et etait catedratico De re militari*", revealed in many letters about military matters that Camassa wrote in 1637–1646.[183] Having enrolled in the Jesuit Order on 3 January 1607 in Naples where many "Knights had left the vanities and frivolities of this world to become Jesuits,"[184] Camassa studied rhetoric in 1608–1610, logic in 1610–1611, mathematics in 1611–1612 and metaphysics in 1612–1613 after which he interrupted his studies to teach humanities at the Jesuit college in Naples (1613–1616). Following a resumption of studies to read theology in 1616–1620, the Jesuit pursued preaching and counselling activities at Bovino (1620–1621) and also taught philosophy and theology at Atri (1621–1627). In 1627 he was recalled to Naples to occupy the chair of mathematics at the Jesuit college (1631–1632). According to a 3 June 1632 letter received by his Provincial from Muzio Vitelleschi, Camassa had by this time already been earmarked by the Spanish Viceroy Don Pedro Parafin de Rivera to serve Spain "as the king commands."[185] Among Camassa's brighter Neapolitan students one finds a certain Domenico Marincola da Taverna who wrote a book about '*Elementi di Euclide e fortificatione*' now lost, and also a work about *tercio* battle formations entitled *Trattato delle ordinanze di squadroni* which was published in Naples in 1637.[186] Having reached Madrid in early 1633 and prepared the draft of a written document entitled *Tabla Universal para ordenar en qual quiera forma esquadrones* which was published later on in that year by Andrés de la Parra of Madrid,[187] Camassa was immediately appointed as Isasi's replacement at the *Colegio Imperial.* According to Astráin, he continued to occupy this

181 *Ibid.,* 65–68. Isasi's death on 20 May 1650 is recorded in Fejer, *Defuncti*, III, 13.

182 For biographical information about Camassa see Almirante, *Bibliografia Militar*, 108–109; O'Neill and Dominguez (ed.), *Diccionario*, 609–610 (*Camassa*) and d'Ayala, *Bibliografia*, 107. See also ARSI, SMV, II, 575; AHSI 103, a.LII (1983) 83 and 87; Baldini, *Saggi*, 108 and Gatto, *Collegio gesuitico napoletano*, 185 and 269–270. Astráin, *Historia*, 168 writes that Camassa "*explico una Catedra de ingenieria, sobre todo en sus aplicaciones militares*".

183 ARSI, SMV, II, 575.

184 Selwyn, *Paradise*, 59–60 citing a 1558 letter from Possevino to Margherita Gonzaga of Mantova.

185 O'Neill and Dominguez (ed.), *Diccionario*, 609–610.

186 D'Ayala, *Bibliografia*, 39 and 107.

187 Almirante, *Bibliografia Militar*, 108.

post for many years despite frequent battlefield absences. He never missed an opportunity to explain "fortifications, mathematics and military art" to many noblemen, even giving in February-April 1635 private lessons to King Philip IV who reportedly listened to the Jesuit's explanations on military architecture "with much pleasure."[188]

Camassa's inevitable absences from his *Reales Estudios* classes can be chronologically classified into two stages—the 1634–1635 period when he accompanied Don Diego Felipe de Guzmán, the first Marquis of Leganés, in a mission that reached a salient point at the battle of Nördlingen on 5 September 1634[189] and the 1635–1642 period when the belligerent Jesuit again accompanied Leganés to Italy, stiffening the fortifications of Alessandria and Sabbioneta and afterwards participating in the 1640 hostilities that had broken out in Catalonia.[190] He was here captured by some French soldiers, only to be released after paying his captors a bag of doubloons "which he always carried with him to offset such misfortunes."[191] He died in August 1646, after developing "a slight ailment which progressively increased"—this could have been the result of a wound he had received in 1644 during the two-month siege of French-held Lerida.[192] A fine moment in his career must have occurred on 29 September 1635 when he had been spotted by many onlookers:

> leaving with all pomp the *Colegio Imperial* in Madrid with such honours that the King embraced him tenderly after the Marquis of Leganés had called for him personally at the Jesuit college in his own carriage, on the way to the Palace placing him on his right hand side and publicly giving him all signs of great esteem.[193]

Described by Almirante as the hero of Nördlingen when he had saved the day by improvising an impenetrable entrenchment to protect the vulner-

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188 Astráin, *Historia*, 168.

189 See n. 187. Leganés, cousin of the powerful Count-Duke Olivares, was governor of Milan 1635–1636 and 1636–1641.The battle happened when Leganés was escorting the *Cardinal-Infante* Ferdinand to Brussels to assume the governorship of the Spanish Netherlands. During the battle, he and Camassa were responsible for the defence of Schömberg hill, ably directing the manouevres of the *San Severo*, *Cardenas* and *Torrecuso* (Neapolitan), the *Lunato* (Italian), the *Fuenclara* (Spanish) and the *De la Tour* and *Alberg* (Burgundian) *tercios*.

190 Almirante, *Bibliografia Militar*, 108–109.

191 *Ibid.*

192 *Ibid.*

193 *Ibid.*

able Spanish infantry,[194] another fine moment in Camassa's career would have occurred during this battle which had happened when the Italo-Spanish army of the Marquis of Leganés was advancing towards the Spanish Netherlands through Germany, as an escort to the new viceroy of that troubled territory, the Cardinal *Infante* Ferdinand, brother of the King of Spain.[195] In 1639 he had also discussed the new fortifications of Malta projected by Floriani in a historic encounter with Grand Master Lascaris' emissary, Vertova.[196] This meeting had taken place in the heavily-fortified Spanish base of Alessandria in northern Italy. Surrounded by the entire Spanish high command (which included Leganés, Don Francisco de Melos, Don Alvaro de Melos, Count Ferrante Bolognino, Don Martin d'Aragona and Don Giovanni de Garay), the "confessor, military advisor, professor of military architecture and mathematician" Camassa gave his esteemed opinion about Malta's new defences against the Turks. The Jesuit's name appears in a later 1680 *mémoire* concerning the victorious campaigns of the First Marquis of Leganés compiled by the military expert Gaspare Berretta, where "*Padre Gammasa*" features prominently among an impressive list of captains general and military engineers/mathematicians included by this author.[197] One source[198] states that Camassa was a student of Clavius, suggesting perhaps some interaction during Clavius' visits to Naples to set up the chair of mathematics in the Jesuit college.

The life history of Isasi and Camassa would suggest that the principal aim of the chair of *De re militari* at the *Colegio Imperial* was a utilitarian one with teaching assuming a clearly secondary role to the field consultancies of the Jesuit professors involved. Considered from this viewpoint it would have been understandable that the six professors of the mathematical faculty also happened to be well versed in military applications as their colleagues in the *De re militari* faculty were, also having good track records of active service.

The first case in point was that of Faille[199] who was born in Antwerp at a time when the Jesuit college founded in 1562 was fast becoming famous

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194 *Ibid.*

195 *Ibid.*

196 De Lucca, *Vertova*, 21 and 97 (reference to '*Padre Gammasa, Gesuita*').

197 Cobos-Guerra and Casto Fernández, *Arquitectura Militar Española*, 87–88 referring to Berretta's *Memoria* (1680).

198 See n. 182 (O'Neill and Dominguez ; D'Ayala).

199 For biographical information about Faille see Meskens, *Joannes della Faille* 127; O'Neill and Dominguez (ed.), *Diccionario*, 1371–1372 (*Faille*); Almirante, *Bibliografia Mili-*

for its pedagogical skills in mathematical instruction. Having joined the Jesuit Order in 1613, Faille taught mathematics at the college of Leuven in 1626–1628. He was from here transferred to Madrid to occupy one of the two chairs of mathematics in the new *Reales Estudios* (1633–1645). On 8 September 1638, King Philip IV appointed him *Cosmografo Mayor* of the Council of the Indies[200] (confirmed on 23 March 1639). One of his main duties in this capacity was to teach fortification mathematics to a special class of twenty-one royal pages when he was often expected to take promising students (in his very Baroque ornate horse-driven carriage) to sketch and measure fortified positions, explaining carefully the rules of perspective to help them acquire the skill of translating their field surveys into ground plans which were necessary for a potential attacker to draw up a proper siege strategy.[201] Faille was sometimes disappointed with the performance of his students[202] who, he once said, preferred fencing to intellectual effort! In the summer of 1641, the Jesuit's teaching activity at the *Colegio Imperial* was interrupted when he was appointed by the king to act as military advisor to the Duke of Alba, then in charge of the sensitive frontier zone of Cuidad Rodrigo.[203] Since this mission involved the installation of heavy artillery, Faille wrote to his friend, the Flemish military engineer Michel Florent Van Langren[204]—who had also been well known to Camassa—to send over the latest artillery manuals which were then being used against the 'heretics' of the Spanish Netherlands. It is recorded that in 1641–1644 Faille not only inspected and equipped all Spanish frontier positions proposing in the process several improvements to the Duke of Alba, but also advised the Count of Santisteban, a former student, regarding the fortifications of Badajoz.[205] It was here that he seems to have clashed with some Spanish officers who, he complained, "had studied but know nothing about military architecture."[206] Returning to Madrid in 1644 he resumed teaching activity in the *Reales Estudios*, replacing an inept substitute, the Jesuit José Martinez.[207] At the same time, he

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tar, 420; MacDonnell, *Jesuit geometers*, AHSI 97,a.XLIX (1980) 265–278; Diaz, *Colegio Imperial* 210 and 530; ARSI, SMV, III, 529–530 and AHSI, 103a, LII (1983) 59 and 70.

[200] Meskens, *Joannes della Faille*, 54–55.

[201] *Ibid.,* 54.

[202] *Ibid.,* 55.

[203] *Ibid.,* 56 and 162, fn. 228.

[204] *Ibid.,* 56 and 162, fn. 229.

[205] *Ibid.,* 57.

[206] *Ibid.*

[207] *Ibid.*

was appointed private tutor to the *Infante* of Spain Don Juan José of Austria. In this capacity he taught Don Juan all about fortification building and navigation, well preparing him for his designated post of Admiral of the Spanish fleet (March 1647).[208] This gave him the opportunity to accompany his student on the high seas, not only devising the capture of a French merchant vessel bound for Lisbon but also visiting Palermo, Messina, Naples and Barcelona and participating in the sieges of Porto Longone and Piombino on the island of Elba (1650).[209] Faille also revised a fortification project for Pamplona which had been drawn up by Isasi[210] and experienced active service outside Barcelona which capitulated to Spanish forces on 13 October 1652. According to Meskens,[211] the Jesuit remained in the city giving valuable advice as to how to improve its defences and taught fortification mathematics in the Jesuit college classrooms. He died of a heart attack on 4 November 1652 and was awarded a Baroque *festa funebre* fit for a prince,[212] bequeathing to posterity a lost manuscript entitled *Tratado de Fortificacion*[213] which he had deposited in the library of the *Colegio Imperial*. Two important contemporaries, both Jesuits, were the Spaniard Francisco Isidro de Monzon who travelled widely as an '*ingegniero real*' fixing fortifications in Galicia and the spy, Ignacio Rojo, who sent regular news bulletins about the movements of the Imperial armies to Madrid, from the Jesuit college of Olmütz in Moravia.[214]

The mathematicians Semple[215] and Richard[216] respectively occupying professorial chairs at the *Colegio Imperial* in 1630–1654 and 1636–1664,

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208 *Ibid.*

209 *Ibid.* See also Philippe Bragard's 1997 doctoral thesis presented at the University of Louvain-le-Neuve.

210 Echarri Iribarren, *Pamplona*, 250, fn. 45.

211 Meskens, *Joannes della Faille*, 62 and 164, fn. 264.

212 *Ibid.,* 63 reproduces the epitaph engraved on Faille's tombstone.

213 *Ibid.*,129. See also Almirante, *Bibliografia Militar*, 420. According to Meskens, Faille also compiled treatises on meteology, astronomy, Euclid, trigonometry, geometry, instrumentation, physics, civil architecture and navigation.

214 Almirante, *Bibliografia Militar*, 109. For Monzon (1609–1684) who joined the Jesuits on 25.03.1627 see ARSI, SMV, V, 1269. For Rojo (1600–1644) who joined the Jesuits in 1619 see ARSI, SMV, VII, 27.

215 For biographical information about Semple, who joined the Jesuits in 1615, see Almirante, *Bibliografia Militar*, 803; Diaz, *Colegio Imperial*, 545; Capel, *geografia*, 3 and fn. 16–17 and ARSI, SMV, VII, 117.

216 For biographical information about Richard, known in Madrid as *Padre Riccardo*, see Almirante, *Bibliografia Militar* 738; Diaz, *Colegio Imperial*, 210 and 542; O'Neill and Dominguez (ed.), *Diccionario*, 3349 (*Richard*); AHSI, 103a, LII (1983) 66 and 76 and Romano,

52. The 1733 'Montemar' plan of the fortifications of Malta kept in the *Archivio di Stato* of Naples, showing the inner S. Margherita girdle of fortifications enclosing the three cities and the Floriana defences with its projecting hornwork, outside Valletta [De Lucca, 2003]. Reproduced with the kind permission of the Italian *Ministero per i Beni e le Attività Culturali—Archivio di Stato di Napoli* [*autorizzazione alla pubblicazione nº 16/2011*].

were Jesuits who were greatly interested in military matters. The first was a Scotsman who was transferred to Madrid after completing his studies at the University of Alcalà (afterwards also assuming responsibility for the running of the *seminarium nobilium* known as the Scots College in Madrid that had been opened in 1627 to train Scottish Catholic nobles).[217] The second was a Frenchman who had previously been teaching mathematics in Lyon, reaching Madrid via Lisbon in 1630 when his plans to go to China had been thwarted by order of King Philip IV who instead wanted him to join the *Reales Estudios* team where he was asked to take up the prestigious post of *Cosmografo Real* up to his death on 20 October 1664 in Madrid.[218] Both Jesuits acted as royal consultants. In this capacity, Semple (whose original name was Lord Hugh Semple of Craigbait and Langside) wrote his *Gobierno y Disciplina de los ejercitos y presidios*—a document which resulted from a lengthy consultation process with the Spanish council of war concluded on 19 July 1653.[219] Richard, known in Spain as '*Claudio Riccardo*', not only drew up detailed reports on the fortification of Malta (1639), San Sebastian (1641) and Pamplona (1643) but also joined the Marquis de Celada on a military campaign during the 1640–1652 Catalonia conflict. In 1645, Richard demonstrated great courage when he travelled to the Spanish Netherlands via England disguised in a layman's attire, to personally supervise the printing in Antwerp of his *Euclides Elementorum Geometricorum Libros* (1645). This book could have been inspired by Semple's earlier mathematical work *De Mathematicis Disciplinis Libri Duodecim* (1635).[220]

At this time the presence in Madrid of a former Scottish mercenary colonel called William Semple of Lochwinnoch (1546–1630) whose role was to advise Philip IV about military strategy and diplomatic manoeuvres against England—the person who had in 1627 founded the Jesuit Scots college in Madrid and the author of a volume entitled *Discurso sobre*

Contre-riforme mathematique, 47 and 71. See also MacDonnell, *Jesuit Geometers*, Appendix I, 12.

217 Capel, *geografia*, 3.

218 O'Neill and Dominguez (ed.), *Diccionario*, 3349 (*Richard*).

219 Almirante, *Bibliografia Militar*, 803.

220 For Richard's involvement with Malta, see Hoppen, *Fortifications of Malta*, 124–125 and 287 and De Lucca, *Vertova*, 43. For his involvement at San Sebastian and Pamplona, see Cobos-Guerra and Castro Fernández, *Arquitectura Militar Española*, 83 citing AGS, GM leg. 1373 and Echarri Iribarren, *Pamplona*, 250 fn. 45. For Richard's association with Celada and his travels, see O'Neill and Dominguez (ed.), *Diccionario*, 3349 (*Richard*). The third book of Semple's 1635 work (which was dedicated to the King of Spain), dealt with fortifications.

el gobierno de mar y terra de España (1601)—seems to have been very beneficial for the immense prestige of Jesuit mathematicians.[221] This was demonstrated when Richard was in 1639 requested by King Philip IV to carry out a study of the fortifications of Malta. The king had been contacted for the purpose by Grand Master Lascaris.[222] Richard's conclusions, dated 14 October 1639 and communicated to the Grand Master with a covering letter from Philip dated 25 November 1639,[223] focused on the new S. Margherita and Floriana fortifications that were then being built in Malta. While savagely criticising the S. Margherita fortifications on the grounds that they were sprawling and would cost too much besides taking too long to build (so that it would have been far better to construct, as the king had also proposed, two strong fortresses rather than a ring of defences), the Jesuit *mathematicus* applauded the new Floriana defences for eight reasons. These fortifications had few bastions thus saving on labour and costs. They were protected by superbly-designed ditches. Their cost was much less than the cost of what was being proposed for the other side of the Grand Harbour. The number of soldiers needed to defend them was roughly equivalent to the number required to defend the Valletta fortifications behind them, this facilitating interactive offensive and defensive operations without additional troops. The awesome sight of the Floriana and Valletta fortifications would make it very difficult for the enemy to count the exact number of Hospitaller soldiers defending them. The Floriani fortifications would have excellent retreat facilities. The enemy's strength would be severely compromised because of the time and energy that would have to employ in penetrating the new fortifications. As a final point, Floriani's powerful defences just in front of the older Valletta landfront would guarantee of the safety of the city's inhabitants. It can be seen that Richard's report addressed the three critical factors of seventeenth-century defensive warfare—fortification design, logistic support and the time factor, the latter being very important in the case of an island which, as the 1565 siege experience had shown, very much relied on help from Spanish Sicily.

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221 Saenz-Cambra, *Lochwinnoch*, various pages.

222 NLM, AOM 256, f. 185.

223 NLM, AOM 6554, ff. 59–61. The King's letter was registered in the *Liber Conciliorum Status* on 26 December 1639 for which see NLM, AOM 257, f. 40.

The death of Richard in 1664 and the appearance on the scene of the Jesuit *mathematicus* Zaragoza[224]—to occupy in 1670–1679 the chair of mathematics of the *Reales Estudios* and the post of *Cosmografo Real*—marked the end of the slow death of the unorthodox *De re militari* chair. A high point in Zaragoza's career happened in 1675 when he was appointed by the regent Mariana of Austria to teach mathematics to her son, the physically disabled and mentally retarded Charles II of Spain. At this time the Jesuit was also giving private lessons to the third Marquis of Leganés, Don Diego Felipe de Guzmán who in 1693 included and acknowledged the value of his master's teachings about fortifications in his *Escuela de Palas* treatise, published during his governorship of Milan in 1691–1698.[225] Zaragoza authored a large number of works about mathematical subjects which included a volume on mathematical instruments for use in war and peace entitled *Fabrica y uso de varios instrumentos matematicos* (1675). He also considerably raised the credibility of the Spanish or '*Austriaca*' school of military thinking, offering a viable alternative to the established Italian, French and Dutch schools and inspiring the setting up of the new R*eal Academia Militar de Matemáticas* in Barcelona in October 1720 for the proper formation of military engineers and officers of the Spanish army.[226] This academy soon became a model and goad for others founded at Oran and Ceuta, where fortification courses were focused on not only resurrecting all the 'maxims' that had featured repeatedly in Jesuit teachings on the subject all over Europe, but also on using advanced Jesuit trigonometry to satisfy the different permutations and combinations of 'regular' and 'irregular' fortifications, terrain conditions, timing factors and the proper use of artillery.[227] The contribution of the Jesuits in seventeenth-century Spain becomes even more significant when one considers that the military applications of mathematics to fortress design had been and were still conspicuously absent in the mathematical syllabi of all the leading Spanish Universities. Zaragoza, one of the major protagonists of this underestimated Jesuit contribution, died on 14 April 1679. His successor

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[224] For biographical information on Zaragoza, who joined the Jesuits on 01.02.1651, see ARSI, SMV, IX, 1465–1468. See also O'Neill and Dominguez (ed.), *Diccionario*, 4071–4072 (*Zaragoza*), Diaz, *Colegio Imperial*, 210, 530 and 550; Cobos-Guerra and Castro Fernández, *Arquitectura Militar Española*, 83, Capel, *geografija*, 3–10 and Almirante, *Biografia Militar*, 923 who mentions the Zaragoza's treatises *Architectura Militaris* (1674) and *Libro de instrumentos matematicos y arte de fortificar* (1674).

[225] BNE, *Escuela de Palas*, II, I, 96–99.

[226] Gonzalez-Capel, *Curso de Cosmografía* consulted online.

[227] *Ibid.*

to the chair of mathematics was the Moravian Jesuit Jacob Kresa (1647–1715) who was substituted for a short time by his former student Francesco Larrondo de Mauleon, the founder of the above-mentioned Barcelona academy. Kresa was towards the end of the seventeenth century succeeded by the French Jesuit Juan Francisco Petier (1641–1695).[228]

It is indeed ironic that the teaching of fortification in eighteenth-century Spain was inaugurated not by a Jesuit but by a priest belonging to the Congregation of S. Felipe de Neri called Tomás Vicente Tosca who in 1707–1715 published a very influential nine-volume work entitled *Compendio Mathemático*. The fifth chapter of this work was mainly dedicated to military architecture and artillery theory[229] and was clearly influenced by the work of the Jesuit Milliet de Chales. At this time, the Jesuit *mathematicus* in Madrid was José Cassani, son of the nobleman Don Juan Bautista Cassani who had represented the Catholic Swiss cantons in Madrid.[230] During his 1701–1732 tenure, Cassani very bravely managed to balance the terse military thinking that becomes explicit in his *Theses matheseos de militari architectura, et cosmographia* (presented to a packed audience in the grand hall of the *Colegio Imperial* on 2 September 1704) and in his *Escuela militar de fortificacion ofensiva y defensiva, Arte de fuegos y de esquadronar* (1705) with the intensely emotional sentiments expressed in his writings about the lives of the Catholic Saints Stanislao Kostka, Luis Gonzaga and Juan Francisco Regis. These writings became instrumental for the subsequent canonisation of the three Jesuits later on in the century. Similar tensions between military and spiritual values can also be detected in Cassani's discussions in his second military book on "the art of firing and of squadron formations where any soldier relies on what he should know to act intelligently during the siege or defence of a city, distributing outposts, manning artillery and bombs and understanding the theory of the movement of bullets and bombs, also the manoeuvres of squadron formations" and in the Jesuit's commemoration of the spiritual endeavours of the Jesuit missions in the New World, recorded in a hefty volume entitled *Historia de la Provincia de la Compañia de Jesus del*

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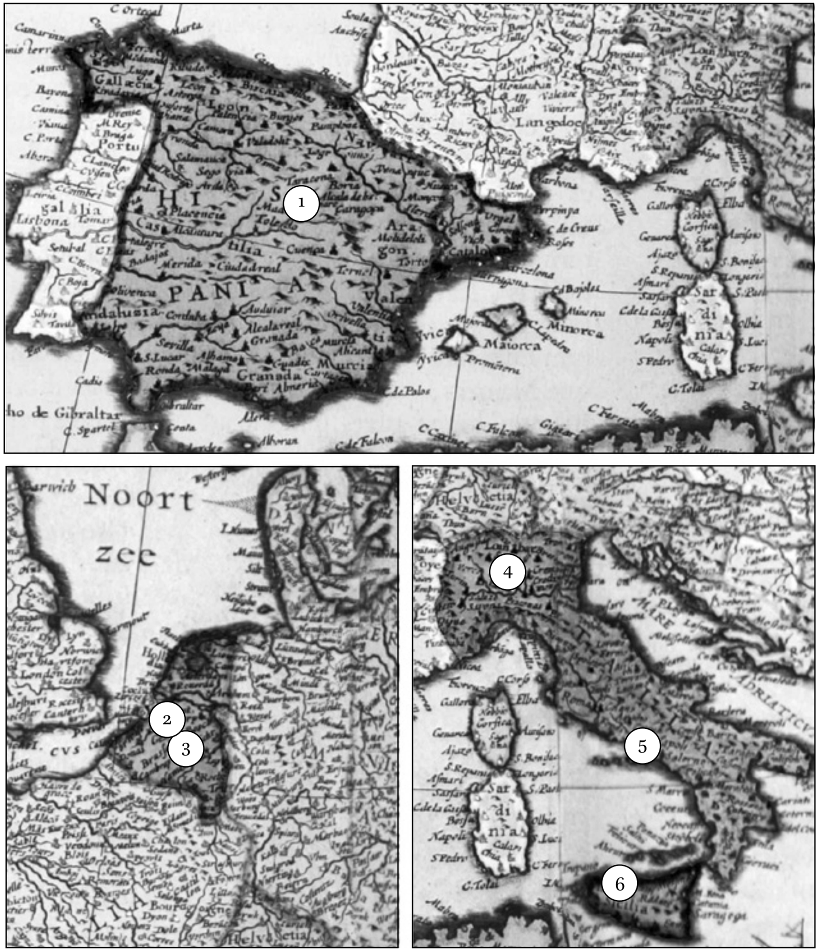
[228] Capel, *geografia*, 3–10.

[229] The contents of chapter V are '*Arquitectura Civil, Montea y Canteria, Arquitectura Militar, Pirotecnia o Artilleria*'

[230] For biographical information about Cassani see ARSI, SMV, II, 812–816; O'Neill and Dominguez (ed.), *Diccionario*, 695 (*Cassani*); Diaz, *Colegio Imperial*, 84 and 520; Almirante, *Bibliografia Militar*, 134–135; D'Ayala, *Bibliografia*, 90; Cobos-Guerra and Castro Fernández, *Arquitectura Militar Española*, 83 and Suarez, *El Siglo de las Luces*, 469–518.



Names and teaching dates of Jesuit mathematicians providing fortification instruction:

1. Madrid (Hermann Hugo, 1625; Francisco Isasi, 1630-1633; Francisco Antonio Camassa, 1634-1640; Juan Carlos de la Faille, 1633-1645; Hugh Semple, 1630-1654; Claude Richard, 1636-1664; José Zaragoza y Vilanova, 1670-1679; José Cassani, 1701-1732; Tómas Cerda, 1765-1767).
2. Antwerp (Gregorius de Saint-Vincent, 1617-1621; André Tacquet, 1645-1648 and 1656-1660; Ignace De Jonghe, 1665-1670; Jean Baptiste Billot, 1678-1679 and Joachim van Papenbroeck, 1679-1680).
3. Louvain (Gregorius de Saint-Vincent, 1621-1625; Juan Carlos de la Faille, 1626-1628; Ignace Der-Kennis, 1628-1633; Guillaume van Hees (Hesius), 1628-1633; Guillaume Boelmans, 1633-1635; Jan Ciermans, 1636-1641; Alexandre Barvoets, 1642-1644; André Tacquet, 1644-1645 and 1649-1656; Philippe Jacobs, 1645; Henri De Prince, 1667-1669; Aloysius Hardevuyst, 1671 and 1678 and François van Callenberghe, 1687-1690).
4. Milan (Tommaso Ceva, 1675-1721 in the Collegium Mediolanense and Giovanni Rossignol, 1768-1773 in the Collegium Mediolanense Nobilium).
5. Naples (Francisco Antonio Camassa, 1631-1632).
6. Palermo (Caspar Schott, 1648-1651 and Giacomo Masò, 1659-1663).

53. Jesuit institutions in Spain and its European dominions providing fortification instruction in the Baroque age superimposed on Joan Blaeu's 1665 map of Europe.

Nuevo Reyno de Granada en la America(1741).[231] The association of military-minded Jesuits with the Madrid college ended in 1767 when the last Jesuit *mathematicus* Tomás Cerda who had occupied the chair since 1765 was ordered to leave Spain by King Charles III (1716–1788), dying in Forlì, Italy in 1791.[232] Besides having served as *Cosmografo del Real Suprema Consejo de Indias*, this Cerda had also taught theology and philosophy at the Jesuit colleges of Zaragoza, Gerona and Ververa and mixed mathematics at the Jesuit *seminarium nobilium* of Santiago de Cordelles in Barcelona. In 1764 he had published a textbook entitled *Lecciones de artilleria* for use in the *Real Academia de Caballeros Cadetes del Real Cuerpo de Artilleria* at Segovia where the professor of military mathematics was another Jesuit from Valencia called Antonio Eximeno, the author of *Manual del Artillero* (1772).[233]

Outside Spain, in the European dominions of His Catholic Majesty, the principal centres of diffusion of Jesuit military knowledge were those situated in the Spanish Netherlands (Louvain and Antwerp), Northern Italy (Milan) and Southern Italy and Sicily (Palermo). The presence of eminent Jesuit mathematicians who produced recorded works on military architecture in the mathematical faculties of the German colleges of Dillingen, Freeborg, Ingolstadt, Cologne, Linz, Tier, Munster, Graz and Vienna would also suggest the dissemination of Jesuit military knowledge in the dominions of Spain's traditional allies, the Catholic principalities of the Holy Roman Empire.

In the first half of the seventeenth century, the Jesuit colleges of Louvain and Antwerp—situated at the northern extremity of the *Spanish road* linking the Spanish-occuped Netherlands and Milan—were regarded by the King of Spain as loyal institutions that could offer reliable advice to the high-ranking officers of his occupation forces. The very busy Jesuit *mathematicus* was here expected not only to teach but also to solve any problems that would arise concerning fortifications and siege works in this indeed sensitive Catholic-*versus*-Protestant scenario. In these circumstances

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[231] O'Neill and Dominguez (ed.), *Diccionario*, 695 (*Cassani*).

[232] For biographical information about Cerda see ARSI, SMV, II, 992–993; Almirante, *Bibliografia Militar*, 145 and Diaz, *Colegio Imperial*, 144, 211 and 521.

[233] For biographical information about Eximeno (1729–1808) who joined the Jesuits on 16-10-1745, see ARSI, SMV, III, 491–495. Eximeno had been entrusted by Felix Gazola, count of Esparavera, to deliver the inaugural oration of the Segovia military school which had been set up by Charles III of Spain. Deported to Rome in 1767 he afterwards dedicated the rest of his life to science.

exceptionally close links were forged between the Jesuit Order and the Spanish school of military engineering in Brussels known as the *Escuela de Bruselas*.[234] One case in point concerned the Flemish military engineer and cosmographer Van Langren who met and corresponded regularly with the Jesuits Faille and Richard.[235] These links reached a salient point in 1644 when a key manual of military architectural practice for use by the Spanish armies authored by the head of the *Escuela de Bruselas*, Juan de Santans y Tapia, was presented to the senior staff of the Spanish army with all pomp and ceremony by the Jesuit *mathematicus* Ignace Der-Kennis (1598–1656), professor of theology, rhetoric, philosophy and the mathematical disciplines at the Jesuit college of Louvain. This Jesuit—one of the protagonists in the fight against the Protestant United Provinces—is recorded to have said: "I have great faith that this work will not only reveal the military fortitude of the illustrious Spanish nation, but will also serve as a guide for the diffusion of Spanish fortification knowledge throughout the universe."[236]

The close relationship between Jesuit mathematicians and the Catholic forces in the Spanish Netherlands had largely resulted from the good offices of general Alessandro Farnese, whose presence here in 1577–1590 had not only led to the establishment of the Jesuit military chaplaincy but also to the foundation of several new Jesuit colleges to supplement those that had already been established at Louvain (1547), Tournai (1562), Saint Omer (1567), Douai (1568), Liège (1569), Bruges (1570), Aix (1574), Antwerp (1575) and Maastrich (1575).[237] The new colleges which mushroomed all over the place in the wake of the victories of Farnese were those of Lille (1578), Valenciennes (1581), Mons (1583), Courtrai (1583), Gand (1585), Ypres (1592), Berques (1594), Mons (1583), Arras (1600), Luxembourg (1603), Brussels (1604), Dunkirk (1612), Cassel (1613), Ardenarde (1615), Lierre (1616), Balleul (1617), Aalst (1620), Hal (1621) and Breda (1625), organised after 1612 into two separate administrative Jesuit provinces known as the *Provincia Gallo-Belgica* and the *Provincia Flandro-Belgica*.[238]

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[234] Cobos-Guerra and Castro Fernandez, *Arquitectura Militar Española*, 83–87 and 91–92 give detailed information of the *Escuela de Bruselas* and its development.

[235] See n. 204.

[236] Suarez, *El siglo de las Luces*, 491. For Der-Kennis see also ARSI, SMV, II, 1940–1943.

[237] O'Neill and Dominguez (ed.), *Diccionario*, 391–397 (Belgica); Giacardi and Roero, *Matematica, arte e technica* (article on *Mathematique architecture et mecanique a l'ecole de Francois d'Aguillon et de Gregoire de Saint-Vincent* by Patricia Radelet-de-Grave); Bangert, *Society of Jesus*, 77–78 and 140–143 and Poncelet, *Histoire*, 158, 163 and 180.

[238] *Ibid.*

Of these colleges, the only ones that provided formal mathematical education were those at Antwerp, Louvain and, to a much lesser extent, Douai—making them popular venues for Spanish officers seeking advice about fortifications.[239] The reputation of the Jesuit Order for diffusing fortification knowledge reached a high point in 1640 when Ciermans devised his revolutionary course in Louvain targeted at the senior officers of the Spanish army, not only teaching all that concerned military architecture but also supplementing his classroom instruction with long sessions of private lessons given from time to time at the Antwerp Jesuit college.[240] Among Ciermans' illustrious students one can mention Baron Wolfgang Philippus Unverzagt of Ebenfurt, Counts Christopher and Jacobus Rozdrazewski, Leo Carolus Sapieha, Philippus Eugenius and Theodore d'Immerseel and the noble Joannes Antonius Tucher, son of the Lord Mayor of Antwerp.[241]

It had all started in 1606 when the Jesuits in Antwerp, striving to transform the spiritual desolation of that metropolis into a Jesuit paradise as explained in Moreti's *Imago Primi Saeculi Societatis Iesu a Provincia Flandro-Belgica* (1640), wrote a letter to the city mayor stating that they were:

> prepared to eventually make all the necessary arrangements for mathematical instruction which is not taught at any university yet is the basis of many of the arts which will prove to be most useful to a commercial metropolis such as this, not merely for the adornment and honour of the city, but also for the benefit of all those who deal in commerce in all Flanders.[242]

Following a positive reaction to the contents of this letter, the Jesuit promoter of this initiative, Francois d'Aguilon (1506–1617)—the architect of the first Baroque church in the city dedicated to St. Charles Borromeo and the author of a volume entitled *Opticorum Libri Sex philosophis iuxta ac mathematicis utiles* (1613)—made all the necessary arrangements to obtain in 1614 the necessary clearance from Aquaviva in Rome to set up a special unit devoted to mathematical teaching within the already estab-

[239] AHSI 93, a.XLII (1978) 167, 169, 171 and 178.

[240] See chapter 1, n. 147 and n. 209 above.

[241] Bruycher, draft of article in '*Philosophia Scientiae*' (University of Nancy) entitled 'To the adornment and honour of the City'. According to Bragard, Tucher presented a thesis on *De Militari Architectura positiones* promoted by Ciermans. See also ARSI, SMV, II, 1186 for the theses of Unverzagt (1641), Rozdrazewski (1639) and Sapieha (1639) presented to an examining board chaired by Ciermans.

[242] *Ibid.*

lished Academy of Church History at the Antwerp college.[243] These events had marked the commencement of all Jesuit mathematical courses in the Spanish Netherlands based on a flexible curriculum ranging from 'purist' to 'applied', depending on the interests of the Jesuit *mathematicus* concerned. These courses were subsequently organized on a quasi-alternating basis in Antwerp (1617–1621, 1645–1648, 1656–1660, 1665–1670 and 1679–1681) and Louvain (1621–1645, 1649–1656, 1667–1669, 1671–1678 and 1687–1690).[244] Besides Aguilon, who had often served as a fortifications consultant to the city of Antwerp, the principal protagonists of mathematical tuition focused on military applications were Gregorius de Saint-Vincent (Antwerp 1617–1621 and Louvain 1621–1625),[245] Juan Carlos de la Faille (Louvain 1626–1628),[246] Jan Ciermans (Louvain 1636–1641)[247] and Andrè Tacquet (Louvain 1644–1645, Antwerp 1645–1648, Louvain 1649–1656 and Antwerp 1656–1660).[248]

Saint-Vincent (1584–1667), one of Clavius' brightest students, had first served as an advisor and military chaplain to Catholic troops stationed in the Spanish Netherlands (1616–1617) and then moved on to became the trusted military advisor and confessor of Emperor Frederick II (1626–1632), fleeing from the city of Prague when it was attacked by the Swedish army in the course of the Thirty Years War to reach Vienna. He was then transferred to the Jesuit college of Ghent where he died on 27 January 1667.[249] A similar career was followed by the Jesuit Tacquet (1612–1660) who also seems to have been heavily involved in giving military advice concerning fortification building[250] as also did other Jesuits like Ignace Der-Kennis, Guillaume Van Hees (Hesius), Guillaume Boelmans,

243 AHSI 97, a.XLIX (1980), 265–278. See also Ziggelaar, *Aguilon*, 45–52. According to professor Piet Lombaerde of Louvain, Aguilon was often asked to advise on the new fortifications of Antwerp.

244 AHSI 97, a.XLIX (1980), 265–278.

245 *Ibid.*

246 *Ibid.*

247 *Ibid.*

248 *Ibid.*

249 ARSI, SMV, VII, 440–443. See also AHSI 97, a.XLIX (1980) 279–303 (article on *Chronologie et analyse des manuscripts mathematique de Gregoire de Saint-Vincent, 1584–1667* by Herman Van Looy).

250 Omer Van de Vyver writing in AHSI 97, a.XLIX (1980) 265–278 says that Tacquet, who joined the Jesuits on 31-10-1629, presided over the examination of two theses presented in Louvain by Count Theodore d'Immerselle (3 September 1652) and Count Philippus Eugenius (29 March 1651), both Cierman's students and both mentioned in ARSI, SMV, VII, 1806–1809. His later *Opera Mathematica* (Antwerp, 1668) contained a 36-page section dedicated to '*Architectura Militaris*' translated into English by J.L. in 1672.

Alexander Barverts, Philippe Jacobs, Ignace de Jonghe, Henri de Prince, Aloysius Harderiyst, Jean Baptiste Billot, Joachim van Pappenbrock and Francois van Callenbergh, during their terms of teaching at Louvain and Antwerp in 1628–1690.[251] In the context of the military build-up of Spain in the Netherlands, it is possible to draw up a picture of all these belligerent Jesuits, united in their desire to halt the advance of 'heresy' from the United Provinces, participating in numerous sieges alongside their former students and colleagues of the *Escuela de Bruselas*. For these were the times when Don Francisco Lanario y Aragon and Juan de Santans y Tapia were writing the important treaties entitled *Los Tratados del Principe y de la Guerra* (1624) and *Tratado de Fortificacion Militar* (1644) and when Fernandez de Villareal y Prado was about to publish a very popular Spanish translation of Fournier's treatise under the title *Architectura militar o fortificacion moderna* (1649). At the dawn of the eighteenth century, Sebastian Fernandez de Medrano, perhaps the most famous teacher at the *Escuela de Bruselas*, authored an important work—clearly influenced by Jesuit research—entitled *El arquitecto perfecto en el arte militar* (1700).[252] Medrano's students included the Flemish Jorge Verboom who was in 1693 appointed senior military architect in the Spanish Netherlands, later promoted to *Ingeniero Mayor de Reino* (1710) and director of the new military academy in Barcelona.[253]

A repeat story of the close Jesuit relationship with the *Escuela de Bruselas* seems to have happened in Milan where the *Escuela de Palas*, closely associated with the Jesuit college and its *seminarium nobilium*, represented a focal point of diffusion of military knowledge to the Spanish armies of Lombardy, once led by the famous First Marques de Leganés. It is in this respect significant that the *Escuela de Palas* treatise (1693) compiled by the Third Marques of Leganés and José Chafrion, both students of Zaragoza, was introduced by the Jesuit *mathematicus* Tommaso Ceva (1648–1777)[254] and that one of the most eminent Jesuit professors of mathematics teaching in the seminary for nobles founded in Milan in 1684, was Giovanni Rossignol (1726–1817).[255] Ceva, who taught mathematics in 1675–1680 and 1681–1721 was a close collaborator of the Spaniards,

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[251] AHSI 97, a.XLIX (1980) 277–278.

[252] Cobos-Guerra and Castro Fernandes, *Arquitectura Militar Española*, 83–87 and 91–92.

[253] *Ibid.*

[254] For biographical information on Ceva, who joined the Jesuits on 24-03-1663, see AHSI, 103a, LII (1983) 83 and 87.

[255] For biographical information on Rossignol, who joined the Jesuits on 10-09-1742, see ARSI, SMV, VII, 183 and AHSI, 103a, LII (1983) 83 and 90–91.

authoring a book entitled *Opuscula Mathematica* (1699) and designing an instrument to divide a right angle into a given number of equal parts while Giovanni Rossignol, who taught mathematics in 1768–1773, authored two books on military architecture entitled *Ballistique* (1802) and *Sur L'art de fortifier les places* (1805). Incidentally, Ceva was also a poet who used his considerable literary talents in the introductory "*Idyllium*" to the *Escuela de Palas* treatise which he prosaically calls the *"Liber Universae Matheseos selectas disciplinas continens cum sub nomine Palladis in lucem venerit*."[256] Further evidence of the close links that existed between the Jesuits and the Spanish military authorities is provided by Berretta's 1680 mémoire[257] which had included the name of Camassa among the famous names associated with a long list of places fortified in the Milanese "under the orders of fifteen captain generals and according to the designs of eighteen military engineers and military mathematicians and the daily *camerales* engineers". Another important contemporary document mentioning the Jesuit contribution was José Chafrion's mémoire (1687) entitled *Plantas de las Fortificationes de la Cuidades, Plazas y Castillos del Estado de Milan*.[258]

A good indication of the close collaboration of the Jesuit Order with the military authorities of Spanish Sicily, occurs in Palermo. Here, the *Collegio Massimo*, founded in 1549 and fitted with a fully fletched *seminarium nobilium* in 1728, had a long history of excellence in mathematical education which had started when Grienberger had lectured here in 1609–1610 and reached a high point in 1658–1663 when the Jesuit *mathematicus* Giacomo Masò arrived here from Malta.[259] The Jesuit college in Palermo had a magnificent library of books which, among other things contained some 185 volumes on fortification themes which would have better adorned the reference library in the Viceroy's palace further up the road rather than that of the Jesuits. The long list of authors indicate that the Jesuit professors of mathematics (and their students) were well aware of and had access to the fortification treatises of most of the better-known military theorists of early modern Europe.[260]

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[256] BNE, *Escuela de Palas*, I, i-v.

[257] See n. 197.

[258] Almirante, *Bibliografia Militar*, 211–212.

[259] AHSI 103 a.LII (1983) 83 and 89.

[260] The Jesuit library of the *Collegium Panormitanum* is now integrated in the BCRS occupying the former premises of the Jesuit college in 429–431, Corso Vittorio Emanuele, Palermo. The wide range of books that could be consulted in this library (marked '*Biblioteca ex Gesuitica Matematica*') ranged from classical works by Galeazzo Alghisi, Carlo Aquino, Theodoricus Baegk, Bernard Forest de Belidor, Gian Battista Bellucci, Alessandro

Names and teaching dates of Jesuit mathematicians providing fortification instruction:

1. Freiburg-im-Breisgau (Theodoric Baegk, 1629-1634).
2. Graz (Franciscus Menegatti, 1660-1661; Ernestus Vols, 1692-1696).
3. Ingölstadt (Franciscus Storer, 1646-1650).
4. Cologne (Jacques Martini, 1677-1679).
5. Linz (Ernestus Vols, 1684-1686).
6. Münster (Michael Cuvelier, 1630-1631).
7. Vienna (Franciscus Menegatti, 1661-1662 and Ernestus Vols, 1717-1720 in the Collegium Vindobonense and Christianus Rieger, 1757-1760 in the Theresianum seminarium nobilium).
8. Vilnius (Wojciech Tylkowski, late 17th century).
9. Trier (Jacques Martini, 1668-1670).
10. Dillingen (Albertus Curtz, 1626-1629).
11. Würzburg (Caspar Schott, 1655-1657 and 1665-1666).

Other Jesuit institutions where military arts were included in the Jesuit curriculum of studies were those of Kalisz (12); Lublin (13); Lemberg (14); Ostrog (15); Poznan (16) and Warsaw (17).

54. Jesuit institutions in Germany providing fortification instruction in the Baroque age superimposed on Joan Blaeu's 1665 map of the region.

Spain had been the staunchest ally of the Holy Roman Empire during the Thirty Years War (1618–1648)—the natural result of the related Habsburg occupants of the thrones of Spain based in Madrid and of the Empire based in Vienna. In this context it would have been inevitable that the Jesuit interest in diffusing military knowledge through its mathematical faculties in its many German colleges would have been as persistent as it was in the Spanish dominions ruled directly from Madrid, particularly so because the Protestant threat in Germany had prompted many Jesuits to react fiercely to this problem. One case in point had occurred when three zealous Jesuits called Adam Tanner, Paul Windeck and Vitus Eberman openly incited all German Catholics to take up arms for the extermination of 'heretics'.[261] In this context, Windeck and Eberman had reportedly said "For what objective have we given to us money, soldiers, sabres and cannons but to use them against the enemy? Why do we hesitate, then, in commencing to eradicate and root out heresy root and branch, and especially the Calvinist abomination?"[262] Another anonymous Jesuit had added that "It would be better to marry the devil than a Lutheran woman."[263]

In the face of such rhetoric, the Jesuit stance in Germany would have been exceptionally charged and militant. The focal points of diffusion of military knowledge were the colleges of Freiburg im Breisgau,[264] Graz,[265]

Capra, Giacomo Castriotto, Girolamo Cataneo,, Menno von Coehoorn, Mattias Dogen, Pietro Paolo Floriani, Guarino Guarini, Jacobo de Lanteri, Bonaiuto Lorini, Gerolamo Maggi, Hugh Manesson Mallet, Samuel Marolois, Bernardo de Mendoza, Raimondo Montecuccoli, Mutio Oddi, Comte de Pagan, Christof Rieger, Charles de Saint-Julien, Pietro Sardi, Maurice de Saxe, Nicolò Tartaglia, Carlo Theti, Gian Battista Valle, Monsieur de Vauban, Flavius Vegetius Renatus and Gian Battista Zanchi to some very rare works conspicuous among which was Domenico Marincola da Taverna's *Trattato delle ordinanze di squadroni* published in Naples in 1637. The Jesuit library in Palermo also contained works by Clavius, Stevin, Copernicus, Kepler, Grienberger, Kircher, Grassi, Richard, Masò, Campanella, Milliet de Chales, Pardies, Semple and Galileo as well as a number of documents of a purely military nature such as *Instruzione della militia de Sicilia riformata dal Vicerè Olivares nel 1595*, *Ordinanza di S.M. Siciliana pe' granadieri e fucilieri dell'infanteria* and Marsigli's *Stato militare dell'impero Ottomano* published in 1732.

261 Griesinger, *The Jesuits*, 240–241.

262 *Ibid.*

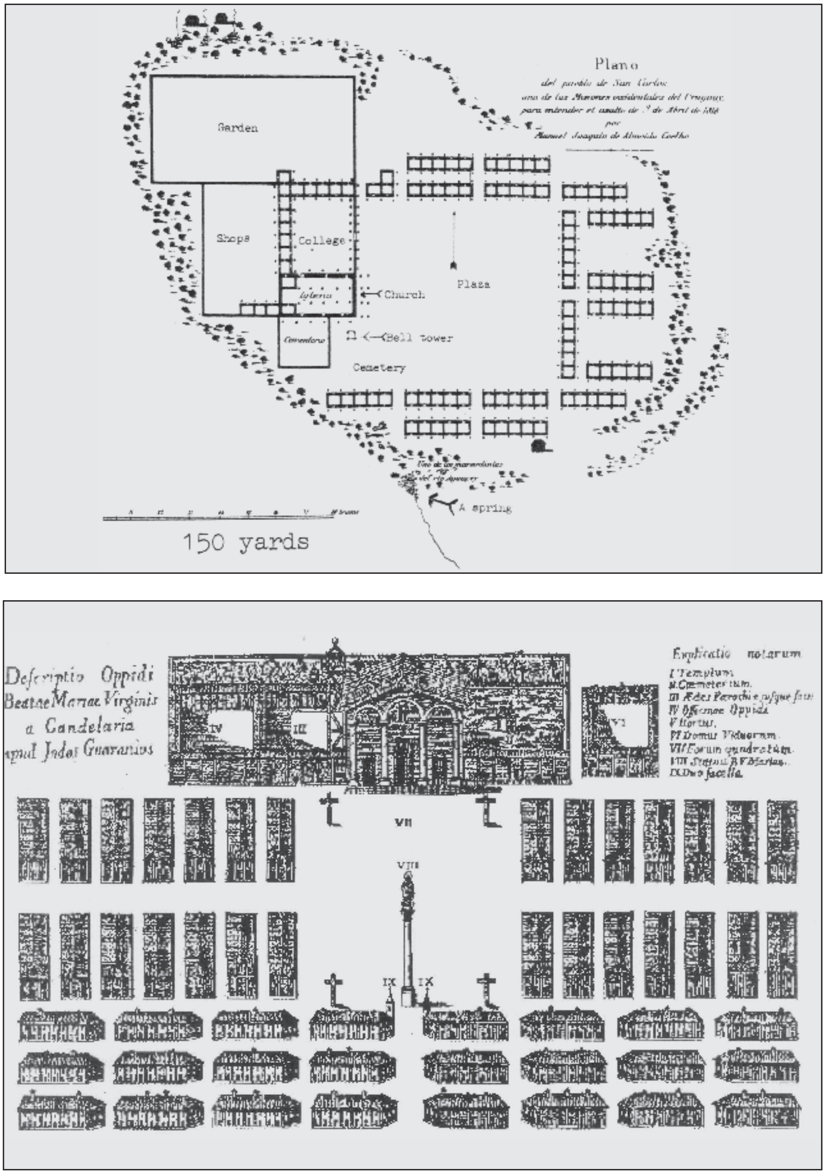
263 *Ibid.*

264 AHSI 93, a.XLVII (1978) 172 and 191.

265 *Ibid.,* 173, 209 and 221.

Ingolstadt,[266] Cologne,[267] Linz,[268] Münster,[269] Vienna[270] (Christianus Rieger who was teaching here at the *Theresianum seminarium nobilium* in 1757–1760 was placed in charge of the *Architectura Civilis et Militares* programme of studies in 1748–1773),[271] Vilnius,[272] Trier,[273] Dillingen[274] and Würzburg.[275] As the authors of several works on military architecture, it would be logical to assume that the belligerent interests of the Jesuit mathematicians teaching in these colleges would have been reflected in their classroom lectures especially so in the many seminaries for nobles that existed in frontier states where military knowledge was essential for survival—those at Vilnius, Kalisz, Lublin, Lemberg, Ostrog, Poznan, Warsaw and Vienna were among the most prominent centres where the Jesuits included the military arts in their curricula of studies.[276] It these circumstances, it is understandable that one of the first choices to occupy the chair of mathematics at the *Reales Estudios* in Madrid had been a German *mathematicus* from the Jesuit college of Ingolstadt, Johann Baptiste Cysat (1587–1657).[277] In the eighteenth century, the college of Lemberg in Poland witnessed the presentation of two theses dealing with military architecture respectively entitled *Ars militaris* (1744) and *Questiones ex architectura militari* (1762). The latter was authored by a student who had been studying the subject at the *Seminarium Nobilium Leopoliensi* where in 1747 the Jesuit Faustyn Grodzicki (1709–1770) had published a most interesting volume entitled *Scientia artium militarium*.[278] As happened with many other theses presentations in Jesuit-run institutions, the defence of the above-mentioned theses concerning military architecture, constituted a formal rhetorical examination during which the student would have presented his conclusions to a panel of three examiners in the form of a printed 'poster' which would have normally

266 *Ibid.,* 175 and 219.
267 *Ibid.*, 177 and 208.
268 *Ibid.,* 178 and 221.
269 *Ibid.*, 180 and 195.
270 *Ibid.,* 186–187, 209, 214 and 221. The *seminarium nobilium* of this college was founded in 1561 but mathematics only started being taught here in 1748 by Ludovicus Becceler, Leopoldus Mozburg and Christianus Rieger.
271 *Ibid.*
272 Darowski, *Philosophie des Jesuits en Pologne*, 220.
273 AHSI 93, a.XLVII (1978) 184 and 208.
274 *Ibid.*, 171 and 195.
275 *Ibid.,* 167, 168, 188 and 217.
276 See n. 272.
277 AHSI 93, a. XLVII (1578) 175 and 195.
278 See ARSI, SMV, IV, 1681 and 1683 (theses) and III, 1747 (Grodzicki).



55. Plans of Jesuit *reducciones* of San Carlos (top) and Candelaria (bottom) in Paraguay [Bangert, 1972 and Fülop-Miller, 1963].

been circulated to the distinguished audience beforehand to enable them to follow the arguments presented in a better way but also to have an attractive programme which was worthy of the festive occasion, to take home as a souvenir of the academic event, thus promoting the great success of the Jesuit educational system in far off Poland.[279] Another case in point was later on in the eighteenth century provided by the Jesuit *seminarium nobilium* in Warsaw where in 1766 the college students Alexander de Tyszkiewicz and Joseph de Plater Radziwill presented a thesis entitled *L'exercice pour l'attaque de places* in a similarly festive atmosphere that was repeated in the following year when the students Florius Strawiński and Andrè Wollowicz presented their *Exercice sur architecture* theses based on their studies of military geometry in the Warsaw seminary for nobles which was then so popular with the Polish nobility that well-born fathers and mothers reportedly vied with each other to send their first born sons to its famous classes.[280]

Some Exotic Jesuit Scenarios beyond Europe: American *Reducciones*, Philippine Fortresses and Chinese Cannon

South America

The controversial decision of General Aquaviva to set up the Jesuit Province of Paraguay in 1604 must be interpreted in the context of the determination of the Jesuit Order in the sixteenth century to establish its missionary activity in South America on a firm footing.[281] Described by Voltaire as an independent State consisting of "upwards of thirty leagues in diameter and divided into thirty districts",[282] the origins of this Province can be traced back to 1586 when an expedition of five Jesuits had set out from Buenos Aires in the direction of Cordoba from where the party had reached the city of Assuncion in 1588. At the request of bishop Don Alonso Guerra, the Jesuits had soon started a massive conversion exercise involving thousands of Guarani Indios inhabiting the forests of the region so that by 1610, the first Jesuit Provincial, Diego de Torres Bollo, was in a posi-

[279] O'Malley *et al.*, *The Jesuits*, 148–169 (Chapter 6 on '*Jesuit thesis Prints and Festive Academic Defence at the Collegio Romano*' by Louise Rice).

[280] ARSI, SMV, VIII, 478.

[281] Egido, *Jesuitas en España*, 209. See also Bangert, *Society of Jesus*, 37 and 93–96; Astráin, *Historia*, 670–679 and CHR, LVI (1970) 501–533 (article on '*Antonio Ruiz de Montoya and the early reductions in the Jesuit Province of Paraguay*' by J.E. Groh).

[282] Voltaire, *Candide*, 27.

tion to found the first Jesuit *reducciones* of San Ignazio Guazu and San Ignazio Mini y Loreto.[283] In founding these settlements, Torres was putting into practice instructions that he had received from Aquaviva who had decided that the best remedy to prevent large scale lapses of the newly acquired Catholic faith among a people accustomed to a nomadic lifestyle would be to gather them in permanent settlements where the converts could avail themselves of constant religious guidance and medical care, in protected environments full of architectural and artistic symbols of Baroque Catholicism, here enhanced by angelic singing, instrumental music and dramatic performances.[284] The success of Torres' expedition had been immediate. It was followed up by an expansionary process spearheaded by the enterprising Jesuit Antonio de Ruiz Montoya who managed to establish eleven similar *reducciones* at San José, San Javier, Encarnación, San Miguel, San Pablo, San Antonio, Concepcion, San Pedro, Los Siete Angeles, Santo Tomás and Jesus Maria. By 1767, the Jesuit Province of Paraguay (which included the frontier zones of Bolivia and the southern part of Brazil), contained fifty-seven Jesuit *reducciones* supporting a population of no less than 113,716 Indios converts, collectively forming what Bangert calls "vibrant centres of faith and civilisation in the heart of the jungle"[285]—a unique experiment, according to this author, of "democratic and spiritual governance" in an age of almost universal Baroque absolutism.

The Jesuit Order had achieved so much in such a short time because it had originally received much backing from the Spanish monarchy. Eager to replace the notorious oppression of his Indios subjects by the descendants of the first *conquistadores* with a novel form of "*conquista espiritual*", King Philip III had issued three royal ordinances to fulfil this purpose. The first, dated 18 December 1606, had instructed the Spanish governor that "even if he could conquer the Indios by force of arms he must refrain from so doing, but must gain them over solely through the sermons and instruction of the Religious (the Jesuits) who had been sent out for the purpose". The second ordinance, dated 30 January 1607, specified that Indios converts could not be used as 'serfs', making them instead

283 Egido, *Jesuitas en España*, 210.

284 Bangert, *Society of Jesus*, 256–261. See also O'Neill and Dominguez (ed.), *Diccionario*, 111–114 (*América Hispánica*) and O'Malley *et al.*, *The Jesuits*, 641–658 (Chapter 30 on '*The use of Music by the Jesuits in the Conversion of the Indigenous Peoples of Brazil*' by Paulo Castagna).

285 Bangert, *Society of Jesus*, 258.

eligible for a ten year period of tax exemption. The third, dated 6 March 1609, went a step further and declared that the native "Indios should be as free as the Spaniards."[286] The royal ordinances issued by the king on the advice of his Jesuit advisers, placed Aquaviva's *reducciones* policy on a firm footing.

Problems started in 1628 when hostile Indios assassinated three Jesuits (followed by two others in 1635 and 1645) and when ruthless slave traders known as *Paulistas* operating from the impoverished highlands of San Paulo dos Campos de Piratininga, devastated the zone of Guayra leaving intact only two of Montoya's *reducciones*. It was at this stage that a furious Montoya travelled to Madrid and in 1638 managed to obtain clearance from King Philip IV to arm the defenceless Indios who, after 1640, started being trained in military matters by Montoya's soldier brother. The Jesuit had convinced his brother to accompany him to Paraguay in view of unequivocal instructions (later ignored) that he had received from the new Jesuit General Muzio Vitelleschi prohibiting all Jesuits in Paraguay to assume the role of military officers and instead to content themselves with only acting as military chaplains.[287] As events unfolded, the emergence of a powerful and potentially rebellious Guarani Indios army using 150 firearm stations equipped with gunpowder and ammunition, sent shock waves throughout Spanish America so that a reluctant King Philip V was in 1661 persuaded by the colonial administration, to revoke the earlier order to arm the Indios. This led to fresh *Paulistas* attacks so that, once again in 1679, the Spanish monarchy had to intervene and accede to a fresh Jesuit petition to provide their Indios with arms and artillery. As a result, the eighteenth-century Guarani army which had drawn the ire of Voltaire and many others, was re-organised to possess no less than 12,000 trained soldiers controlling 1000 firearm stations, 30 small ships, a strong cavalry arm and traditional weapons—making them a Jesuit-controlled military force to be reckoned with. Considered against this background, there are two relevant aspects of the Jesuit *reducciones* of Paraguay that need elaboration.

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[286] It is significant that as early as 1537, the '*Sublimus Deus*' Papal Bull had stated that the Indios were rational creatures of God. These sentiments were echoed in the writings of the Jesuit Francisco Suarez who declared that all infidels (including Indios) were fully rational human beings who had not been given the opportunity to seek the salvation of their souls, to be clearly distinguished from European 'heretics' who, despite having been given ample opportunity to mend their ways, had stubbornly refused to do so.

[287] O'Neill and Dominguez (ed.), *Diccionario*, 113 (*América Hispánica*).

In the first place there were the defensive considerations, both physical and spiritual, that were adopted in the planning of a typical settlement that would have been exposed to attacks by hostile Indios and *Paulistas*. Here walls, palisades and thorn bushes, sometimes supplemented by wet ditches, defined the rectangular boundary of the settlement composed of communal dwellings, churches, colleges, mortuary chapels, cemeteries and workshops, all organised on a system of straight streets arranged on a gridiron pattern and focused on a central plaza, not dissimilar to the standard practice adopted in many a Spanish American town, but here, as one would expect, full of religious overtones symbolising the protection of a benign God. This was reflected in the Jesuit practice of placing four monumental crosses or chapels at the corners of the church-dominated square central plaza to distinguish 'sacred' from 'profane' space, as inspired by ancient Christian rituals.[288] Added to the scenario of such potent 'spiritual fortifications' (which was sometimes even accentuated by a change in level as at Concepcion de Mojos), was the dominant presence, opposite to the main door of the church, of the statue of Jesus Christ or of the Virgin Mary or of some Saint, elevated on a tall column for all to see, revere and fear, looking down upon the artillery pieces which were often dragged out of the storehouses in an emergency and positioned to cover the straight streets leading towards the *Sacrarium* of these Jesuit 'fortresses of God'.

In the second place, there were the defensive considerations that were taken by the Jesuits when the decision was taken to form a Guarani Indios standing army. This had prompted another critic of the Jesuit Order to comment that:

> the Jesuits even went so far as to form, in every Reduction or Bourgade (borough), an armed force, consisting of cavalry as well as infantry; and by means of these troops, well armed and drilled as they were, besides being also provided with artillery, they could easily get the better of any foreign attempt at intrusion… [289]

On the other hand Caraman[290] gave a more objective view of this military achievement by the Jesuits of Paraguay when he wrote that "each reduction furnished eight military companies with a *maestro de campo*, generally a *cacigue*, at its head, a sergeant major, eight captains and other officers", with military exercises, drills, instruction in the use of firearms

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[288] Bangert, *Society of Jesus*, 256–261. See also Fagiolo, *Città Latino-Americane*, 35–58.
[289] Griesinger, *The Jesuits*, 144.
[290] Caraman, *Jesuit Republic*, 9–10.

and even sham battles becoming background scenarios that supplemented the angelic singing that invariably accompanied the elaborate church rituals devised by the Jesuits. The principal strength of this remarkable Jesuit army most certainly lay in its formidable cavalry arm led by carefully selected loyal Spanish officers and Jesuit military chaplains who used their mathematical knowledge to maintain an orderly line of march and set up planned military camps in plains to prevent surprise attack.[291] So high was the operational efficiency of these Guarani horsemen that the Jesuit force managed to win two important victories against well-armed *Paulistas* at Caazapà-Mini in 1638 and at Mbororè in 1641 besides being summoned on at least fifty occasions, to help the Spanish governors of the region to put down revolts by hostile Chacho Indios and disgruntled colonists, also to resist attacks by Portuguese and English pirates and even to build new fortifications at Buenos Aires.[292] All this earned them in 1743 the praise of King Philip V of Spain who is said to have declared that in all his colonial possessions, he had "no subjects as faithful and loyal as them."[293] This was a tribute indeed to the leadership skills, organisation and sense of sound strategy that Ignatius had instilled in the Jesuit Order, particularly pronounced in the Province of Paraguay when that same Order obtained clearance from Rome to appoint a number of Jesuits operating between the towns of Panana and Uruguay to act as 'war superintendents.'[294]

The Philippine Archipelago

The equally remarkable Jesuit involvement in both the spiritual conversion and the defensive requirements of the Spanish colony of the Philippines was inaugurated in July 1581 when the founder of the first Jesuit mission in Mexico, Antonio Sedeño (1538–1595) was ordered to proceed to Manila to set up a difficult mission which would eventually contain by 1600 some 100 Jesuits operating in most islands of that vast archipelago.[295] The newly-arrived Sedeño was warmly greeted by the

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291 *Ibid.,* 10 writes that the Jesuit-trained Indios "marched in the same manner as other South American armies: the Caballada or spare horses led, followed by the vanguard made up of the best cavalry, then the baggage train with the herdsmen driving the cattle..."

292 *Ibid.*, 10

293 *Ibid.*

294 O'Neill and Dominguez (ed.), *Diccionario*, 113 (*América Hispánica*) use the words '*Superintendentes de Guerra*'

295 Bangert, *Society of Jesus*, 169. See also Costa, *Philippines,* 7–8 who writes that Sedeno, who joined the Jesuits at Loreto in 1558 (afterwards studying in Padova and the

Spanish governor, Don Gonzalo Ronguillo de Peñalosa, who expressed the urgency of providing spiritual direction and protection for the 400 Spaniards under his responsibility in the wake of repeated corsair attacks.[296] At this time, Manila was an unfortified settlement of timber buildings which had been rapidly laid out on a gridiron system of planning focused on a grand plaza in accordance with normal Spanish practice in the New World.[297] A devastating fire in 1583, had intensified the exposure of Manila to enemy attack so that when the new Governor, Santiago de Vera, decided to rebuild the town and provide it with fortifications, he requested Sedeño, an experienced former soldier, to help him in the drawing up of a master plan of the new fortifications,[298] taking into consideration the natural advantages of a site which was protected by a river on its northern side, by the sea on its western side and by inaccessible marshland on its eastern side. In these circumstances the Jesuit advised the building of a powerful landfront, reinforced with a ten metre wide ditch and hinged on a massive artillery tower with flanks which was situated at the south-west corner of the town to command both the sea access and the exposed southern side.[299] Sedeño's contribution was praised by his successor Ramon Prat (1557–1605) who, in the obituary marking Jesuit's demise in 1595 remarked that:

> He had helped in the war plans department with both military and naval fortification…his presence was required at all staff conferences….he attended town meetings, helped to build churches, and made positive contributions to public affairs, for he started the fashion of stone buildings in this town, which previously were all of wood. He began the manufacture of lime and fired the first tile. He imported silkworms, planted mulberry trees and set up looms.[300]

What Prat's obituary did not mention is that Sedeño had not only set up the San José seminary and the Jesuit college in Manila[301] but also designed

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Roman *Collegio Germanico*), was assigned to join the Florida mission on 13 March 1568 from where he went to Mexico to serve as rector of the Jesuit college (1572). On being appointed Superior of the first Philippine mission, he reached Manila in July 1581. See also O'Neill and Dominguez (ed.), *Diccionario*, 1422–1424 (*Filipinas*) and Javellana, *Fortress of Empire*, 37–43.

296 Costa, *Philippines*, 7–8.

297 *Ibid.,* 108–109. See also Hardoy, *Cuidades Coloniales*, 8–34.

298 Costa, *Philippines*, 109.

299 *Ibid.* For details about Sedeno's tower which was "high, rounded and covered to be more appropriate for a warm climate" see Javellana, *Fortress of Empire*, 37–43.

300 Costa, *Philippines*, 109.

301 Bangert, *Society of Jesus*, 169.

and supervised the building in 1583 of Bishop Domingo de Salazar's palatial residence where he took the opportunity of training Filippino and Chinese workers involved in this project to quarry and use stone, thus starting, as Prat had rightly commented "the fashion of stone buildings"[302] in the Spanish Philippines.

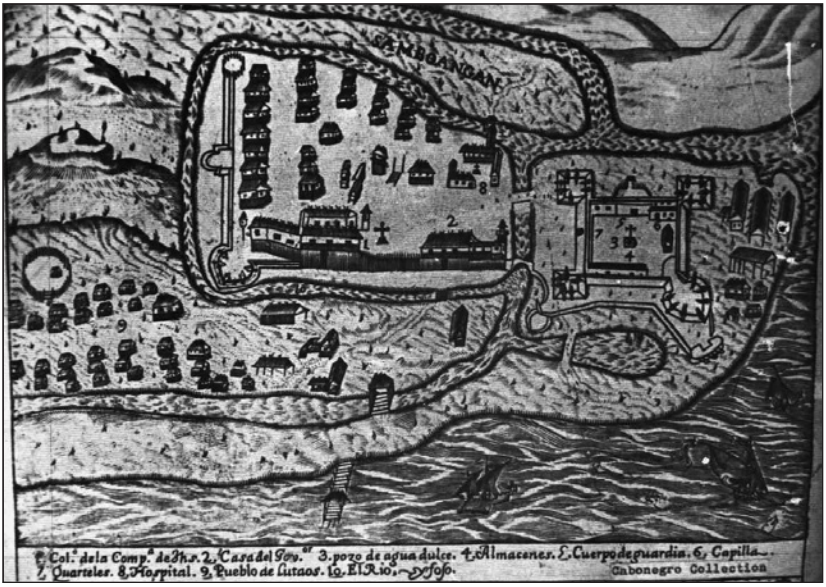
Sedeño's legacy as a builder of fortifications was soon followed up in 1635 when another Jesuit architect and military engineer, the Spaniard Melchor de Vera (1585–1646), was detailed to accompany a perilous military expedition of 300 Spanish troops and 1000 local recruits sent by governor Juan Cerezo de Salamanca to the island of Mandaloa to stop infidel raids in an area that had been largely under the control of the Muslim Sultanate of Sulu since 1490.[303] The '*casus belli*' was the serious damage that had been inflicted by the Muslims on Jesuit missionary stations in the region where, according to the new Jesuit Provincial in Manila, Juan de Bueras "three missionaries had already lost their lives; mission churches had been repeatedly sacked and burnt; sacred images mutilated and destroyed; chalices and other alter vessels stolen and profaned; Christian communities scattered, pursued and killed" and all this despite the efforts of both Melchor de Vera and Juan del Carpio, one of the assassinated Jesuits, to fortify their respective mission stations with palisides.[304]

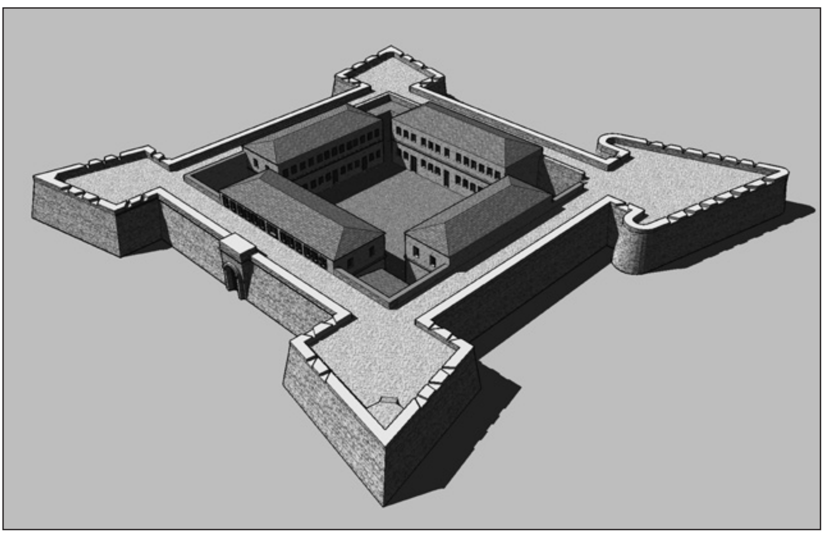
In the emerging 'just war', Bueras had instructed the learned Jesuits, Pedro Gutiérrez and Diego Patiño, to draw up a defensive strategic plan for Mandaloa. This was primarily aimed at protecting the interests of the Jesuit apostolate in a region under Muslim influence. Reporting that the small

302 Costa, *Philippines*, 108–109.

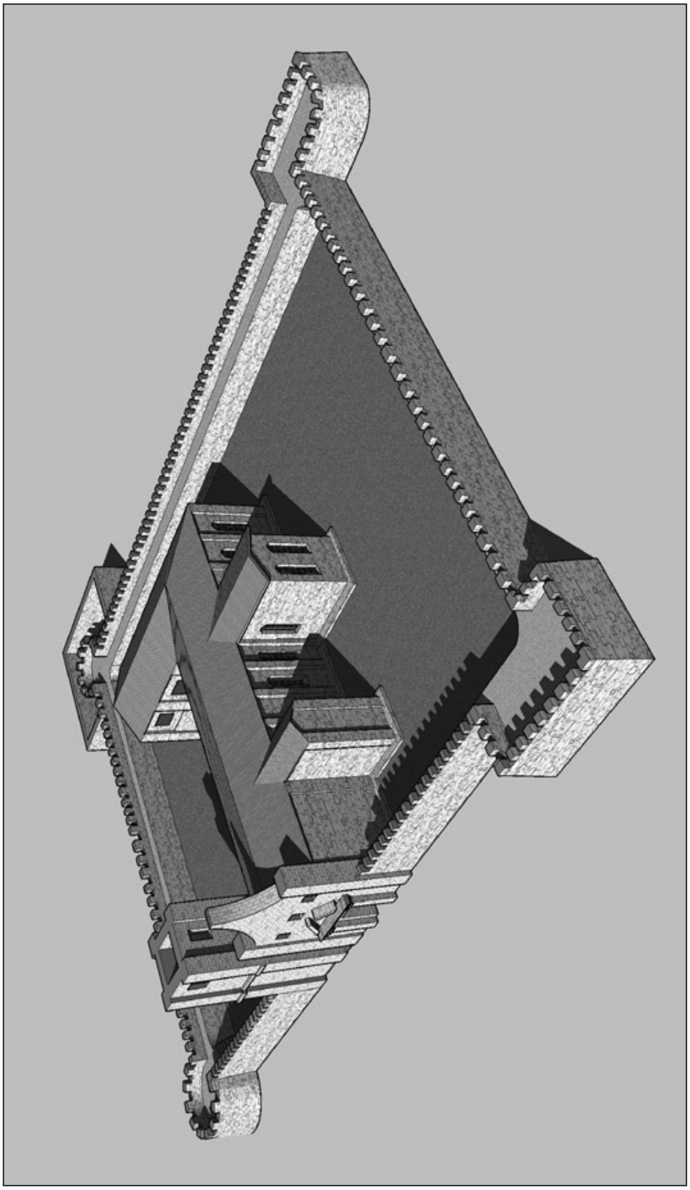
303 *Ibid.,* 324–325. See also Javellana, *Fortress of Empire*, 149 who writes that the Jesuit chronicler Pedro Murillo Velarde had described de Vera as "well informed concerning architecture, especially of the military kind".

304 Costa, *Philippines*, 324–325 referring to a circular letter dated 1 February 1635. According to O'Malley *et al*, *The Jesuits*, 430 (Chapter 20 on '*The Jesuits and the Indigenous Peoples of the Philippines*' by Renè B. Javellana), de Vera was the first to have come up with the idea of protecting the church compounds of the Jesuit missions with stone walls, after a 1629 raid on Carigara in Leyte. Javellana, *Fortress of Empire*, 149 notes that de Vera also built a stone fort in Carigara "which became a model for other Jesuit-built fortifications in Samar and Leyte". Regarding the theological justification for the activities of Jesuits like De Vera and José Ducós, Javellana, citing *Padre* Juan de Olivier, writes that "In situations of common danger, he is their leader by sea and land; and on account of his superior wisdom and courage, is looked up to as a strong tower against Muslim invasion. It is the prerogative of each (Jesuit) missionary in his own parish to issue orders for building or repairing the fort, for providing it with cannon and ammunition, and for the construction of war canoes, which he frequently commands in person. He appoints subordinate officers, presides over the discipline of the militia, regulates the number of guards, and even directs the sentinel to his proper post".





56. Divine power translated into military force—An old plan of the Jesuit de Vera's original fortress of *Real Fuerza de San José* in Zamboanga (top), rebuilt on the same site in 1719 when it was renamed *Real Fuerza de Nuestra Señora del Pilar de Zaragoza* (bottom).



57. Typical fortifications of a Jesuit mission station in the Philippine Islands. Such bastioned systems echoing European models, equipped with cannons and heavy Spanish muskets and manned by Jesuit-trained native troops, were used to protect the key Jesuit stations of Mariduque (Boac, Santa Cruz and Mogpag), Samar (Capul, Lauang, Palapag, Tubig, Basey, Paranas, Catbalogan and Zumarraga), Leyte (Carigara, Palo, Tanauan, Palompar, Ormoc and Hilongos) and Bohol (Baclayan and Loboc) [Javellana, 1997].

Spanish naval squadrons based at Cepu and Iloilo had been largely ineffective to stop Muslim raids, the two Jesuit strategists suggested that a better solution would be to establish a permanent garrison equipped with artillery and fortifications at the tip of the so-called Zambuanga peninsula.[305] It was on the instigation of Gutiérrez and Patiño that the Salamanca expedition led by Captain Juan de Chávez had been sent out to Mandaloa. According to Costa, the Spanish force was at first reluctant to proceed to that island, not only because of the considerable distance from Manila and the Muslim threat in the region but also because of the soft earth nature of the terrain at Zamboanga coupled with a lack of freshwater. When de Vera was placed in charge of the design and execution of a new fortress that was required by Captain Chávez, one Spanish soldier even threatened to finish off the Jesuit with "two bullets."[306]

The foundation stone of the *Real Fuerza de San José* fortress was laid at Zamboanga on 23 June 1635. This fortress was renamed *Real Fuerza de Nuestra Señora del Pilar de Zaragoza* in 1719.[307] When first designed by Melchor de Vera in 1635, it had assumed the form of a perfect square with four corner bastions being large enough to contain the living quarters of the Spanish garrison and their families, a church, a grammar school and a hospital—the last buildings were designed to offer a service to a sprawling and largely unfortified suburb which was left to mushroom on one side of the Jesuit fortress. It is recorded[308] that on one occasion, the Spanish army had awoke one morning to face a surprise attack of some 5000 Muslim corsairs who had accessed the Rio Hondo at night to attack the fortifications that were being built. In these circumstances, cannons had been hastily mounted on the incomplete walls and on de Vera's express instructions, the Spaniards had retired into a partial shelter that had been formed to pour artillery fire onto the advancing corsairs. With the completion of the fortress, Muslim attacks on the Philippines were curtailed and, as a result, Jesuit missionaries continued exercising great influence on Spanish military strategy. In 1636 a large Muslim fleet led by admiral Datu Tagal was destroyed and in 1637 Muslim forces led by Sultan

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305 Costa, *Philippines*, 325.

306 According to Costa, *Philippines*, 326, the disgruntled soldier's exact words were that he "would rather put two bullets in this priest than (Sultan) Corralat"

307 Javellana, *Fortress of Empire*, 55–56 writes that de Vera's fortress was rebuilt in 1719 by the Spanish military engineer Juan de Ciscara since the original building had been destroyed in 1663 in the wake of a withdrawal of its garrison to reinforce Manila, then threatened by the Chinese general Koxinga.

308 Hurley, *Swish of the Kris*, consulted online.

Correlat at Pagalamatan were defeated by a Spanish force personally led by governor Sebastian Hurtado de Corcuera who, on this occasion, was accompanied by the Jesuits "Marcello Mastrillo who led the Spanish troops under the standard of St. Francis Xavier; Melchor de Vera, who eventually carried home to Spain the captured banners of the Muslim Sultanate of Sulu; and the Jesuits Juan de Barrios, Gregorio Balin and Miguel Solaña."[309] The five Jesuits participated in all the battles that were fought. On conclusion of the campaign, it was decided to build a chain of supporting forts, north of Zamboanga and to again entrust their design to Melchor de Vera. On 2 March 1649, governor Corcuera issued a decree authorising the construction of another fortress at Sabavilla in the bay of Illana, based on a design that had been left by Melchor de Vera and capable of accommodating a garrison of 200 soldiers.[310] According to Sommervogel,[311] the Jesuit military architect, who died at Cebu on 13 April 1646, had also been responsible for the design of the Jesuit college church in that town—an impressive monument indeed to his knowledge of both civil and military architecture and to his unparalleled understanding of Philippine building construction techniques.

China

Sabatino de Ursis' vision of the Jesuit Order in seventeenth century China was that of a group of dedicated and exceptionally knowledgeable missionaries who worked with both hands, the right in the affairs of God and the left in the affairs of science and the intellect, since this was, as from 1583, considered by the first Jesuit missionaries in China—Matteo Ricci (1552–1610) and Michele Ruggieri (1543–1607)—as the best route for the conversion of the ancient Chinese nation.[312] It was in these circumstances that Ricci, a vociferous critic of Ming fortifications (which he had once described as lacking both provision for flanking crossfire and protective

309 *Ibid.*

310 *Ibid.*

311 ARSI, SMV, VIII, 571.

312 Wright, *Jesuits*, 86 citing D'Elia, *Galileo in China*, 21. See also O'Malley *et al.*, *The Jesuits II*, 659 (Chapter 30 on '*Clockwork and the Jesuit Mission in China*' by Catherine Pagani) who explains Ricci's twin methods of approach to penetrate Chinese Society: cultural accomodation authorised by Ignatius and scientific propaganda—'*propagatio fidei per scientias*'—inaugurated in 1611 when Ricci donated a mechanical clock to the Ming emperor.

ditches),[313] had become the Mandarin Li Madou to establish in 1601 the first Jesuit *casa professa* in Peking from where he had radiated an enviable reputation for applied mathematical scholarship and understanding of ancient Chinese culture.

Ricci's legacy was taken up by his successors Johann Adam Schall von Bell (1591–1666) and Ferdinand Verbiest (1623–1688). The first, a German Jesuit known in China as Tang-Jo-Way, had before arriving in China been involved in a unique opportunity to apply his considerable mathematical knowledge to help the beleaguered garrison of Portuguese Macao to use their cannons effectively to fend off a surprise attack on the town by Dutch 'heretics', for which reason the last Ming Emperor of China had subsequently invited him to China even honouring him in 1639 with the ceremonial presentation of a tablet bearing the inscription "I, Emperor, praise and protect these teachings from heaven."[314] The Ming had afterwards convinced Schall to apply his unique expertise to design and manufacture some small cannon using home-made gunpowder, to protect the empire from a powerful alliance of some of his warlords with the Manchu Tartars. He had also commissioned him to supervise the fortification of Peking to resist attack—all to no avail since in 1644 the defeated Ming dynasty was succeeded by the Qing dynasty. The Qing emperor Kangxi, having made Schall a Mandarin and having appointed him to serve him as director of the Imperial Board of Astronomy, had invited to China the second Jesuit, the Belgian *mathematicus* Ferdinand Verbiest, later known in Peking as Nan-houai-jin. Verbiest's arrival in imperial China, was inaugurated with the powerful defence that he had put up after Schall had been imprisoned and sentenced to death on false charges of high treason, false astronomy and false teachings in a court intrigue—won only after Verbiest had accurately forecasted a lunar eclipse.[315] This dramatic episode opened a new chapter in the working of the Jesuit Chinese mission after Schall's demise on 15 August 1666.

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313 Tracy, *City Walls*, 388 (article on '*The Artillery Fortress as an empire of European overseas expansion, 1480–1750*' by Geoffrey Parker). Parker also writes that the Jesuit missionary Luis Fröis commented in the 1590's that Toyotami Hideyoshi's new fortress at Kyoto was incapable of resisting an artillery attack because of its lack of angled walls—words which may have soon afterwards inspired the design of Oda Nobunaga's 'new' fortress in Christianised Kyushu which became as a model and a goad for other 1530–1630 Japanese strongholds at Kumamoto and Osaka.

314 Bangert, *Society of Jesus*, 245.

315 MacDonnell, *Jesuit Geometers*, 65. See also ARSI, SMV, VIII, 574–586 (*memoires pour defendre le P.Adam Schall*).

Having presented the Qing emperor in 1674 with a set of large astronomical instruments (including a quadrant, an azimuth compass, a sextant, a celestial globe and two armillary spheres), Verbiest is credited with the invention of numerous mechanical devices.[316] He refitted the Peking observatory and, for good measure, corrected the obsolete Chinese calendar.[317] He gave private lessons to the emperor in geometry, philosophy and music, translating Euclid into the Manchu language and writing over thirty books—which included a thirty-two volume work on astronomy, a Manchu grammar and a work on the fundamental teachings of Christianity which he was by imperial decree permitted to teach anywhere in the empire.[318] On 27 January 1682 Verbiest also presented the Emperor Kangxi with a lavishly illustrated book, now lost, that he had written about artillery theory and practice after receiving on 12 March 1681 a *Breve Pontificio* from Pope Innocent XI Odescalchi (1676–1689) praising him "for using the profane sciences for the safety of the (Chinese) people and for the spread of the faith."[319] This manual entitled *Shenwei Tushuo* was based on a number of earlier studies that he had made on the subject. Among other things, it demonstrated the use of complicated mathematical calculations to optimise the relationship between the cannon position—target distance and the inclination of the cannon which could be adjusted accordingly by means of an instrument devised by the Jesuit, well explained in a French edition of his manual entitled *Traité de la Fonte des Cannons, et de lieur usage*.[320] Literally translated, *Shenwei Tushuo* meant "an illustrated account of the magical awe-inspiring cannon", this surely summing up Verbiest's deep involvement in the battlefields of seventeenth-century China which earned him after his death on 28 January 1688, a funeral ceremony of unprecedented magnificence.

Gunpowder had been invented by the Chinese before the ninth century and had started being used for military purposes in the tenth century. In 1259, a primitive form of gun, the *Tuhuoiang* firing high velocity projectiles started being used in battle and in the defence of fortifications by the Yuan and Ming emperors. A quantum leap in the use of firearms by the

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316 Kurz, *Jesuit Missionaries as translators and interpreters in 17th Century China* consulted online.

317 MacDonnell, *Jesuit Geometers*, 65.

318 *Ibid.,* 66 and Bangert, *Society of Jesus*, 245.

319 MacDonnell, *Jesuit Geometers*, 20.

320 ARSI, SMV, VIII, 574–586. For details on *Shenwei Tushuo* see also Witek, *Verbiest* 228–244 (article on '*Ferdinand Verbiest and the casting of cannon in the Qing Dynasty*' by Shu Liguang).

Chinese had happened in 1522 when breach-loading culverins had been presented to the Ming court by the Portuguese. By the end of the century, Ottoman armaments started being copied by the Chinese, inspiring General Qi Jiguang (1528–1588) to use cannon mounted on carts to very effectively check Mongol cavalry charges. Another Ming general, Liu Tianhe convinced the emperor to start mounting cannon batteries on the rampants of frontier fortifications called "fighting towers" to more effectively defend them against frontal attack.[321] Soon after the arrival of Matteo Ricci in China, a warlord called Nurhaci had decided to launch a massive rebellion (1618). This so-called Manchu uprising had received a boost at Mount Arhu (1619) so that Nurhaci had decided to invade the prosperous province of Liaodong in north-east China. It is recorded that the warlord had here encountered great problems in attacking the well-fortified cities of the region which were protected with cannons.[322] The Manchu attack on a typical city in the Liaodong province was later described in great detail by the Austrian Jesuit cartographer Martino Martini (1614–1661) in his book *De Bello Tartarico Historiae*, providing an interesting example of the limitations of early slow-firing gunpowder weapons when confronted by hordes of attackers who, in true oriental fashion, were not afraid to die and could overwhelm fortifications once the first volley had been received.

> These Manchus were very afraid of muskets and bullets, in the face of which, however, they were able to find a strategy. They divided their army into three columns: the first column was armed with wooden shields and sent to the attack; the second was armed with ladders for scaling the city walls and the third consisted in cavalry. With such an array, the Tartar King surrounds the city on all four sides. First the wall of wood advances against the volley of artillery and in the blink of an eye, the soldiers with ladders have already climbed on the top of the walls, without being possible for a defending soldier to fire a second time…in this type of attack, the weapons of the Chinese soldiers have no great importance: they do not have the time to open fire for a second time and the Tartans have already scaled and entered, and as they come out from all four sides they encounter the fast cavalry.[323]

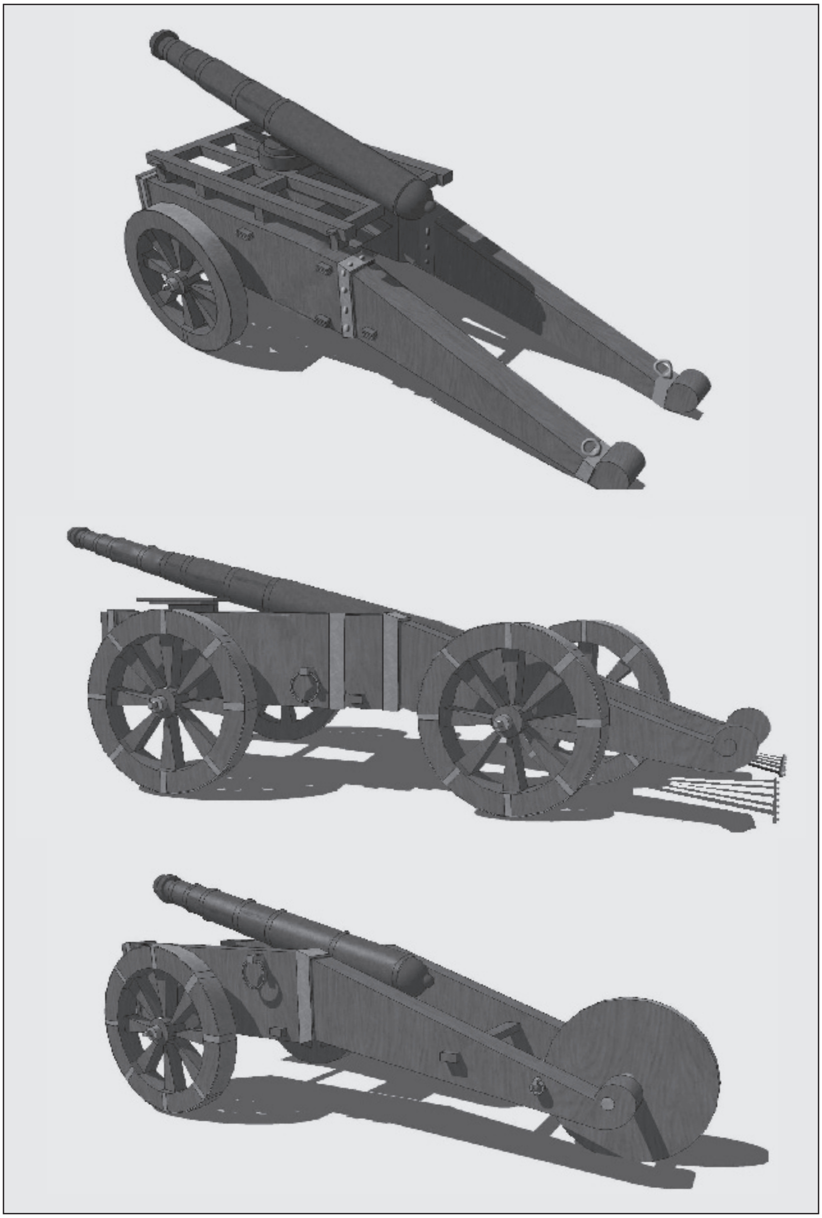
In an attempt to halt the advance of the Manchus, the Ming Emperor started adopting a policy of reinforcing the fortifications of important

[321] See Nicola di Cosmo's paper on '*European technology and Manchu Power: Reflections on the military revolution in seventeenth century China*' presented at the Oslo 2000 International Congress of Historical Sciences, 3–7, consulted online.
[322] *Ibid.* See also Cosmo, *Warfare*, 337–368.
[323] See n. 321.

urban centres by the deployment of bronze cannons of the type that were then being produced by the Portuguese of Macao in foundries operated by Chinese blacksmiths working under the direction of Portuguese technicians. What had happened was that Xu Guangqi and Li Zhizao, Chinese converts who had studied at the Peking Jesuit mission with Matteo Ricci, had managed to convince the Ming emperor to send several Portuguese cannon to the northern frontier to counteract the Manchu threat, this leading to a major Ming victory at Ningyuan in 1626. The success had further encouraged the Ming emperor to continue relying on European expertise so that the Jesuit Rodriguez was sent to Macao to recruit Portuguese soldiers and artillery. In 1642—when the Ming dynasty was on the verge of collapse—the desperate emperor had even ordered Johann Adam Schall von Bell, then head of the Jesuit mission, to utilise Jesuit mathematical knowledge in a new cannon foundry in Peking (1642) with express instructions to supervise the production of novel pieces of artillery which were smaller and lighter so as to facilitate transportation in difficult terrain conditions.[324] Schall was at first reluctant to accept this commission but at the end of the day, he seems to have had no option but to accept, producing soon afterwards twenty prototype cannon followed by the manufacture of another 500 cannon. Schall also produced a manual about artillery entitled *Huogoniz Geiyao*—Essentials of Gunnery.[325]

The son and successor of Nurhaci, Hong Taigi, reacting to the Ming military build-up, set up in 1642 a rival Manchu cannon foundry at Jinzhou, producing several cannons based on captured Ming and Portuguese prototypes. The Manchu efforts seem to have been successful since by 1644 China was firmly in the grips of the new Qing dynasty. In 1660 the new emperor, Kangxi had been only too glad to welcome Verbiest. The Jesuit, however, soon discovered that Kangxi was by then already facing rebellion from a former Ming general called Wu Sangui who had joined forces with the powerful governor of the Gongdong and Fujian provinces of southern China (1673–1674). On 10 September 1674 the emperor issued the following order to Verbiest: "When our grand army marches to suppress the rebels, it will need firearms badly. We therefore order Nan-houai-jin (Verbiest), the director of Our Imperial Board of

[324] *Ibid.*
[325] *Ibid.*



58. An artist's impression based on Witek, 1994 of Verbiest's *Shenwei* (top), *Wuchengyongyu* (middle) and *Shengong* (bottom) cannons. Reproduced with the kind permission of Dr Stephen Spiteri of the International Institute for Baroque Studies at the University of Malta.

Astronomy, to cast light but effective cannon, convenient for transportation."[326]

The new cannon had to be easy to move on difficult terrain because most of the rebel strongholds were located on mountains or in forests where the formidable Manchu cavalry would be totally ineffective, this explaining an earlier 14 August 1674 instruction communicated to the Jesuit by the emperor's chamberlain "You are asked to work out a good technique to cast cannon that meet the need of military operations in mountainous territory carved by rivers."[327] In view of the fact that over 500 of a total of 905 artillery pieces cast during the reign of Kangxi were cast under the direction of Verbiest, one can conclude that Verbiest's Chinese enterprise was a highly successful one. It is recorded that when the first guns were finished, the remarkable Jesuit had consecrated them in a public ceremony, engraving the name of a Catholic Saint on each cannon and, attired in surplice and stole, sprinkling one cannon with Holy Water and offering prayers for the proper and just deployment of the weaponry, while imperial generals and high officials looked on at this Jesuit Baroque spectacle.[328]

According to Liguang,[329] the first cannon that were cast by Verbiest, were the so-called 'wooden cannon' consisting of a light barrel which was stiffened by a cover of painted wood and mounted on a carriage, the principal asset of this piece being that it could be easily transported but rather weak and very limited in both range and calibre. It seems that the best and most innovative cannon designed by the Jesuit were produced after 1681 to equip each of the eight artillery battalions or 'banners' of the Chinese army with 40 artillery pieces. The first series of these new Verbiest cannon, numbering 240 pieces, were ready in 1681, followed by the casting of others in 1682–1689. What Liguang considers to have been unique in these Verbiest cannon was the high standard of engineering precision that went into their manufacture, with inscriptions in Chinese and Manchu revealing detailed information with regards to the gunpowder to be used, the type and weight of the shot and the sighting systems to be used, this besides the names of their Jesuit inventor, the production

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326 Witek, *Verbiest*, 221 (article on '*The Manchu cannon cast by Ferdinand Verbiest and the hitherto unknown title of his instruction*' by Giovanni Stary). This contribution gives a comprehensive list of Verbiest cannon in Europe, including those in the Tower of London and the Chelsea Royal Hospital, London. See also Bertone, *gesuiti*, 128–129.

327 See n. 320.

328 MacDonnell, *Jesuit Geometers*, 20.

329 Witek, *Verbiest*, 230.

supervisors, the chief craftsmen and the deputy craftsmen. As for the cannon they were of various types, the most important being the *Shenwei* cannon of 1681, the *Wuchengyongyu* cannon of 1689 and the *Shengong* cannon of 1689.[330] The first type, produced to crush a rebellion of three rebel warlords in preparation for a massive drive by the emperor to expel Russian marauders, was a light field gun weighing 200 kilograms and mounted on a two-wheel carriage, having an effective range of 200–300 metres and delivering a cannon ball of 900 grams. The second type of cannon was much heavier, weighing 2–3.5 tons, mounted on a four-wheel carriage and capable of delivering a cannonball of 10 kilograms weight. The third Verbiest cannon weighed half a ton and delivered a cannonball weighing 1.8 kilograms. It was designed to look impressive when mounted on a three-wheel carriage. Verbiert also produced for the emperor a curious type of trench mortar called *Chongtian Pao* capable of shooting explosive shells on a sharply curved trajectory path directed against a charging mass of enemy soldiers, this in accordance with a 28 July 1686 imperial decree "to design a type of cannon that is able to shoot 30 *jin* of cannonballs each time and that is loaded on a chariot and attached to the bottom by a plate."[331] Verbiest's contribution to the military advancement of Kangxi's China was recognised posthumously when a still grateful emperor granted official permission for the propagation of Catholicism throughout his empire (1692), also allowing five French Jesuit missionaries who had arrived in 1688 to take up residence in the Imperial City and also build a church as a reward for curing him of malaria.

In the eighteenth century, Verbiest's rather unorthodox involvement in *De re militari* to propagate Catholicism in China was resurrected by the Jesuits Felix de Rocha, Joseph Marie Amiot, Giuseppe Castiglione, Jean-Denis Attiret and Ignatius Sichelbart[332] who all went out of their way to glorify the Qing empire. The involvement of the Portuguese Felix de Rocha (1713–1781) in the military programme of the emperor Qianlong (1736–1795) started when that emperor sent out this Jesuit director of the Imperial Board of Astronomy to the battlefield during the course of the Jinchuan War to make accurate surveys of the terrain (1774) so as to enable the imperial artillery to be used more effectively against some massive stone towers that had been built by the Xinjiang rebels.[333] This fact was collaborated by

330 *Ibid.*, 235–241.
331 *Ibid.,* 232–234.
332 ARSI, SMV, VI, 1930 (Rocha); I, 295 (Amiot); II, 845 (Castiglione) and I, 613 (Attiret).
333 Waley-Cohen, *Culture of War*, 58

both Jesuit and Chinese sources. The biography of Aui, Qianlong's commander-in-chief, mentions that the Jesuit had been sent out by the emperor to rectify earlier imprecise calculations concerning the inclinations at which the cannons were fired at the above-mentioned towers and to even supervise the casting on site of new cannons for the same purpose.[334] When the hostilities were over in 1777, Felix de Rocha together with another Jesuit called Joseph Espinha, were also engaged by the emperor to draw up military maps of different parts of China.

The correspondence of Jean-Marie Amiot (1718–1793) with the Comptroller-General of France in Peking, Henri Bertin, betrays the interest of this Jesuit in the military affairs of China. This was crystallised in 1772 when Amiot produced the very first translation in French of Sun Tzu's *Art of War*, based on several treatises on the subject that had existed in 500BC or thereabouts and which had been collected by a mysterious Chinese general of the time called Sun Tzu.[335] This book was a veritable encyclopaedia of ancient Chinese military knowledge which had been greatly treasured by all Ming and Qing emperors in view of the fact that it listed all the principles of warfare (moral cause, climate, terrain, command, discipline and organisation), all possible ways to achieve victory, the nature of the 'science of war', all possible failings of an army general, alternative ways of using fire and information about the spies that could be used who "are better for gathering intelligence than prayer". There is further evidence in Amiot's correspondence that in 1784 he had unsuccessfully tried to introduce hot-air balloons for military purposes in China[336] and that he and other Jesuits had been deeply involved in plans and models for the building of new artillery fortifications at Peking[337] amidst the fears of the fellow Jesuit Jean-Mathieu de Ventavon that "we would be accused of teaching the infidels the art of war."[338] As a precautionary measure, Ventavon had written to Rome mentioning Johann Adam Schall von Bell's similar activities in the previous century which had been encouraged rather than condemned!

In view of his many successes in military operations, the emperor Qianlong wanted to record, publicise and commemorate his military prowess. For this purpose, he had transformed an old pavilion in Peking

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334 Luk, *Contacts between cultures*, 94–99 (article on '*God and Guns in Eighteenth Century China: Jesuit Missionaires and the Military Campaigns of the Qianlong Emperor, 1736–1795*' by Joanna Waley-Cohen)

335 *Ibid.,* 95. See also ARSI, SMV, I, 295.

336 *Ibid.,* 95.

337 *Ibid.,* 96.

338 *Ibid.,* 96.

which had been used to inspect parades of Chinese armies, into a 'Hall of the Purple Light'—'*Zi Guang Ge'* in Chinese—to serve as a museum of the emperor's exploits (1760).[339] Not content with hanging on the walls the portraits of some one hundred generals and statesmen who had been responsible for his victories, the emperor approached the Jesuit war artists Castiglione, Attiret and Sichelbart and another artist called Jean-Damascene Sallusti of the Augustinian Order, to produce sixteen large scenes depicting all the important battles, raids, triumphs and celebrations of his wars in Central Asia. These were to be represented in the form of copper engravings inspired by European paintings of warfare executed by the German painter Rugendas (1666–1742) about whom the emperor had learnt much from his Court Jesuits who would have also briefed him about similar commemorative artistic works executed at the Escorial, Versailles and the Buen Ritiro.[340] The Jesuit war designs were soon afterwards shipped to France where several hundreds of sets of the finished copper engravings were manufactured and sent back to China not only to adorn the emperor's pavilion but also to be distributed to deserving officials and to be displayed in public buildings throughout the empire—a massive exercise of imperial propaganda which was orchestrated by the Jesuit mission. Copper engraving activity continued gaining momentum when other wars at Wushi (1765), Taiwan (1787), Vietnam (1788), Nepal (1792) and Yunnan-Hunan (1790) were commemorated on similar copper engravings which, this time, were not only designed but also engraved in China by craftsmen who had been trained by the Jesuits to glorify both the Christian God and the pagan Emperor.

[339] Waley-Cohen, *Culture of War*, 42.

[340] *Ibid.*, 41. ARSI, SMV, I, 294 mentions an Amiot letter concerning Attiret's achievement in China.

59. Diego Rodriguez de Silva y Velásquez's seventeenth-century painting of the surrender of Breda showing the Protestant Dutch general Justin of Nassau giving the city keys to Ambrogio Spinola. Reproduced with the kind permission of the *Museo del Prado* in Madrid.

CHAPTER THREE

JESUIT WRITINGS ON MILITARY ARCHITECTURE

Summary

The many treatises on military architecture produced by Jesuit mathematicians in the Baroque age reflected the interest of individual members of the Jesuit Order to record their knowledge about a subject that was regularly communicated to students attending their classes and private lessons. In so doing these Jesuits also attracted the attention of the people that mattered in contemporary society. Despite repeated warnings from Rome and General Vincenzo Carafa's *De Fortificationibus* prohibition of 1648, many Jesuit mathematicians persisted in their studies about all things military. Some of the works outlining their ideas about improved fortification systems were even summarized and publicly acknowledged in a late seventeenth-century manual produced for the exclusive use of the Spanish armies stationed in Milan. The *Escuela de Palas* treatise demonstrated the synergy that existed between Jesuit thinking about military architecture and the various fortification systems that were devised by the leading military theorists of early modern Europe.

The Authors and Titles of Jesuit Treatises on Military Architecture in the Baroque Age

The earliest Jesuit treatises concerning military architecture were those entitled *De Re militari veterum Romanorum* and *De Caliga veterum.* They were respectively written by the Jesuits Giovanni Antonio Valtrini[1] and Giulio Negrone[2] in 1597 and 1617. The two works, of inspirational rather than of technical value, were written at the time immediately preceding the Thirty Years War (1618–1648) when large parts of Germany and Italy were transformed into an immense theatre of military operations described by the Carmelite friar, Francesco Voersio di Cherasco, who wrote that "all of a sudden, the principal torments that God normally

[1] ARSI, SMV, VIII, 430 Valtrini, b[orn in] 1588 (Rome), e[nrolled with the Jesuits in] 18-10-1574, d[ied on] 31-08-1601 (Lorette), taught for many years humanities, moral theology and sacred scripture.

[2] ARSI, SMV, V, 1616. Negrone, b.1553 (Genova), e. 1571, d. 17-01-1625 (Milan), taught rhetoric, philosophy and theology afterwards serving as rector of the Verona, Genova and Cremona colleges.

sends to punish the human race—famine, disease and war—were simultaneously unleashed".[3] The Belgian Jesuit mathematician Hermann Hugo[4] inaugurated nearly two hundred years of Jesuit writings about military matters with his classic work entitled *De Militia equestri antiqua et nova ad Regem Philippum IV*, which was published in five volumes in Antwerp in 1626, as an excellent follow up of this Jesuit's eyewitness account of the siege of Breda in 1625.[5] The capture of the strategic town by the *tercios* of General Ambrogio Spinola, meticulously described in Hugo's volume, was an important event in the eighty-year long Dutch revolt against Catholic and Spanish domination (1568–1648). Hostilities had intensified following the creation of a rebel government in the Protestant provinces of Holland headed by the excommunicated 'heretic' Prince William of Orange in 1572, and the reactionary formation soon afterwards of an alliance between the southern Catholic provinces and Philip II of Spain (1579). Differences between Spain and the Protestant provinces had been patched up with the signing of an armistice in 1609 but in 1621 hostilities had been renewed with increased hatred and ferocity. In the meantime, the town of Breda, initially captured by King Philip II in 1567 but wrestled from Spain in 1577 by Count von Hohenlohe, had in 1581 again been captured by the Spaniards through bribery, following which the whole town had been sacked. Recaptured in 1590 by the Protestant forces of Prince Maurice of Nassau by means of the so-called Peatbarge stratagem whereby seventy protestant soldiers were smuggled into the castle, the town of Breda had been once more attacked by general Ambrogio Spinola, an Italian nobleman and a great benefactor of the Jesuits, who had in 1603 been appointed by King Philip IV of Spain to lead all Catholic forces in the Netherlands. After a siege of eleven months, Spinola's army of 18,000 soldiers managed to penetrate the defences of Breda, vigorously exhorted by the Jesuit *mathematicus* Hugo who at the time was serving Spinola as his military chaplain and adviser on fortifications and siege works. The city remained a Catholic stronghold with a Jesuit college up to

[3] Oliva, *I Savoia*, 248.

[4] ARSI, SMV, IV, 512–522. Hugo b. 09-05-1588 (Brussels), e. 04-09-1605, d. 12-09-1629 (Rhinberg), served in Antwerp and Brussels, afterwards going to Spain as confessor of the duke of Arschot. He later returned to the Spanish Netherlands where, as military chaplain to General Spinola, he participated in many battlefields.

[5] Hugo's latin account of the siege of Breda was translated into Spanish in 1627 by Emmanuel Sueyro for which see Almirante, *Bibliografia Militar*, 383. ARSI, SMV, IV, 512–522 also mentions a 1627 English edition by H. Gage.

1637, when the Protestant general Freidrich Hendrick laid siege to the town and managed to capture it on 11 October of that same year,[6] ending a decade of Jesuit influence.

During the 1630–1640 period, at a time when Protestant Sweden turned the tide of the Thirty Years War by defeating the Catholic army at the battle of Wittstock on 4 October 1636, Jesuit mathematicians bequeathed to posterity twelve interesting contributions concerning military architecture. These were the *Tabla universal para ordenar en cualquier forma esquadrones* (1633) by Francesco Antonio Camassa;[7] the *Architectonica militaris* (1635) by Theodoric Baegk;[8] the *Problema Mathematicum, ex Architectura militari* (1636) by Jacques Honoré Durand;[9] the *Paralella heroscopa* (1636) by Oswald Kruger;[10] the *Le siege de Landrecy* (1637) by Jacques de Billy;[11] a report on the fortifications of Malta (1638) by Orazio Grassi;[12] the *Tratado da Milícia* (1638) by Inácio Stafford;[13] another report on the fortifications of Malta (1639) by Claude Richard[14]—which was followed by other reports by this Jesuit on the defences of San Sebastian (1641) and Pamplona (1643)[15]—and the *Alphabetum Militare* (1640) by George Gobat.[16] The distinguishing factor of all these works on military architecture and siegeworks was their technical nature which introduced a new chapter in the involvement of the Jesuit Order in the battlefields of Europe. A case in point was Baegk's book, (discussed in the next section of this work because of the controversy it raised in Rome). Another impor-

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6 BSA, *Breda captured*, consulted online.

7 Almirante, *Bibliografia Militar*, 108.

8 ARSI, SMV, I, 761. Baegk, b.1598 (Ueberlingen), e. 1618, d. 19-03-1676 (Rome). First taught mathematics in the Freiburg im Breisgau and Lucerne colleges, then served as the confessor and military adviser of Frederick of Hesse-Darmstadt, travelling with him to Malta (1638). He later became a Cardinal.

9 ARSI, SMV, III, 300. Durand, b. 07-07-1598 (Brussels), e. 01-10-1615, d. 28-08-1644 (Gratz), taught philosophy, moral theology and mathematics at Graz college. He authored other mathematical works.

10 ARSI, SMV, IV, 1260. Kruger, b. 1598 (Ruthenia), e. 18-08-1618, d. 06-05-1665 (Grodnius), taught mathematics for 13 years in Vilnius where he published several works, mainly on astronomy.

11 ARSI, SMV, I, 1477. Billy, b. 1602 (Compiégne), e. 1619, d. 14-01-1679 (Dijon) served as rector of the Châlons, Langres and Sens colleges.

12 See chapter 2, n. 36 a[nd].r[elated].t[ext].

13 See chapter 2, nn.119–120 a.r.t.

14 See chapter 2, nn.102, 216 and 220 a.r.t.

15 *Ibid.*

16 ARSI, SMV, III, 1508. Gobat, b. 01-07-1600 (Charmoille), e. 01-06-1618, d. 23-03-1679 (Constance), taught literature, philosophy and theology, moving on to become rector of the Halle and Fribourg colleges.

tant military architecture contribution of this period was Jan Ciermans' *Annus Positionum Mathematicarum* (1640–1641).

The period 1640–1660 was marked by the consolidation of the doctrine of royal absolutism and by the granting to Protestants the right of the "free exercise of their religion" which was now entrenched in clause XXVIII of the Treaty of Westphalia (1648). In a bid to accommodate such dramatic religious and political transformations which would have made Possevino roll in his grave, it was to be expected that Jesuit attitudes to writings about fortification would temporarily reflect General Carafa's prohibition of 1648[17] but this did not happen. There is much evidence to indicate that many Jesuits continued to persist in making a reality of Ignatius' vision to see the world turning in obedience to a universal church ruled by the pope and many mathematicians of the Order continued expressing interest in military matters, now also associating themselves with issues concerning the 'security' and 'adornment' of the emerging magnificent Baroque cities. They did this by producing several treatises in manuscript or book form about fortification building but also on civil architecture. It is within this perspective that one must evaluate the seventeen Jesuit writings on military architecture produced during these times entitled *L'architecture des voutes* (1643) by François Derand;[18] *Traité des fortifications* (1648) by Georges Fournier;[19] *Gnomonica, statica, architectura militaris* (1649) by Franz Storer;[20] *Traité des fortifications* (c.1650) by Jean Berthet;[21] *Amussis Ferdinandea* (1651) by Albert Curtz[22] (writing under the

[17] See pp. 197-211 of this work.

[18] ARSI, SMV, II, 1938. Derand, b. 1588 (Metz), e. 1611, d. 29-10-1644 (Agde) taught mathematics and designed the '*église de la Maison professe*' in Paris. Provincial permission to publish his book was given on 28-02-1642.

[19] ARSI, SMV, III, 910. Fournier b.1595 (Caen), e.1617, d.13-04-1652 (La Fléche) specialised in mathematical teaching for military and navigational purposes. See also chapter 2, nn.78, 92 and 93 a.r.t.

[20] ARSI, SMV, VII, 1602. Storer, b. 17-01-1617 (Constance), e. 03-09-1635 d. 1662 (Ethiopia), taught grammar, humanities, Hebrew, sacred scripture and mathematics for many years, afterwards making a systematic reconnaissance of the old caravan route from Persia to India and travelling to Isfahan and Goa. Having in 1655 received instructions from Rome to reconstruct the difficult Ethiopian mission, he went there disguised as an Armenian surgeon to die under mysterious circumstances, as had happened to other Jesuits in 1554–1636.

[21] ARSI, SMV, I, 1376. Berthet, b. 22-02-1622 (Tarascon), e. 25-01-1637, d. 29-06-1692 (Paris), taught humanities, philosophy and mathematics and also served as tutor to Théodore de Bouillon. He left the Jesuits in 1681, retiring to the Benedictine monastery of Oulx.

[22] ARSI, SMV, II, 1743. Curtz, b. 1600 (Munich), e. 1616, d. 19-12-1671 (Munich), served as rector of the colleges of Eichstädt, Lucerne and Neubourg, after teaching mathematics and

pseudonym of 'Lucius Barrettus'); *Flores mathematico-militare* (1651) by Michel Cuvelier;[23] *Tratado de Fortificacion* (1652) by Juan Carlos de la Faille;[24] *Gobierno y disciplina de los ejercitos y presidios* (1653) by Hugh Semple;[25] *Apiariorum Philosophiae Mathematicae—Auctoria Militaria* (1654) by Mario Bettini and *L'Art de Fortifier les places regulaires et irregulaires* (1653), *L'architecture militaire, ou l'art de fortifier les places reguliers et irreguliers* (1655) and *Le dessein ou la Perspective militaire* (1655) by Pierre Bourdin;[26] *Architettura militare defensiva, et offensiva* (1655) by Giacomo Masò (1626–1674)[27] and *Stratagemata militaria et moralia* (1656) by Pierre de Bivero (1572–1656);[28] *Architectura Militaris* (1658) by Giuseppe Ferroni[29] and *Trattato di fortificare alla moderna* (1660) by Francesco Eschinardi.[30] The period of time that elapsed between 1640 and 1660 also witnessed the publication of Johann Adam Schall von Bell's treatise on artillery *Huogoniz Geiyao* (1642).

The 1660–1680 period, corresponding with the ascendancy of France as the dominant military power in Europe as a result of the concerted efforts of King Louis XIV *Le Roi Soleil*, his war minister Louvois and his military engineer Vauban, saw the compilation of at least fourteen military treatises by Jesuit mathematicians, six of them associated with

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philosophy at Ingolstadt. Using the pseudonym 'Lucius Barrettus', he published works on Imperial politics and astronomy. See also Sommervogel, *Dictionaire*, 29, 157, 369, 225 and 963.

23 ARSI, SMV, II, 1752. Cuvelier, b. 17-06-1600 (Soignies), e. 16-09-1618, d. 10-12-1651 (Cologne), taught philosophy and mathematics in Germany also serving as mathematical tutor and confessor to the Palatine Elector Philippus Guillaume.

24 ARSI, SMV, III, 529–530. Faille, b. 01-03-1597 (Madrid), e. 12-09-1613, d. 04-11-1654 (Barcelona) achieved a great reputation for mathematical instruction in Louvain and Madrid. See also chapter 2, nn.199–213 a.r.t.

25 ARSI, SMV, VII, 1117. Semple, b. 1589 (Ecosse), e. 1615, d. 28-09-1654 (Madrid) also published in 1635 a mathematical work, the third selection of which dealt almost exclusively with fortifications. See also chapter 2, nn.215, 219 and 220 a.r.t.

26 See chapter 2, nn. 62–65 a.r.t. for Bettini, b. 06-02-1582 (Bologna), e. 11-11-1598, d. 07-11-1657 (Bologna) and chapter 2, nn. 78–85 a.r.t. for Bourdin, b. 1595 (Moulins), e. 1612, d. 27-12-1653 (Paris). Bourdin also discussed fortifications in his 1642 *Cours de Mathematique,* mentioned in ARSI, SMV, II, 30.

27 See chapter 4.

28 ARSI, SMV, I, 1528. Bivero, b. 1572 (Madrid), e. 1593, d. 26-04-1656 (Madrid), taught rhetoric, philosophy and theology in various colleges, afterwards serving as preacher to Cardinal Ferdinand and adviser to the Marquis of Aytora, governor of the Spanish Netherlands. He also served as rector of the *Colegio Imperial*.

29 ARSI, SMV, III, 696. Ferroni, b. 16-01-1628 (Pistoia) e. 27-10-1641, d. 15-01-1709 (Siena) taught mathematics in Bologna and Siena. See also chapter 2, nn.39 and 42 a.r.t.

30 ARSI, SMV, III, 434. Eschinardi, b. 1623 (Rome), e. 1637, d. 12-01-1703 (Rota) taught mathematics in Florence, Perugia and Rome. See also chapter 2, nn.40, 45 and 46 a.r.t.

French Jesuit colleges. These were the *Mathesis Caesarea* (1662) by Caspar Schott;[31] *L'art universel des fortifications, francoises hollandoises, espagnoles, italiennes, et composées* (1665) by Jean du Breuil[32] (writing under the pseudonym of 'Silvére de Bitainvieu'); *Architecturae militaris* (1669) by Andrè Tacquet;[33] *Polemica, seu de arte bellica* (1673) by Barthélemy Labarthe;[34] *Art de la guerre* (1673) by Ignace Gaston Pardies;[35] *Architectura militaris* (1674), *Libro de instrumentos matematicos y arte de fortificar* (1674) and *Fabrica y uso de varios instrumentos matemáticós* (1674) by Josè Zaragoza y Vilanova;[36] *Cursus seu Mundus Mathematicus* (1674) and *L'art de fortifier* (1677) by Claude François Millet de Chales;[37] *Nobilior Philosophiae pars seu Mathesis—Architectura militaris* (1678) by Jacques Martini;[38] *Pratique général des fortifications* (1679) by Pierre Ango[39] and *Traité de la Fonte des Canons* (1682) by Ferdinand Verbiest[40]— which was really a translation of his book about artillery *Shenwei Tushuo*.[41] To these works, one must add Giuseppe Ferroni's contribution on *L'arte di fortifi-*

[31] ARSI, SMV, II, 1743. Schott, b.1607 (Konigshoren), e. 1626, d. 22-05-1666 (Wurzburg), taught mathematics at Wurzburg college 1655–1657 and 1665–1666, afterwards studying in Wurzburg and Palermo. Closely associated with the celebrated Athanasius Kircher, he revised and edited a second 1662 edition of Curtz's 1651 *Amussis Ferdinandea*.

[32] ARSI, SMV, II, 144–147 and X, III, 838–841. Breuil, b. 22-07-1602 (Paris) e. 1617, d. 27-04-1670 (Dijon) was the son of a Paris librarian.

[33] ARSI, SMV, VII, 1806–1812. Tacquet, b. 23-06-1612 (Antwerp), e. 31-10-1629, d. 23-12-1660 (Antwerp), taught mathematics at Louvain and Antwerp, for which see chapter 2, nn.248 and 250a.r.t. His *architecturae militaris* formed part of a larger mathematical work (ff. 265–303) mentioned in SMV, VII, 1810.

[34] ARSI, SMV, IV, 1289. Labarthe, b. 02-08-1602 (Gascogne), e. 17-02-1627, d. 13-11-1682 (Cahors), taught philosophy and mathematics.

[35] ARSI, SMV, VI, 205. Pardies, b. 05-09-1636 (Pau), e. 17-11-1652, d. 22-04-1673 (Bicétre) produced many works including remarks on the optical discoveries of Newton (1672).

[36] ARSI, SMV, VIII, 1465–1468. Zaragoza, b. 05-05-1627 (Alcalà de Chivert), e. 01-02-1651, d. 14-04-1679 (Madrid) achieved great fame as a mathematician. See also chapter 2, n. 224 a.r.t.

[37] ARSI, SMV, II, 1044. Chales, b. 1621 (Chambéry), e. 1636, d. 22-03-1678 (Torino), first taught humanities and rhetoric and afterwards spent time in the Turkish mission. Returning to France, he was appointed professor of hydrography at Marseilles by King Louis XIV moving on to become rector of Chambéry college. See also chapter 2, nn. 95, 96 and 97a.r.t.

[38] ARSI, SMV, V, 644. Martini, b. 11-02-1624 (Dinant), e. 14-08-1654, d. 09-12-1719 (Tréves), taught humanities, philosophy, theology and mathematics and wrote treatises on horography, astronomy and optics.

[39] ARSI, SMV, I, 396. Ango, b. 1640 (Rouen), e. 13-09-1658, d. 18-10-1694 (La Fléche), taught philosophy, humanities and mathematics and authored a work about optics.

[40] ARSI, SMV, VII, 581. Verbiest, b. 09-10-1623 (Pitthem), e. 02-09-1641, d. 27-01-1688 (Peking), studied in Seville from where he was instructed to accompany the distinguished Jesuit cartographer Martino Martini (1614–1661), author of *Novus Atlas Sinensis* (1653), to China. See also chapter 2, nn. 320 and 326–329 a.r.t.

[41] See chapter 2, n. 320 a.r.t.

care which included five tables (1674). The criticism of the blind application of the so-called French, Dutch, Italian and Spanish (*Austriaca*) fortification systems and the replacement of this seventeenth century practice by a universal system dictated solely by terrain conditions (as discussed in Ango's work) is as significant as it is innovative, as was the continued use of pseudonyms to protect the identity of some Jesuit authors.

The last two decades of the seventeenth century, coinciding with the many conflicts started by King Louis XIV of France with his European neighbours (which culminated in the 1701–1714 war of the Spanish Succession) and with the renewed provocations of the Ottoman Turks (which started with the Turkish siege of Vienna in 1683 and ended with the capture of Belgrade by Catholic forces in 1717) saw nine Jesuit contributions to fortification. These were the *Architettura Militare* (1684) by Francesco Eschinardi (writing under the pseudonym of 'Costanzo Amichevoli');[42] *Compendio dell' Arte Militare* (1670) by Carlo Antonio Santi;[43] A anonymous transcript of the Sextus Julius Frontinus' *Stategematicon* (1690) mentioned by Sommervogel;[44] *Collectiones mathematicae de architectura militari* (1691) by Franz Menegatti;[45] *Collectiones Mathematicae de Architectura militari* (1691) by Gabriel Froelich;[46] *De Navali Machina* (1694) by Joseph de Jouvancy;[47] *Thèses de mathématiques sur le fortifications* (1695) by Guillaume de Raousset supervised by Jean-Baptiste de Saint-Just;[48] *De praxi in aggerum constructione* (1698) by Giovanni Macrini[49] and *Traité de l'architecture militaire* (1700) by Bernard

42 See n. 30.

43 ARSI, SMV, VII, 589. Santi, b. 25-02-1663 (Bergamo), e. 02-12-1680, d. 03-02-1729 (Parma) impressed the audience with his rhetorical skills at the *Festa Funebre* of Duke Francis II of Modena (1695). See also chapter 2, n. 70 a.r.t.

44 ARSI, SMV, IX, 1314.

45 ARSI, SMV, V, 904. Menegatti, b. 01-11-1631 (Wels), e. 08-01-1648, d. 16-11-1700 (Vienna) was the confessor of the Emperor Leopold.

46 ARSI, SMV, III, 1028. Froelich, b. 07-10-1657 (Vienna), d. 25-03-1725 (Vienna) served as rector of the Linz college.

47 ARSI, SMV, IV, 843. Jouvancy b. 14-09-1643 (Paris), e. 01-09-1659, d. 29-05-1719 (Rome) was called to Rome in 1699 to continue writing the *Historia Societatis*.

48 ARSI, SMV, VII, 430. Saint-Just, b. 04-02-1638 (Saint-Symphorien d'Ozon), e. 22-11-1653, d. 16-09-1710 (Aix) promoted Raousset's thesis in the wake of another work that had been presented at Aix by Paroy, for which see chapter 2, n. 104. He delivered a brilliant funeral oration to mark the demise of Maria Theresa of Austria (1683).

49 ARSI, SMV, IX, 1314. Macrini, b. 08-05-1632 (Imola), e. 22-08-1649, d. 07-06-1698 (Ferrara) taught grammar, humanities, philosophy, moral theology and mathematics in various colleges.

Durand.[50] According to Sommervogel, Durand's beautifully-illustrated manuscript was divided into two parts, one dealing with the theory and practice of military architecture, the other dealing with the application of perspective to both military and civil buildings, designed to 'protect' and 'adorn' the Baroque city.

The dawn of the eighteenth century covering the period 1700–1730 saw Jesuit mathematicians producing thirteen treatises on military architecture, now focusing their work on the resistance of potential fortifications to more sophisticated forms of artillery attacks that had been brought to perfection by Vauban in his sieges of Maastrich (1673), Valenciennes (1677), Ypres (1678), Luxembourg (1684), Mons (1691), Charleroi (1693) and Ath (1697). Among these treatises—which also took cognisance of the victories of Prince Eugene of Savoy over the Turks at Zenta (1697), Peterwardeen (1716) and Belgrade (1717) and over the French at Carpi (1701), Blenheim (1704), Turin (1706), Oudinaarde (1705) and Malplaquet (1709)—one can mention the *Theses matheseos de militari architectura* (1704) and the *Escuela militar de fortificacion ofensiva y defensiva* (1705) by José Cassani;[51] *Traité des fortifications* (c.1712) by Joseph Michel Aubert;[52] *Stratagemaia Martis ungarici* (1716) by Michel Bednari;[53] *Histoire de la milice françoise* (1721) by Gabriel Daniel;[54] *Lexici militaris* (1724) by Carlo d'Aquino;[55] *Reflexiones militares* (1724) by Carlo Giacinto

[50] According to ARSI, SMV, III, 300. Durand was b. 13-04-1645 (Dijon), e. 13-10-1664 and d. 08-05-1701 (Dijon).

[51] ARSI, SMV, II, 812. Cassani, b. 26-03-1673 (Madrid), e. 12-11-1686, d. 12-11-1750 (Madrid) taught mathematics at the *Colegio Imperial*, was consultant of the Spanish Inquisition and a founder member of the Madrid Royal Academy (1713). His 1705 book was dedicated to the king to whom it was presented by Cassani in the presence of Don Joseph de Solis Valderrabono y Dabila.

[52] ARSI, SMV, I, 618. Aubert, b. 10-02-1676 (Rennes), e. 02-10-1697, d. 08-08-1749 (Moulins) served as *Professeur Royal des Mathématiques* at the University of Caen, delivering a celebrated oration on mathematical teaching which was published in Caen by the *Imprimeur ordinaire du Roy*, Antoine Cavalier.

[53] ARSI, SMV, I, 1126–1127. Bednari, b. 1682 (Nagy-Tapolstan), d. 14-01-1728 (Trentschin) dedicated his 1716 work to the Hungarian Catholic nobility.

[54] ARSI, SMV, II, 1811. Daniel, b. 08-02-1649 (Rouen), e. 16-09-1667, d. 23-06-1728 (Paris) also criticised Descartes in his '*Voyage du monde de Descartes*' (1690). His work was praised by the military engineer Folard who had visited Malta in 1715 and afterwards published a 6-volume work on military history (1727–1730).

[55] ARSI, SMV, I, 494. Aquino, b. 15-04-1654 (Naples), e. 1669, d. 11-05-1737 (Rome), was a member of Christina of Sweden's Arcadia academy, using the pseudonym 'Alcone Sirio'. He also translated Dante's *Divina Commedia* into Latin (1728) and published a *Fragmenta Historica de bello Hungarico* (1726). In writing his 1724 *Lexicon* Aquino used the notes of Alberto de Albertis, for whom see chapter 2, n. 70 a.r.t.

Ferrero;[56] *Trattato sopra l'armi defensive ed offensive* (1725) and *Trattato d'Architettura Militare e Civile* (1725) by Filippo Buonanni[57] and the *Expérience du canon vertical* (1728) by Jacques Antoine Fèvre[58] who in 1746 served as confessor to the King Philip V of Spain. To this list of authors and titles of Jesuit treatises in 1700–1730 one must add Luís Gonzaga's *Exame militar* (1701) and Inácio Vieira's *Tratado mathematico da Pirothenica* (1705).[59]

The 1730–1750 period, marked by the war that France declared against Austria over the Polish succession (1733) and then by the so-called war of the Austrian Succession (1740)—at a time when Maria Theresa of Austria who firmly believed in the Habsburg 'divine mission', decided to fight the combined forces of Prussia, France and Spain with the help of Hungarian troops and British money—witnessed the appearance of twelve major works on military matters produced by professed Jesuits. These were entitled *Traduction de Végèce* (1730), *Nouveau Système de la maniere de défendre les places par le moyen des contremines* (1731), *Exercice sur la tactique* (1757) and *La guerre reduite en art et en regles* (1757), all by Louis Bertrand Castel;[60] *Architecturae militaris tyrocinium* (1738) by Ernest Vols;[61] *Elemens de l'art militaire dans la Fortification* (1740) by André Stanislas Fijan who was the Vice-Provincial of Champagne (1768);[62] *Mémoire sur la force de la poudre et le recuil des canons* (1740) by Louis Antoine Lozeran du Fesc;[63] *Ars muniendi, sive architectura militaris* (1740)

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[56] ARSI, SMV, III, 690. Ferrero, b. 1648 (Valperga), e. 16-01-1663, d. 18-10-1730 (Torino) was the spiritual adviser of Princess Louise Gabrielle of Savoy whom he accompanied to Spain for her marriage to Philip V, also delivering impressive funeral orations for Chales and the famous military commander, the Marchese di Pianezza.

[57] ARSI, SMV, II, 383. Buonanni, b. 07-01-1638 (Rome), e. 14-10-1655, d. 30-11-1725 served as librarian of the *Collegio Romano* and compiled several catalogues for Papal coins (1696), the Military Orders (1712), Musical instruments (1716) and the Relgious Orders (1722).

[58] ARSI, SMV, II, 709–710. Févre, b. 20-04-1689 (Champagne), e. 13-09-1704, d. 04-07-1768 (Baume-les-Dames), spent most of his life in Strasbourg, going to Spain in 1746–1747 to serve as royal confessor.

[59] See chapter 2, nn.145 and 146 a.r.t.

[60] ARSI, SMV, II, 827–841.Castel, b. 05-11-1688 (Montpellier), e. 26-10-1703, d. 11-01-1757 (Paris) also published a *Mathématique Abrégée*, (1727) which was reprinted in 1758.

[61] ARSI, SMV, VIII, 903. Vols, b. 27-12-1650 (Radkerspurg), e. 09-10-1667, d. 22-07-1720 (Vienna) taught mathematics for 20 years, served as rector of Linz college and also compiled a *Parvus Atlas Regni Hungariae* (1689).

[62] ARSI, SMV, III, 729. Fijan, b. 15-03-1718 (Dijon), e. 19-07-1736, d. 08-06-1791 (Nancy) taught mathematics for a long time at Pont-á-Mousson college.

[63] ARSI, SMV, V, 135. Lozeran, b. 07-01-1691 (Valence), e. 06-09-1705, d. 07-01-1755 (Tournon) was a member of the royal academies of Lyon, Bordeaux and Béziers.

by Guillaume François Baucheron;[64] *Recherches sur l'invention de la poudre à canon* (1743) by Charles Pierre Xavier Tolomas;[65] *Scientia artium militarium Architecturam* (1747) by Faustin Grodzicki;[66] *Mémoire sur le jet des bombes* (c. 1750) by Jean Claude Ignace Morand;[67] and *Lecciones de artilleria* (1764) by Tomas Cerda, the text of which had been finished in 1755.[68]

The fifty-five year old Florentine nobleman, Lorenzo Ricci, was elected by the nineteenth general congregation to head the Jesuit Order on 21 May 1758. The governments of the major Catholic European powers, except that of Austria, were then placing Rome under what Bangert[69] describes as "a heavy siege". The main protagonists of the Enlightenment were about to unleash a concerted effort to humiliate the Roman Church by destroying its "stormtroopers"—the Jesuits—so as "to shake off", as the Spanish diplomat Don José Nicolás de Azara (1730–1804) declared, "the yoke which in the centuries of barbarism had been imposed by the Court of Rome on the childish credibility of princes and peoples".[70] In a time which witnessed the gradual dissolution of the Jesuit Order first in Portugal (1759), then in France (1764), in Spain (1767), in Naples, Parma and Malta (1768) and everywhere else by the Papal Bull *Dominus ac Redemptor* (1773), it would only be logical that Jesuit writings about military matters during the period 1750–1773 would continue to emphasise the usefulness of the Jesuit *mathematicus* to the new masters of Europe despite their increasingly negative attitudes towards the Order. In such

[64] ARSI, SMV, I, 1016. Baucheron, b. 20-11-1719 (Chateauroux), e. 20-05-1739, d. 1788 taught grammar, humanities, rhetoric and philosophy. He authenticated his 1740 manuscript with the words "*P.Bauch*".

[65] ARSI, SMV, VIII, 85. Tolomas, b. 17-03-1706, e. 01-03-1724, d. 21-09-1762 (Lyon) also authored a book on the architecture of ancient Egypt (1745). His treatise on cannons formed part of a larger manuscript.

[66] ARSI, SMV, III, 1844. Grodzicki, b. 15-02-1709 (Lithuania), e. 26-08-1726, d. 1770, served as rector of the Kaminiec college and as a missionary in Poryck (1761–1770), also publishing a work on civil architecture (1748).

[67] ARSI, SMV, V, 1285. Morand, b. 06-02-1707 (Besancon), e. 19-10-1724, d. 25-04-1780 (Avignon) constructed an observatory at Avignon college, for which he was admitted to the royal academy of Lyon.

[68] ARSI, SMV, II, 992. Cerda, b. 22-12-1715 (Tarragona), e. 03-04-1732, d. 1791 (Forlì) occupied the Chair of Mathematics at the *Colegio Imperial* (1765–1767), taught mathematics at the Barcelona military academy and served as Cosmographer Royal. ARSI, SMV, IX, 839 gives the completion date of the *Lecciones* as 175[..] while Almirante, *Bibliografia Militar*, 145 gives the publication date as 1764.

[69] Bangert, *Society of Jesus*, 363.

[70] *Ibid.*, 364.

circumstances, the beleaguered Jesuits produced no less than twelve treatises on military architecture. These were the *Plaidoyer sur l'Art militaire prononcés au Collége de Louis le Grand, le 19 août* 1751 by Jacques Lenoir Duparc;[71] *Traité de l'architecture civile et militaire* (1758) by Yves André;[72] *Systema primum muniendi celebris Mareschalli de Vauban* (1758) by Christian Mayer;[73] *Universae Architecturae Militaris elementa* (1758) by Christian Rieger;[74] *Notizie Storico-Critiche concernenti all'Arte degli Antichi* (1761) by Matteo Aloisio Canonici;[75] *Elementa architecturae militaris* (1765); *Tractatus de Pyrotechnia, et Ballistica* (1766) and *Principes de fortification* (1769) by Giovanni Battista Izzo;[76] *Architectura tum civilis tum bellica* (1768) by Aloisio Panizzoni[77] and *Art militaire des Chinois* (1772) which was the very first translation of *Sun Tzu* by the Jesuit missionary in China Joseph Marie Amiot.[78] It is ironic that the patriotic Amiot—who had later exclaimed that "no longer are we Jesuits but Frenchmen we still remain"[79]—had managed to introduce this mine of ancient Chinese military wisdom to the French army shortly before the arrival of the news from Rome that the Jesuit Order had been universally suppressed, this

71 ARSI, SMV, III, 291. Duparc, b. 15-11-1702 (Pont-Audemer), e. 07-01-1721, d.c.1791 (Paris) headed the marine seminary in Brest; He was fond of Baroque spectacles and theatrical reproductions.

72 ARSI, SMV, I, 337. André, b. 22-05-1675 (Châteaulin), e. 13-09-1693, d. 26-02-1764 (Caen), also wrote extensively on the concept of beauty (1759), the history of papal excommunications (undated) and the 'art of good living'(undated). He was a member of the *Académie Royale des Belles-lettres* of Caen.

73 ARSI, SMV, V, 795. Mayer, b. 20-08-1719 (Mederizenhi), e. 20-09-1745, d. 16-04-1783 (Heidleberg), was a member of astronomical circles in Manheim, Munich, London, Philadelphia, Bologna and Göttingen. His book was based on a lecture about Vauban's fortifications that he had delivered to a packed audience at the University of Heidleberg where he held the post of professor of mathematics and experimental physics.

74 ARSI, SMV, VI, 184. Rieger, b. 14-05-1714 (Vienna), e. 17-10-1731, d. 26-03-1780 (Vienna), taught mathematics and military and civil architecture at the *Collegium Nobilium Theresianum* in Vienna for which see chapter 2, n. 271. He served Spain as royal cosmographer and was rector of the Passau and Laybach colleges.

75 ARSI, SMV, II, 688. Canonici, b. 05-08-1727 (Venice), e. 15-10-1743, d. 1805 or 1806 (Treviso), was an admirer of antiquity who set up a medals museum in Parma, and a gallery of religious objects in Bologna and a library of over 4000 old bibles in Venice, also serving as secretary of the Duke Ferdinand I of Parma.

76 ARSI, SMV, IV, 704. Izzo, b. 29-08-1722 (Naples), e. 02-11-1736, d. 05-12-1793 (Vienna) taught at the *Collegium Nobilium Theresianum* in Vienna where he also published *Elementa Architecturae Civilis* (1764) based on his lectures.

77 ARSI, SMV, VI, 167–169. Panizzoni, b. 11-06-1729 (Vicenza), e. 03-11-1745, d. 11-08-1820 (Rome), served as Provincial of the Russian Jesuit Province in Italy after the 1773 General Suppression.

78 See chapter 2, n. 332 a.r.t.

79 Bangert, *Society of Jesus*, 409.

making his book on military matters one of the last Jesuit contributions of the Baroque age. In the third chapter of his work, the French Jesuit mentioned Sun Tzu's great fear of fortified cities, this leading that mysterious Chinese general/s of the sixth century BC to adopt various stratagems to attack them. At the same time it would be necessary to warn everyone that any decision to assail such fortifications would be costly in terms of time lost and soldiers killed, to be carefully evaluated in the context of any war "which determines life and death, and the rise and fall of a nation". According to Bangert, Amiot was also responsible for composing a moving epitaph inscribed in Latin on the wall of a house outside Peking, recorded by bishop Martial Mouly in 1835:

> In the Name of Jesus, Amen. Long unshaken but overcome at last by so many storms, it has fallen. Travellers stop and read. Reflect for a few moments on the inconsistency of things human. Here lie the French missionaries of that very renowned Society which has taught and spread abroad in all its purity, the worship of the true God; which, while imitating amidst pain and toil and as far as human weakness allows Jesus whose name it bore, lived virtuously, helped our neighbour and making itself all things to all in order to gain all, for two flourishing centuries and more gave to the Church martyrs and confessors. I, Joseph Marie Amiot, and other French missionaries of the same Society, under the patronage and protection of the Tartar-Chinese emperor and with the support of the arts and sciences which we practise, still forward the divine cause. While in the imperial palace itself, amidst altars of false gods, our French Church shines with a true magnificence, we, secretly grieving even to the last of our days, have erected here amid burial graves this monument of our fraternal affection .Go, traveller, continue on your way. Felicitate the dead; weep for the living; pray for all wonder and be silent in the year of Christ 1774, on the 14th day of October, in the twentieth year of Ch'ien Lung, the 10th day of the 9th moon.[80]

Two other Jesuit books on military matters were published on the eve of the general suppression of the Order. They were the *Manual del Artillero* (1772) by the Spanish Jesuit *mathematicus* Antonio Eximeno (1729–1808)[81]—which was published as a follow up of Eximeno's better known monumental work entitled *Historia Militar Española* (1769)—and the *Eléments généraux des principales parties des mathématiques nécessaires à*

[80] *Ibid.*, 410–411 (Mission report of Bishop Mouly).

[81] ARSI, SMV, III, 491–495. Eximeno, b. 29-09-1729 (Valencia), e. 16-10-1745, d. 09-06-1808 (Rome) taught mathematics at the Segovia military school, for which see chapter 2, n. 233 a.r.t. See also Almirante, *Bibliographia Militar*, 276.

l'artillerie (1773) by the Amiot's compatriot, François Para du Phanjas.[82] During the forty long years that elapsed between the Papal Bulls *Dominus ac Redemptor* and *Sollicitudo omnium Ecclesiarum* which on 7 August 1814 reinstated the Jesuit Order, nine former Jesuits contributed the military treatises and ideas mentioned in the last chapter of this work.

General Vincenzo Carafa's Prohibition of Jesuit Research on Fortification Building

The book entitled *Architectonica militaris defensiva* authored by the German Jesuit *mathematicus* Theodoric Baegk must have raised many eyebrows in Jesuit circles.[83] Published in 1635, just one year after Baegk had relinquished his teaching activity at the college of Freiburg im Breisgau,[84] the new book was clearly based on his classroom notes on the subject, making it one of the earliest Jesuit writings on military architecture to focus on technical knowledge rather than on philosophical scholarship—reflecting at the same time a dangerous stance that could have easily vindicated John Donne's merciless tirades against the Jesuit Order as expressed in his *Pseudo-Martyr* (1610) and *Ignatius his conclave* (1611).[85] Despite its obvious usefulness to the German nobility to whom it was primarily addressed, the book would have put the Jesuit general Vitelleschi in, at best, an embarrassing and, at worst, an untenable position had its author not also been fortunately involved soon afterwards in a much-publicised conversion scoop involving the Protestant Prince Friedrich of Hesse-Darmstadt (1616–1682).[86] Baegk's publication was written in an *annus horribilis*. On 19 May 1635, Cardinal Richelieu of France had persuaded his king to declare war on the

82 ARSI, SMV, VI, 194. Para du Phanjas, b. 13-02-1724 (Champsaur), e. 16-09-1742, d. 1797 (Paris) authored several works. His contribution to Deidier's military work (which was first published in 1745) consisted in the addition of a treatise on military perspective, based on studies that he had made in Besancon.

83 See n. 8.

84 See chapter 2, n. 264 a.r.t.

85 Donne (1572–1631) had been educated by the Jesuits but he had later renounced his Catholic upbringing to become one of the most vociferous critics of Rome, targeting his considerable rhetorical and literary skills at the Jesuits.

86 Friedrick was the son of the Protestant Landgrave Ludwig V of Hesse-Darmstadt (1577–1626) and Magdalene of Brandenberg (1582–1616). He was first introduced to Catholicism by Lucas Holste, the librarian of Cardinal Francesco Barberini and Pope Innocent X Pamphili. Friedrick's conversion (1636) was attributed to the Jesuit *Mathematicus* Kircker who was in 1637 succeeded by Baegk as his Friedrick's confessor and adviser.

60. Frontispiece of Baegk's *Architectonica Militaris* book [BNCR, 6-25.D.61]. Reproduced with the kind permission of the Italian *Ministero per i Beni e le Attività Culturali.*

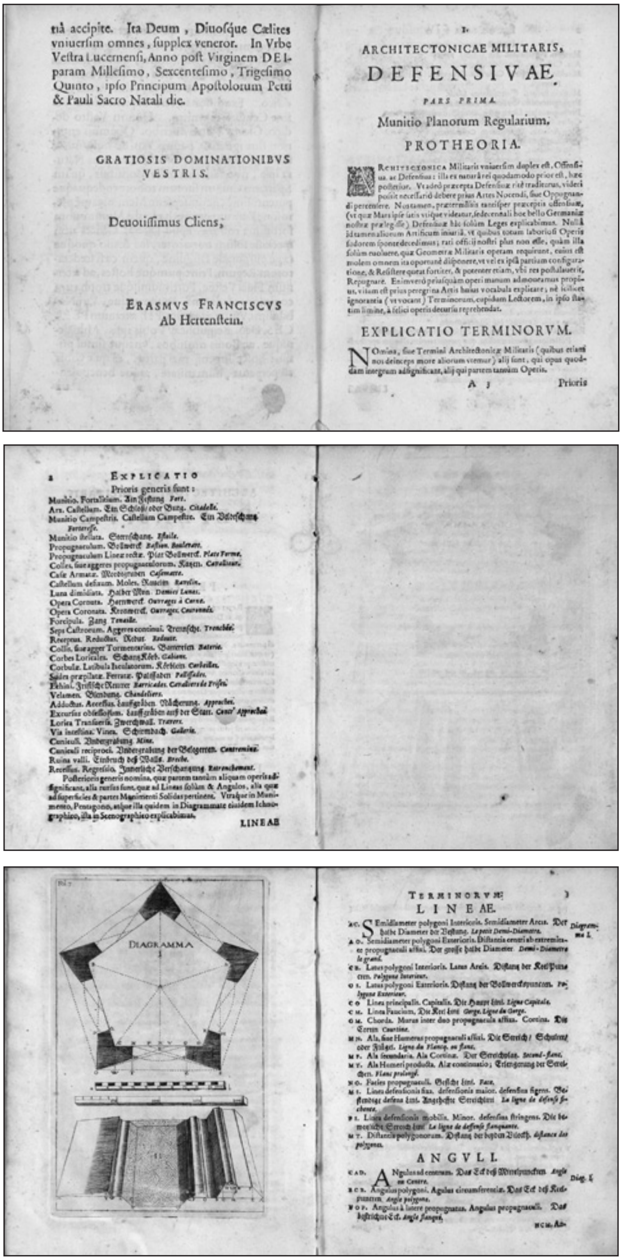
Habsburgs, thus considerably strengthening the Protestant position in the Thirty Years War. This changed situation not only reflected the volatile nature of seventeenth-century warfare but also contradicted the stance of the Jesuits who were far more single-minded in their support of a unified Catholic cause. It would have provided a just cause for the intensified pressure that was everywhere being brought to bear on Jesuit mathematicians of Baegk's ilk to help Catholic leaders with their knowledge of fortification mathematics, particularly so with printed works on the subject that could easily double up as classroom textbooks and battlefield manuals by their concise format and terse style, as Baegk's book was.

The *Architectonica Militaris Defensiva* tackled in a lucid way all aspects of early modern military architecture in the logical fashion that one would expect from an experienced Jesuit *mathematicus*. After listing a series of terminological expressions in Latin (with French translations) entitled *Explicatio Terminorum* (folios1–5), Baegk moves on to discuss the usual classification of fortified places into regular and irregular forms but also according to royal ("*realium*"), large ("*magnae*"), average ("*mediocres*") and small ("*parvae*") types, this depending on the length of their lines of defence (folios 5–8). A discussion of topographical issues entitled *Topographia* followed. This section was mainly focused on adapting the trace of fortified positions to different types of terrain marked by the presence of rivers, paved roads, cultivated fields, wasteland, forests, mountains, marshland, valleys, passage and harbours (folios 8–10). The work then progressed to clinically discuss *Eutimetria*—the computation of angle and line dimensions for use in the design of regularly-shaped fortifications based on various polygonal forms (folios 10–21). This section includes a series of tables which, Baegk states, were based on the "recent" works of Samuel Marolois and Adam Freitag which he had consulted. These works were Marolois' *Artis muniendi, sive fortificationis* (1615) and Freitag's *Architectura militaris nova et aucta* (1631). The tables reproduced by the Jesuit seem to have been intended to enable the layman designer of a regularly-shaped defensive work to swiftly draw up the trace of the fortifications without having to go through the gruelling process of time-consuming mathematical calculations, proceeding instead to rapidly apply the tabled dimensions given for all the different parts of the fortress—bastion faces, flanks and gorges; lines of defence; exterior and interior dimensions of the polygonal frame and others.

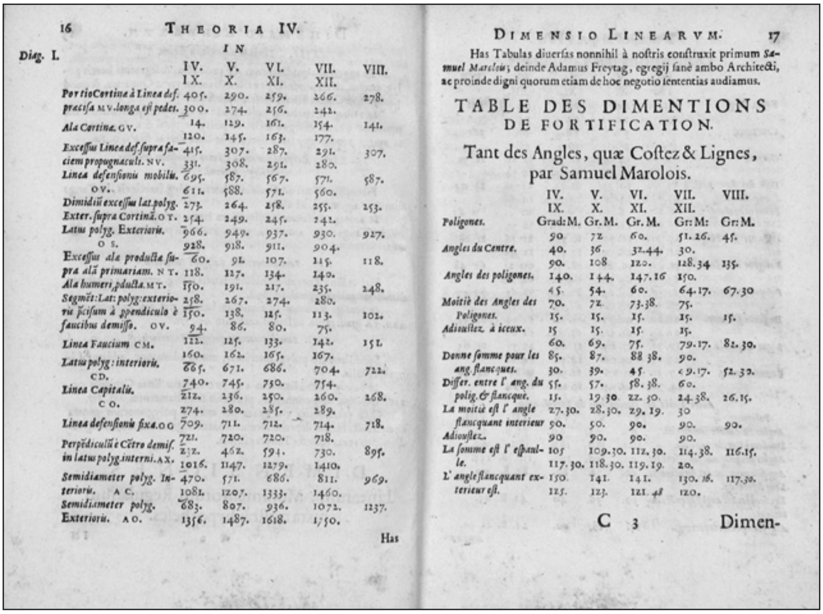
The next section of Baegk's work entitled *Ichnographia* (folios 22–29) discussed the geometrical layout and planimetric dimensions of the defensive and town planning elements which formed the 'military' and 'civil' zones of a typical Baroque city-fortress, here beautifully illustrated in two plates—the first showing the construction lines of an 'ideal' seven-sided polygonal city-fortress and the second showing the construction lines of all the planimetric features (inclusive of streets and squares) of another 'ideal' six-sided polygonal city-fortress with plenty of outworks. Its radial form of city planning must have been inspired by the spirit of the Utopian Venetian city-fortress of Palmanova founded in 1593 to resist a possible Turkish invasion.[87] The following section of Baegk's work was entitled *Stereometria*—giving on folios 29–51 several mathematical calculations for the optimum dimensions of various elements. Judging by the style in which they are presented, these could have been transferred directly from the Jesuit's classroom expositions at Freiburg-im-Breisgau college. This section was followed by *Opera Regularia Extraordinaria*—giving on folios 52–58, design information about cavaliers and casemates but also "*castella defixa*" (ravelins), "*semi-lune*" (demilunes), "*fossae*" (ditches), "*opus cornutum*" (hornworks), "*opera coronata*" (crownworks) as well as "*forcipes*" (tenailles). Conscious that he was first and foremost a Jesuit, Baegk saw it fit to conclude his book on military architecture with a reference to the spiritual mission of the Jesuit Order by inserting the words "*Omnia ad Maiorem Dei, Dei paraeque V. Mariae gloriam*" (dedicated to the greater glory of God and the Virgin Mary), adding that his work had been published "*Cum Licentia Superiorum*" (by permission of superior authority) meaning that the necessary authorisation from Rome had been obtained. The very original and beautifully designed frontispiece of Baegk's book also included the words "*Deus omnia videt*" (God sees everything), here inscribed in circular form around a human eye, clearly intended to stress the strong religious convictions of the author and God's blessing of the contents!

An important aspect of Baegk's work, which would surely have featured strongly in the granting of publication clearance by Rome, was undoubtedly the Jesuit's close association from his Freiburg-im-Breisgau days, with Friedrich von Hesse-Darmstadt, a Protestant Prince who had in 1636 converted to Catholicism, soon afterwards joining the Knights of

[87] Sopra, *Palmanova*, 12–16.



61. Extracts from the '*Explicatio Terminorum*' section of the *Architectonica Militaris* book [BNCR, 6-25.d.61]. Reproduced with the kind permission of the Italian *Ministero per i Beni e le Attività Culturali.*



16 THEORIA IV.

Diag. I.

IN

	IV. IX.	V. X.	VI. XI.	VII. XII.	VIII.
Portio Cortinæ à Linea def.	405.	290.	259.	266.	278.
præcisa M V. longa est pedes.	300.	274.	256.	242.	
Ala Cortinæ. G V.	14.	129.	161.	154.	141.
	120.	145.	163.	177.	
Excessus Lineæ def. supra faciem propugnaculi. N V.	415.	307.	287.	291.	307.
	331.	308.	291.	280.	
Linea defensionis mobilis.	695.	587.	567.	571.	587.
O V.	611.	588.	571.	560.	
Dimidiũ excessus lat. polyg.	273.	264.	258.	255.	253.
Exter. supra Cortinã. O T.	254.	249.	245.	242.	
Latus polyg. Exterioris.	966.	949.	937.	930.	927.
O S.	928.	918.	911.	904.	
Excessus alæ productæ supra alã primariam. N T.	60.	91.	107.	115.	118.
	118.	127.	134.	140.	
Ala humeri, pducta. M T.	150.	191.	217.	235.	248.
Segmẽt: Lat: polyg: exterioris pcisum à ppendiculo è	258.	267.	274.	280.	
	150.	138.	125.	113.	102.
faucibus demisso. O V.	94.	86.	80.	75.	
Linea Faucium C M.	122.	125.	133.	142.	151.
	160.	162.	165.	167.	
Latus polyg: interioris. C D.	665.	671.	686.	704.	722.
	740.	745.	750.	754.	
Linea Capitalis. C O.	212.	236.	250.	260.	268.
	274.	280.	285.	289.	
Linea defensionis fixa. O G	709.	711.	712.	714.	718.
Perpẽdiculũ è Cẽtro demiss. in latus polyg. interni. A X.	721.	720.	720.	718.	
	212.	462.	594.	730.	895.
	1016.	1147.	1279.	1410.	
Semidiameter polyg. Interioris. A C.	470.	571.	686.	811.	969.
	1081.	1207.	1333.	1460.	
Semidiameter polyg.	683.	807.	936.	1072.	1237.
Exterioris. A O.	1356.	1487.	1618.	1750.	

Has

DIMENSIO LINEARVM. 17

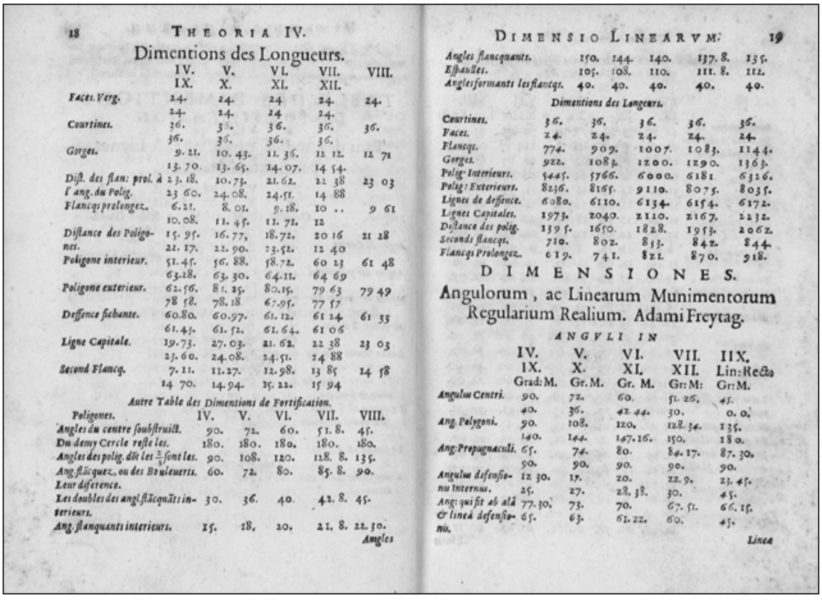
Has Tabulas diuersas nonnihil à nostris construxit primum Samuel Marolois; deinde Adamus Freytag, egregij sanè ambo Architecti, ac proinde digni quorum etiam de hoc negotio sententias audiamus.

TABLE DES DIMENTIONS DE FORTIFICATION.

Tant des Angles, quæ Costez & Lignes, par Samuel Marolois.

	IV. IX.	V. X.	VI. XI.	VII. XII.	VIII.
Poligones.	Grad: M.	Gr. M.	Gr. M.	Gr: M:	Gr: M.
	90	72	60.	51. 26.	45.
Angles du Centre.	40.	36	32. 44.	30.	
	90.	108	120.	128. 34	135.
Angles des poligones.	140.	144.	147. 16	150.	
	45.	54.	60.	64. 17.	67. 30
Moitiè des Angles des Poligones.	70.	72.	73. 38.	75.	
	15.	15.	15.	15.	15.
Adiousstez à iceux.	15	15.	15.	15.	
	60.	69.	75.	79. 17.	82. 30.
Donne somme pour les ang. flancques.	85.	87.	88 38.	90.	
	30.	39.	45.	49. 17.	52. 30.
Differ. entre l' ang. du polig. & flancque.	55.	57.	58. 38.	60.	
	15.	19 30	22. 30.	24. 38.	26. 15.
La moitiè est l' angle flancquant interieur	27. 30.	28. 30.	29. 19.	30	
	90.	90.	90.	90.	90.
Adiousstez.	90	90.	90.	90.	
La somme est l' espaule.	105	109. 30.	112. 30.	114. 38.	116. 15.
	117. 30.	118. 30.	119. 19.	20.	
L' angle flancquant exterieur est.	150.	141.	141.	130. 16.	117. 30.
	125.	123.	121. 48	120.	

C 3 Dimen-



18 THEORIA IV.

Dimentions des Longueurs.

	IV. IX.	V. X.	VI. XI.	VII. XII.	VIII.
Faces. Verg.	24.	24.	24	24.	24.
	24.	24.	24	24.	
Courtines.	36.	36.	36.	36.	36.
	36.	36.	36.	36.	
Gorges.	9. 21.	10. 43.	11. 36.	12 12.	12 71
	13. 70.	13. 65.	14. 07.	14 54.	
Dist. des flan: prol. à l' ang. du Polig.	23. 18.	10. 73.	21. 62.	22 38	23 03
	23 60.	24. 08.	24. 51.	14 88	
Flancqs prolongez.	6. 21.	8. 01.	9. 18.	10 ..	9 61
	10. 08.	11. 45.	11. 71.	12	
Distance des Poligones.	15. 95.	16. 77.	18. 72.	20 16	21 28
	22. 17.	22. 90.	23. 52.	12 40	
Poligone interieur.	51. 45.	56. 88.	58. 72.	60 23	61 48
	63. 28.	63. 30.	64. 11.	64 69	
Poligone exterieur.	62. 56.	81. 25.	80. 15.	79 63	79 49
	78 58.	78. 18	67. 95.	77 57	
Deffence fichante.	60. 80.	60. 97.	61. 12.	61 24	61 33
	61. 43.	61. 52.	61. 64.	61 06	
Ligne Capitale.	19. 73.	27. 03.	21. 62.	22 38	23 03
	23. 60.	24. 08.	24. 51.	24 88	
Second Flancq.	7. 11.	11. 27.	12. 98.	13 85	14 58
	14 70.	14. 94.	15. 22.	15 94	

Autre Table des Dimentions de Fortification.

Poligones.	IV.	V.	VI.	VII.	VIII.
Angles du centre soubstruict.	90.	72.	60.	51. 8.	45.
Du demy Cercle reste les.	180.	180.	180.	180.	180.
Angles des polig. dõt les ⅓ sont les.	90.	108.	120.	128. 8.	135.
Ang. flãcquez, ou des Bouleuerts.	60.	72.	80.	85. 8.	90.
Leur diference.					
Les doubles des angl. flãcquãts interieurs.	30.	36.	40.	42. 8.	45.
Ang. flanquants interieurs.	15.	18.	20.	21. 8.	22. 30.

Angles

DIMENSIO LINEARVM. 19

Angles flancquants.	150.	144.	140.	137. 8.	135.
Espaulles.	105.	108.	110.	111. 8.	112.
Angles formants les flancqs.	40.	40.	40.	40.	40.

Dimentions des Longeurs.

Courtines.	36.	36.	36.	36.	36.
Faces.	24.	24.	24.	24.	24.
Flancqs.	774.	909.	1007.	1083.	1144.
Gorges.	922.	1083.	1200.	1290.	1363.
Polig: Interieurs.	5445.	5766.	6000.	6181	6326.
Polig: Exterieurs.	8236.	8165.	9110.	8075.	8035.
Lignes de deffence.	6080.	6110.	6134.	6154.	6172.
Lignes Capitales.	1973.	2040.	2110.	2167.	2232.
Distance des polig.	1395.	1650.	1828.	1953.	2062.
Seconds flancqs.	710.	802.	833.	842.	844.
Flancqs Prolongez.	619.	741.	821.	870.	918.

DIMENSIONES.

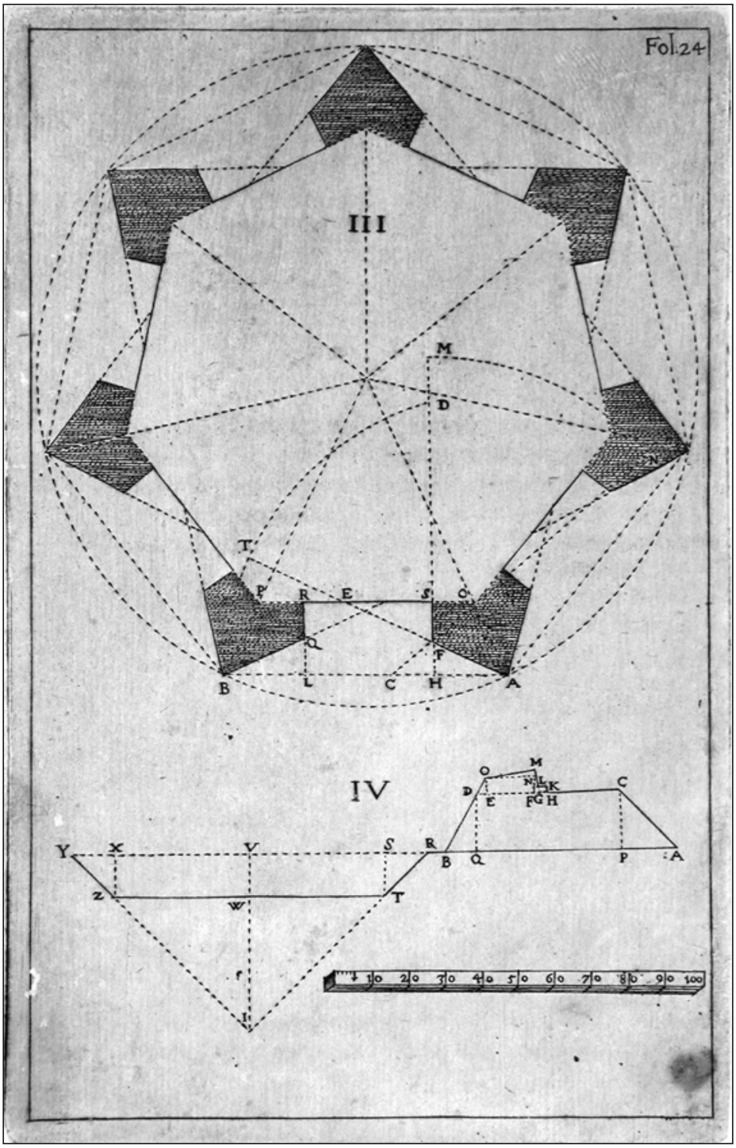
Angulorum, ac Linearum Munimentorum Regularium Realium. Adami Freytag.

ANGVLI IN

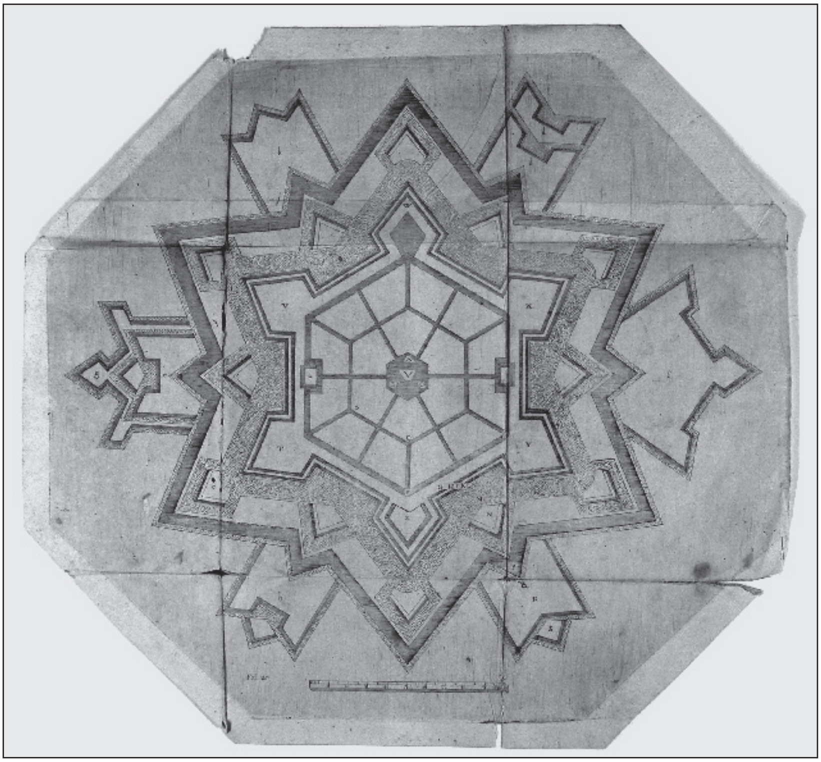
	IV. IX.	V. X.	VI. XI.	VII. XII.	IIX. Lin: Recta
	Grad: M.	Gr. M.	Gr. M.	Gr: M:	Gr: M.
Angulus Centri.	90.	72.	60.	51. 26.	45.
	40.	36.	42. 44.	30.	0. 0.
Ang. Polygoni.	90.	108.	120.	128. 34.	135.
	140.	144.	147. 16.	150.	180.
Ang: Propugnaculi.	65.	74.	80.	84. 17.	87. 30.
	90.	90.	90.	90.	90.
Angulus defensionis Internus.	12 30.	17.	20.	22. 9.	23. 45.
	25.	27.	28. 38.	30.	45.
Ang: qui fit ab alâ & lineâ defensionis.	77. 30.	73.	70.	67. 51.	66. 15.
	65.	63.	61. 22.	60.	45.

Linea

62. Extracts from the '*Eutimetria*' section of the *Architectonica Militaris* book [BNCR, 6-25.d.61]. Reproduced with the kind permission of the Italian *Ministero per i Beni e le Attività Culturali.*



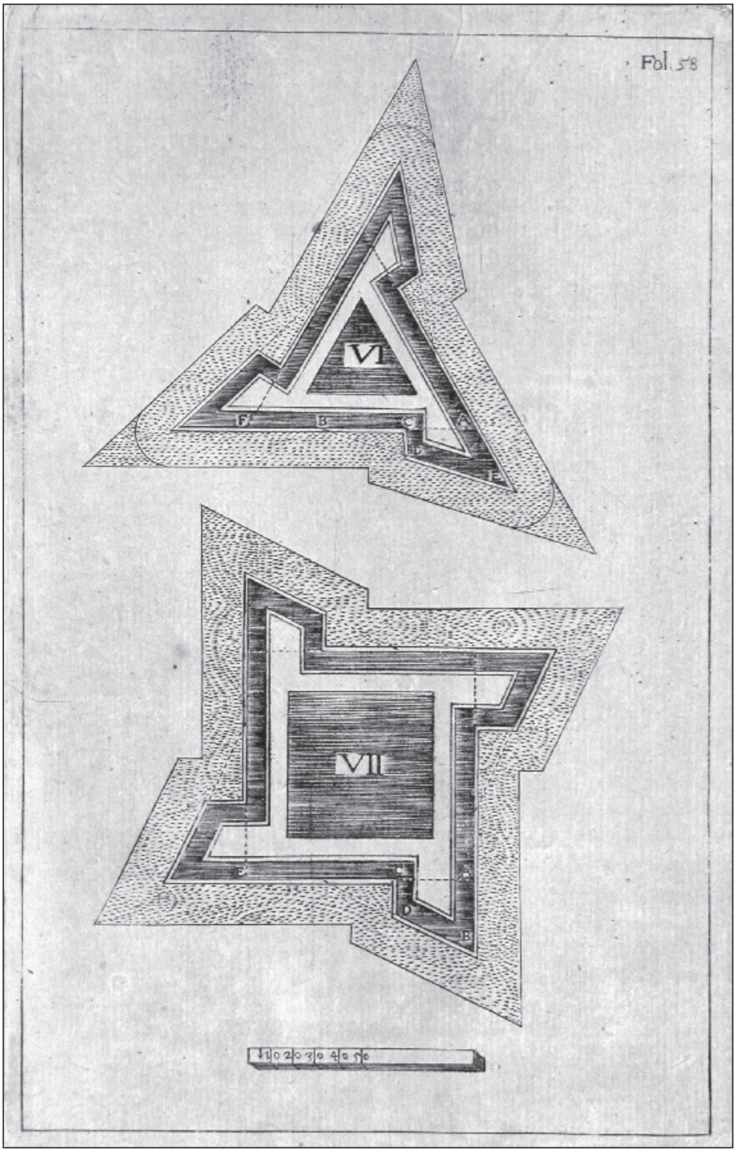
63. Extract from the '*Ichnographia*' section of the *Architectonica Militaris* book [BNCR, 6-25.d.61]. Reproduced with the kind permission of the Italian *Ministero per i Beni e le Attività Culturali.*



64. Extract from the '*Ichnographia*' section of the *Architectonica Militaris* book showing different types of 'outworks' used in the early seventeenth century [BNCR, 6-25.D.61]. Reproduced with the kind permission of the Italian *Ministero per i Beni e le Attività Culturali*.

Malta to engage in a personal crusade against the Turks on the high seas. The Jesuit protagonist of Friedrich's dramatic conversion had been the famous German *mathematicus* Athanasius Kircher (1602–1680) who had accompanied the nobleman to Malta as his confessor.[88] Unpublished documentary evidence in the form of correspondence exchanged between

[88] ARSI, SMV, IV 1046–1077. Kircker, b. 02-05-1602 (Giesel bei Fulda), e. 02-10-1618, d. 27-11-1680 (Rome), also known as the "master of a hundred arts", taught mathematics at the *Collegio Romano* in 1639–1640 and 1644–1646, publishing several works of great scientific value. For his stay in Malta see NLM, AOM 1417, f. 32V (14-01-1638 Lascaris to Barberini letter) stating that Kircker "had given so much satisfaction to me, my Knights and the people of Malta with his admirable skills and disposition to teach, that we all learnt to love him and wish him all honours and success in his endeavours."



65. Extract from the '*Opera Regularia Extraordinaria*' section of the *Architectonica Militaris* book [BNCR, 6.25.D.61]. Reproduced with the kind permission of the Italian *Ministero per i Beni e le Attività Culturali.*

Grand Master Lascaris, General Vitelleschi and the pope's advisor Cardinal Francesco Barberini, clearly reveals that when Kircher had been recalled to Rome from Malta late in 1637, he had been immediately replaced as Hesse-Darmstadt's confessor by Theodoric Baegk—described by the Grand Master on 14 January 1638 as a person of remarkable qualities and sound spiritual values who had on more than one occasion proved himself to be most worthy of the strong recommendation that had been drafted for him by Vitelleschi.[89] Not only did Baegk join the German Prince in naval action against the 'infidels' targeted at Goletta[90] but he also accompanied Hesse-Darmstadt, now a Knight of Malta, to Palermo where he placed a copy of his book on military architecture in the library of the *Collegio Massimo*.[91] Baegk then travelled with the prince through Spain and Italy, where his military expertise would surely have turned out to be most useful during Friedrich's two military appointments, firstly as admiral of a fleet of Spanish war galleys patrolling the Mediterranean and then, as governor of Sardenia, based in the city-fortress of Cagliari.[92] Since Baegk died in Rome on 14 December 1676, he would have probably continued serving as the prince's adviser and confessor after 1655 when Friedrich was conferred with a Cardinal's hat by Pope Innocent X Pamphili (1644–1655). This appointment allowed the prince to participate in the 1655 conclave which elected to the papacy as Alexander VII, his former friend and Inquisitor to Malta, Fabio Chigi.[93] Cardinal Hesse-Darmstadt, now assured of Papal favour, was afterwards appointed ambassador to that other great convert to Catholicism, Queen Christina of Sweden (1655). It is recorded that he ended his career as Cardinal-Bishop of Breslau (1671) where he died on 19 February 1682.[94]

Architectura Militaris Defensiva was followed by other writings by the Jesuits Durand, Kruger, Billy, Grassi, Stafford, Richard, Gobat, Schall von Bell, Derand and Fournier. It was at this point that the new Jesuit General

[89] NLM, AOM 1417, f. 28 (14-01-1638 Lascaris to Vitelleschi letter) and f. 29 (14-01-1638 Lascaris to Barberini letter).

[90] Freller and Scalpello, Malta, 34, fn. 135 citing *Relatione della gloriosa impresa fatta in Barbaria dalle Galere della Religione Gerosolmitana, sotto il commando dell'Eccellentiss. Sig. Principe Landgravio Federico d'Assia, Generale* (Rome, 1640). See also Barz, *Landgraf Friedrich*, 73–94.

[91] See chapter 2, n. 260 a.r.t.

[92] Miranda, *Cardinals*, consulted online.

[93] *Ibid*.

[94] Following his death in Breslau, Friedrich was buried with great Baroque ceremony in the church of his ancestor St. Elisabeth of Thuringia.

Vincenzo Carafa, a Neapolitan nobleman with a wide reputation for sanctity who had received 52 out of 80 votes at the eighth Jesuit General Congregation that elected him,[95] decided to put a stop to such 'unholy' Jesuit writings. On the very same day of the signing of the Treaty of Westphalia at Munster on 24 October 1648—the treaty aimed at ending the "Discords and Civil Divisions that for many years had been stirred up in the Roman Empire" and which "had increased to such a degree that not only all Germany but also neighbouring kingdoms, and France particularly, had become involved in the disorders of a long and civil war"[96]—a cautious Carafa simultaneously issued a prohibition circular entitled "*De Fortificationibus*" to all the *Rheni Superioris* Jesuit Provincials:

> Given the just and various factors involved and in order that I can avoid any troubles that may occur hereafter, also after having consulted our assistant fathers about this matter, I have judged it necessary to prohibit our Professors from teaching any subject matter concerning fortifications, since this is deemed to be incompatible with our constitutions and with the mission of the Society. For this reason, Your Reverence may not, after this, permit our Professors to either read or teach this subject. I would also recommend that you circulate this note for its accurate enforcement.[97]

What would have prompted the Jesuit General to issue such a blanket prohibition on Jesuit teaching and research on military architecture and why was this action carefully timed to coincide with the signing of the Treaty of Westphalia which ended the Thirty Years War in Europe? The answers to these questions are perhaps found in two inter-related categories of insertions included in the treaty. The first category included references to the enforced demolition of several "fortifications and ramparts" that had been associated with the violent occupation of many places in the war theatres of Europe during the period of hostilities—fortifications that had now become powerful symbols of oppression and aggression (articles LVIII and LXXXIII were the most explicit clauses in this regard). The second category included references to the determination of all concerned "to abstain for the future from all acts of hostility," real or perceived (articles CIV, CXVIII, CXXI, CXXII and CXXIII were the two most explicit clauses in point). This would have undoubtedly led a cautious

95 Padberg *et al.*, *Congregations*, 17.

96 British Foreign Office, *Treaty of Westphalia*, consulted online.

97 ARSI, *Mon. Ger. Paed.*, III, 75–76 (Article 40 *'Der unterricht über Festungsbau den professorem S.J. Verbotem'*, dated 24-10-1648 and translated by Oratio Vella, professor of Latin at the University of Malta).

66. Gerard ter Borch's painting of the swearing of the Oath of Ratification at Münster on 24 October 1648. Reproduced with the kind permission of the National Gallery in London.

Carafa to play it safe and prohibit altogether the controversial involvement of Jesuits in all things military, especially so in the context of a warning insertion stating that:

> Nevertheless the concluded peace shall remain in force, and all parties in this transaction shall be obliged to defend and protect all and every Article of this peace against any one, without distinction of Religion; and if it happens that any point shall be violated, the offended shall before all things, exhort the offender not to come to any hostility, submitting his cause to a friendly composition, or the ordinary proceedings of justice. [98]

Carafa died on 8 June 1649 when the ashes of war had hardly cooled. His weak successors Francesco Piccolomini, Luigi Gottifredi and Goswin Nickel obviously failed to universally enforce the 1648 ban on fortification research by Jesuits like Storer, Berthet, Curtz, Cuvelier, Faille, Semple, Bettini, Bivero, Ferroni and Eschinardi.[99] Nor did the Jesuit hierarchy in Rome manage to stop the large influx of European students attending the very popular military classes that were still being held behind the closed walls of the Jesuit-run seminaries for nobles of Catholic Europe. In Parma, the Jesuit-run *seminarium nobilium* inaugurated by Ranuccio Farnese, registered an extraordinary rise of students hailing from Germanic countries who went there to learn military as well as literary skills,[100] Despite possessing a published set of rules called the *Regulae Revisorum Generalium* designed to censure any Jesuit written work before going to print-rules that were confirmed at the tenth General Congregation held on 7 January–20 March 1652[101]—the Jesuit Order failed miserably to apply the rigours of this mechanism to the publication of military treatises. Could this imply a 'tacit' approval of these works by Jesuit authors as opposed to the vociferous opposition of the Jesuit heirarchy to theological and philosophical studies, particularly those concerned with the unorthodox works of Descartes and Malebranche, whose Jesuit apologists were even subjected to a general purge by the Order's authorities in Lyon[102] in 1705? Several points of interest emerge.

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98 See n. 96 (Article CXXIII).

99 See n. 20–30 a.r.t.

100 O'Neill and Dominguez (ed.), *Diccionario*, 1247 (*Ensenanza Militar*). See also Brizzi, *Classe Dirigente*, fig. 4 a.r.t.

101 ARSI, Inst SJ, III, 65–68 (*Regulae Revisorum Generalium editae iussu Congregationis VIII, recognitae in Congregatione X*).

102 See chapter 2, n. 95 (Van Damme).

None of the fifteen clauses of the *Regulae Revisorum Generalium* dealing with the thorough examination of Jesuit manuscripts mentioned military writings. On the other hand they did specifically mention, among the subjects to be carefully watched, "profane" and "ecclesiastical" history, theology, politics, philosophy and writings against 'heretics'. They often targeted the works of the learned professors of scholastic theology, Sacred Scripture and philosophy (but not of mathematics) for special scrutiny in Clause VI. A case in point was the rigid censorship of Athanasius Kircher's *Oedipus Aegyptiacus* (1652) which is still considered to be one of the most illuminating encyclopaedias of magical practices and esoteric traditions that have been published (albeit with the enforced "corrections" of the *Revisores*) in Baroque Europe.[103]

In several cases, Jesuit authors of military treatises written before and after 1648 often showed themselves to be prepared to go through great pains to obtain approval not only from their respective Jesuit Provincials but also from the state authorities in their field of operation, this often being viewed as an assurance that their works would not run counter to the interests of the Catholic princes they served. Jesuit mathematicians in France like Fournier and Bourdin made great efforts to obtain the permission of both their Provincial and the King of France, before publishing their military manuscripts. Bourdin's *Architecture militaire* and *Perspective militaire* obtained the French Provincial Cellot's clearance on 9 February 1655 but the efforts of the Jesuit Masò in Sicily to obtain permission to publish his *Architettura militare defensiva, et offensiva* (even as part of his larger mathematical work) met with a flat refusal.[104] Evidently much depended on the political climate in a particular Jesuit province and the need or otherwise that was felt by the Jesuits to implement 'accommodation' tactics.

There was also the issue of whether the Jesuit Order could really afford to have among its ranks a community of mathematicians who focused on *De re militari*. The 'inner conflicts of conscience' that had caused problems for belligerent Jesuits like Ciermans, Isasi, Camassa, Verbiest and Masò must here be confronted with the strong convictions of Jesuits of the ilk of Possevino (who considered military studies to be a valid com-

[103] O'Malley *et al.*, *The Jesuits II*, 336–354 (Chapter 15 on '*Utility, Edification and Superstition: Jesuit Censorship and Athanasius Kircher's Oedipus Aegyptiacus*' by Daniel Stolzenberg).

[104] ARSI, SMV, II, 29 (Cellot's clearance) and ARSI, Sic.17, *Epis. Gen.* (31-07-1659), ff. 328–328v (Masò) mentioned in chapter 4, n. 72 a.r.t

ponent of the Jesuit apostolic mission in view of the demands of a titled nobility who repeatedly expressed great interest in Jesuit achievements in this field). It would seem that Jesuit activities concerning *De re militari* invariably activated recurrent tensions that had harassed the Jesuit Order since its foundation in 1540[105]—tensions between a 'useful' intellectual activity closely related to the political and military realities of the Baroque age and, on the other hand, an increasingly dangerous public perception of diminishing spirituality. The frontispiece of Baegk's *Architectonica militaris defensive* prominently displaying the words *Deus Omnia Videt* and the "*Omnia ad Maiorem Dei, Dei paraeque V. Mariae gloriam*" conclusion to this book, provides one example of the way in which the Jesuits tried to reconcile such conflicting issues.

Considered in the perspective of such complications, the many authors of Jesuit works on military architecture who constituted the elite of the Jesuit mathematical community, are to be admired for their overall success in resisting the short-lived attempt of General Carafa to suppress their research and writings on military architecture and siege craft, on artillery and troop formation studies. Had this prohibition been rigorously and uniformly applied by his successors, it would have almost certainly reduced the considerable influence of the Jesuit Order in the Catholic courts of early modern Europe.

The Creation of a Unique Synergy Document: The *Escuela de Palas* Treatise of 1693

It was a Jesuit—the "*famoso jesuita*" José Zaragoza y Vilanova—who laid the foundations of one of the most remarkable treatises on military architecture in the Spanish world when he had spent long hours explaining this discipline to a young Spaniard called Don Diego Felipe de Guzman, better known in history as the third Marquis of Leganés.[106] This Grandee of Spain later served his country as governor of Catalunya (1685–1688) and then as governor of Milan (1691–1698), moving on to become president of the Council of Castille (1700).[107] It was during his tenure in Milan that the

105 Baldini, *Saggi*, 108.
106 BNE, *Escuela de Palas*, II, 96–99 (Construccion XXVIII—Del Padre Joseph Zaragoza). See also Almirante, Bibliografia Militar, 923.
107 Online information on Spanish Viceroys of Catalonia, Governors of Milan and *Presidentes del Consejo de Castilla*.

marquis authored the treatise known as the *Escuela de Palas* (1693)[108] which unfortunately did not save him from meeting an untimely death in the French prison of Vincennes in 1711 following his participation in the many intrigues that had led to the replacement of the last Habsburg monarch of Spain Carlos II (1661–1700) by the Bourbon Philip V (1683–1746), nicknamed "*El Rey Animoso*".[109] Through the good offices of Zaragoza, Leganés was introduced to the military minds of José Cassani and Tomas Vicente Tosca—both these Spanish priests and military theorists had been influenced by that other famous priest with a concern of all things military called Juan Caramuel y Lobkowitz (1606–1682)—author of the *Declaracion Mystica de las armas de España* (1636)[110]—whose contribution was discussed in the *Escuela de Palas* treatise.

In the Milan of 1693, links between the newly-arrived governor from Spain and the Jesuit *Collegium Mediolanense*, also called the '*Brera*', were strong. It is therefore not at all surprising that when Leganés decided to author under anonymous cover, the *Escuela de Palas* treatise, he would have requested the Jesuit *mathematicus* Tommaso Ceva—the top professor of the mathematical disciplines at the *Brera* in 1675–1680 and again in 1681–1721[111]—to introduce his work with a lengthy poem or "*Idyllium*". As was to be expected in these circumstances, the introductory section of the Leganés' book took the form of a very Baroque play of masks where the identities of both author and his Jesuit advisers were skilfully concealed in verses that are full of riddles, acronyms, epigrams and plays on words:[112]

> "This military school is executive power
> A mirror of famous Captains
> A norm with which you acquire or gain it (*o le ganés*)
> A way to establish your name up to the end of time"

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[108] BNE, *Escuela de Palas*, I and II.

[109] These intrigues were associated with the War of the Spanish Succession (1701–1714) which secured the inheritance to the Spanish throne of Philip V against whom Leganés had conspired.

[110] Almirante, *Bibliografia Militar*, 115. Addressed as 'Venerable bishop' in the *Escuela de Palas* treatise, Caramuel is credited with devising a novel type of fortification in 1645 which was adopted by the Emperor Ferdinand III in Hungary, greatly influencing the 'maxims' governing the '*Austriaca*' fortification system of fortifying places for which see n. 124 a.r.t.

[111] AHSI 103, a. LII (1983) 83 and 87. See also chapter 2, n. 254 a.r.t.

[112] BNE, *Escuela de Palas*, I, VI-VII.

67. Frontispiece of the *Escuela de Palas* treatise [BNE, R/15043]. Reproduced with the kind permission of the *Biblioteca Nacional de España*.

In his preface or *Exortacion*, Don José Chafrion, "*tenente de Maestro de Campo General del esercito del estado de Milan*",[113] brought forward arguments to justify the production of this extraordinary treatise. These arguments were concluded with a six-line poem or *Exastichon* addressed to an author who "hated flattery" but who however "promised much glory to all who abide by his instruction"—an obvious reference to his master, the Jesuit-trained Marquis of Leganés. The first argument mentioned the fact that any soldier of Spain, however brave or intelligent, had a great need to learn "the mathematical sciences that are taught in this military school" since when courage would be united with acquired wisdom, that same soldier would be in a much better position to achieve great glory for himself, for his family and for his homeland. Chafrion's second argument discussed the religious basis of both defensive and offensive military operations. Defensive action according to him, originated when God—well before Pythagoras—decided to enclose the garden of Paradise with walls which were "defended by Cherubs who guarded it well using iron and fire weapons". Offensive action originated when God fielded his "army of Angels" against Lucifer's hordes (as mentioned in St. John's Apocalypse and in the Holy Scriptures). These two examples more than justified the usefulness of the military arts to conserve or impose peace, freedom and justice. One can here indeed detect an evocation of the 'just war' priority for any military action that had been advocated by the Jesuit Order since the sixteenth century, this once more underlining the influence on Chafrion's mind of his old mentor Zaragoza whose private lessons he had shared with Leganés in Spain. As was fitting in any introduction to a seventeenth-century military work, Chafrion continued his preface by mentioning the great usefulness of arithmetic, geometry, the study of the sphere, geography, hydrography, chronolography, chronography, astronomy and astrology without which, he wrote, "you cannot end up being a perfect soldier" (this obviously implying that the virtual monopoly of knowledge of this nature contained within the walls of the main Jesuit colleges and seminaries for nobles was indispensable to produce good soldiers in this age of the soldier).[114] At the end of his preface,

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[113] BNE, *Escuela de Palas*, I '*Exortacion*' Cobos-Guerra and Castro Fernández, *Arquitectura Militar Española*, 89 remark that Chafrion was in 1694 placed in charge of all fortifications in Catalonia, where he drew up projects for Montjuic and Hostol, also improving the Barcelona fortifications. While in Milan, Chafrion authored an important document on the fortifications of the State of Milan (1687).

[114] Villari, *Baroque Personae*, 32 (Chapter 2 on *'The Soldier'* by Geoffrey Parker).

Chafrion mentions the great value of algebra, described as that "miracle of mathematics", of trigonometry, described as that science which enables "the facile measurement of the earth, the seas and the skies" and, in a tacit acknowledgement of the pioneering works of John Napier of Merchistoun (1550–1617) and Henry Briggs (1561–1630), of logarithms, which he describes as "that admirable new science that through its rules eliminates for us the nuisance of multiplying, subtracting, extraction of roots and propositions" to thus reduce large books to "exquisite charts". Chafrion writes that Leganés used this new mathematical knowledge to give:

> easy rules to understand irregular fortifications, locations and places, their good and bad qualities, for what purpose they should be fortified or not, how armies should be camped, the ways to conduct a siege and to defend strong positions, the forms of attacking an enemy, the ways of introducing reinforcements, the knowledge of all necessary instruments, the characteristics of materials, the time factors involved and costs involved, how to endow cities with citadels, how to store ammunition and victuals to enable a prolonged defence, how to organise surprise attacks, all these constituting the content of what the soldier-gentleman who decides to pursue studies in this noble school of the Palace could be promised to learn by the most illustrious author of this treatise.[115]

The corpus of Leganés masterpiece followed very faithfully the methodical approach of Jesuit treatises. The first volume entitled *Escuela de Palas ó sea Curso Mathematico Tomo I* contained 219 folios based on ten treatises concerned with each of the mathematical disciplines. Of particular interest is *Tratado VII* concerning geography.[116] One can identify veiled evidence of contemporary Jesuit jargon in the notes about various countries where, to quote just two examples, King Louis XIV of France was described as "a member of the Catholic religion" while King William II of England was described as "a Christian Protestant". It is also interesting to see here that Malta was described as having achieved fame for its Religion of St. John, as an "*antemurale de la Christianidad*".[117]

The second volume of Leganés' treatise entitled *Escuela de Palas ó sea Curso Mathematico Tomo I* contained 211 folios in two sections. *Libro I* concerned regularly shaped fortifications and consisted of fourteen chapters about (1) terminology and ways representation (2) use of measuring scales (3) different types of polygons (4) maxims to observe when design-

115 BNE, *Escuela de Palas*, I, "*Exortacion*".
116 *Ibid.*, I, 91–136 (*Tratado VII—de la Geographia*).
117 *Ibid.*, I, 98.

ing a good fortification (5) fortification methods devised by various authors (6) recessed flanks, orillons and high and low platforms (7) external works: ravelins, demilunes, counterguards, hornworks, crown-works and tenailles (8) orthographic representations (9) necessity for and construction of citadels (10) scenographic representations (11) stereotomy of fortifications (12) setting out of a fortification on site (13) setting out ravelins, ditches, terrapleins and covered ways on site and (14) "the manner of drawing plans of places to be fortified or places already fortified, using the art of perspective".[118] *Libro II* consisted of fifteen chapters dealing with (1) gateway and barracks design (2) palisades (3) victuals and ammunition magazines (4) battlefield and marching formations of troops (5) bridge construction (6) setting up camp (7) siege dispositions (8) further siege dispositions (9) the commencement of siege operations (10) types of approach trenches (11) tools to attack and defend in fortified positions (12) the defence of a place (13) old and modern artillery (14) mortars and (15) military drills. *Libro II* was introduced by a lengthy discussion on the nature and siting of difficult irregularly-shaped fortifications.[119]

The longest insertion in the second volume of the *Escuela de Palas* was Chapter 5 of *Libro I* which revealed in summary the fortification systems of the military theorists identified by author as having been worthy of inclusion in his masterpiece. Leganés also included himself in this short-listing exercise perhaps with the aim of recording the 'official' Spanish viewpoint about military engineering practice. The names of the selected authors were classified in a format that started off with the better known representatives of the Italian, Dutch, and French schools of thought,[120] moving on to discuss the less-known Spanish school theorists, gathered together under a significant heading with imperial connotations entitled '*Austriaca*'[121]—hinged on the figure of the Jesuit 'guru' of this school, Zaragoza, who is thus praised by Leganés:

> My first teacher to whom I owe an obligation to give back what he taught me by publishing his exceedingly clear, easy and brief method of building fortifications. I have discovered that had he spent all his life in the armies (of Spain), he would not have been capable of providing anything better

[118] *Ibid.*, II, 1–161.
[119] *Ibid.*, II, 162–207.
[120] *Ibid.*, II, 10–81.
[121] *Ibid.*, II, 82–113.

> than what he gives in his 'construction' which he describes and presents in perfected form in summary by means of a calculated chart.[122]

Chapter 5 of *Libro I* was marked by a description of the views of different authors including those of Zaragoza and the French Jesuits Bourdin, Fournier, Breuil (Bitanview) and Milliet de Chales.[123] Leganés obviously thought that that the five Jesuits deserved a place of honour among his short-list of great names concerned with military theory. Being a figure of high authority in Spanish Italy, his inclusion of these members of the Jesuit Order provides a very solid justification of the value attached by Catholic Spain to their contribution.

In the *Escuela de Palas*, Zaragoza emerges as a leading military theorist who had vigorously promoted the fortification 'maxims' that had been laid down by the Habsburg Emperor Ferdinand III (1608–1657)[124] based in Vienna. Using the word '*Austriaca*' to distinguish this Spanish school of military thinking from the other schools Leganés added that the school also owed much to Don Juan Caramuel de Lobkowitz. In formulating its 'maxims', he continued, the Emperor Ferdinand would have referred to his numerous battlefield experiences before becoming emperor in 1637 since he had fought with his uncle the *Cardinal-Infante* Ferdinand, with the first Marquis of Leganés and with that other "*famoso gesuita*" Camassa at the battle of Nördlingen. As titular commander of the Spanish armies he would have participated in just about every meeting of the Catholic High Command. Besides Zaragoza and himself, the other military theorists mentioned by Leganés who had conspicuously promoted and publicized the Spanish school were Don Diego Enrique de Villegas, Don Alonso de Zepeda y Adrada, an unidentified Austrian military engineer called "*Capitano Franck*", Don Sebastiano de Medrano, Don Mateo Moran, Donato Rosetti and Fray Don Juan Caramuel y Lobkowitz[125]—Medrano

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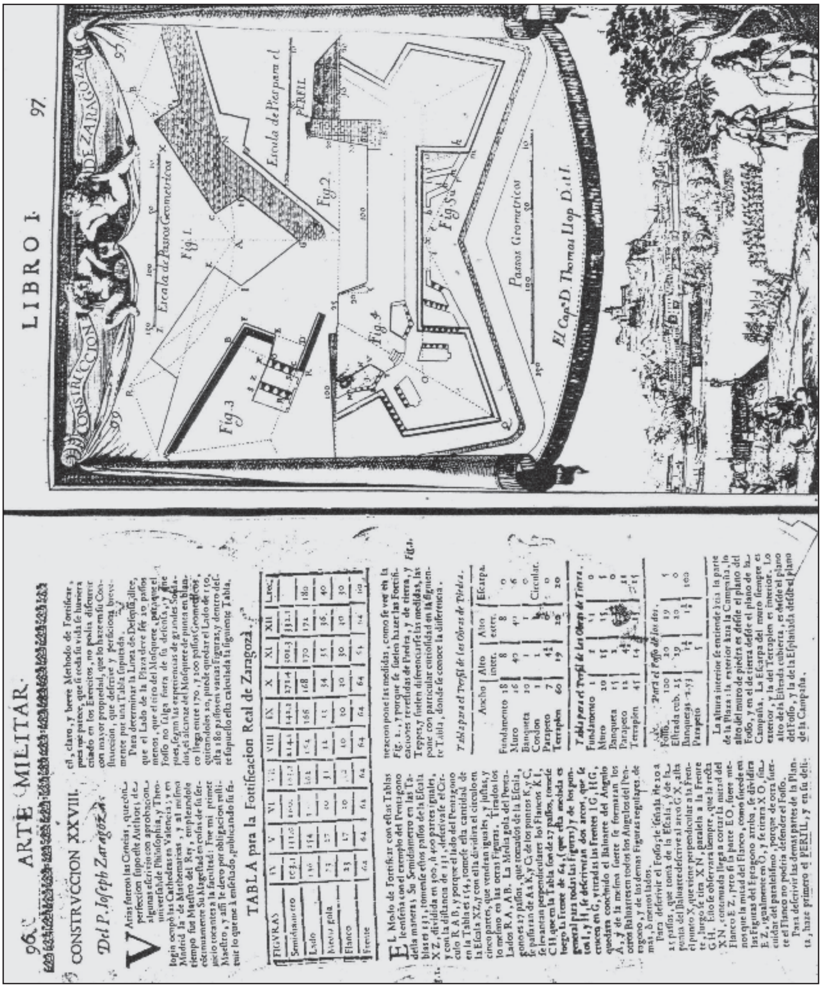
122 See n. 106.

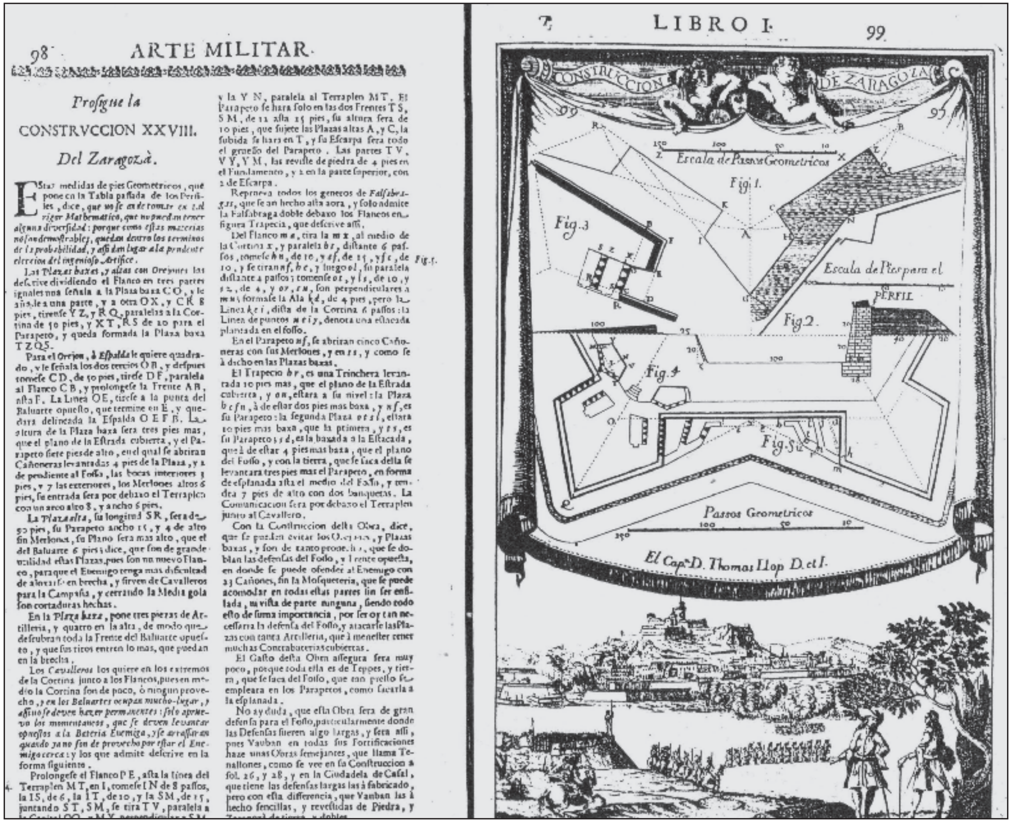
123 BNE, *Escuela de Palas*, II, 116 (*Construccion XL—Del P. Bourdin, Pedro Brolini y Manuel Alvarez*); 118 (*Construccion XLI—Del P. Jorge Fournier*); 64 (*Construccion XVIII—De Bitainvieu*) and 118 (*Construccion XLII—Del P.Claudio Chales*).

124 *Ibid.*, II, 82–85 (*Construccion XXIV—Austriaca*).

125 *Ibid.*, II,86–89 (*Construccion XXV—De Don Diego de Villegas*); 90–91 (*Construccion XXVI—Del Thiniente de Maestre de Campo General, D. Alonso de Zepeda*); 92–95 (*Construccion XXVII—Del Capitan Franck*); 96–99 (*Construccion XXVII—Del P. Joseph Zaragoza*); 100–103 (*Construccion XXIX—Del Capitan, Don Sebastian de Medrano*); 104–107 (*Construccion XXX—Del Maestre de Campo, Don Matheo Moran*); 108–111 (*Construccion XXXI—De Donato Rosetti*); 112–113 (*Construccion XXXII—De Don Juan Caramuel*) and 124–161 (*Construccion LIV—De Author*). For further information about Villegas, Zepeda, Zaragoza,



68. The *Escuela de Palas* entry praising Zaragoza's contribution to the military architecture of the Baroque age [BNE, R/15043]. Reproduced with the kind permission of the *Biblioteca Nacional de España.*



98 ARTE MILITAR.

Proſigue la

CONSTRVCCION XXVIII.

Del Zaragozà.

Eſtas medidas de pies Geometricos, què pone en la Tabla paſſada de los Perfiles, dice, *que no ſe an de tomar en tal rigor Mathematico, que no puedan tener alguna diverſidad: porque como eſtas materias nó ſon demoſtrables, quedan dentro los terminos de la probabilidad, y aſſi dan lugar a la prudente eleccion del ingenioſo Artifice.*

Las *Plazas baxas, y altas con Orejones* las deſcrive dividiendo el Flanco en tres partes iguales: una ſeñala a la Plaza baxa C O, y le añade a una parte, y a otra O X, y C R 8 pies, tirenſe Y Z, y R Q, paralelas a la Cortina de 50 pies, y X T, R S de 20 para el Parapeto, y queda formada la Plaza baxa T Z Q S.

Para el Orejon, ò *Eſpalda* le quiere quadrado, y le ſeñala los dos tercios O B, y deſpues tomeſe C D, de 50 pies, tireſe D F, paralela al Flanco C B, y prolongeſe la Frente A B, aſta F. La Linea O E, tireſe a la punta del Baluarte opueſto, que termine en E, y quedarà delineada la Eſpalda O E F B. La altura de la Plaza baxa ſera tres pies mas, que el plano de la Eſtrada cubierta, y el Parapeto ſiete pies de alto, en el qual ſe abriran Cañoneras levantadas 4 pies de la Plaza, y a de pendiente al Foſſo, las bocas interiores 3 pies, y 7 las exteriores, los Merlones altos 6 pies, ſu entrada ſera por debaxo el Terraplen con un arco alto 8, y ancho 6 pies.

La *Plaza alta*, ſu longitud S R, ſera de 50 pies, ſu Parapeto ancho 15, y 4 de alto ſin Merlones, ſu Plano ſera mas alto, que el del Baluarte 6 pies; dice, que ſon de grande utilidad eſtas Plazas, pues ſon un nuevo Flanco, para que el Enemigo tenga mas dificultad de alojarſe en brecha, y ſirven de Cavalleros para la Campaña, y cerrando la Media gola ſon cortaduras hechas.

En la *Plaza baxa*, pone tres pieças de Artilleria, y quatro en la alta, de modo que deſcubran toda la Frente del Baluarte opueſto, y que ſus tiros entren lo mas, que puedan en la brecha.

Los *Cavalleros* los quiere en los extremos de la Cortina junto a los Flancos, pues en medio la Cortina ſon de poco, ò ningun provecho, *y en los Baluartes ocupan mucho lugar, y aſſi no ſe deven hazer permanentes: ſolo aprueva los momentaneos, que ſe deven levantar opueſtos a la Bateria Enemiga, y ſe arraſſaran quando ya no ſon de provecho por eſtar el Enemigo cerca*: y los que admite deſcrive en la forma ſiguiente.

Prolongeſe el Flanco P E, aſta la linea del Terraplen M T, en I, tomeſe I N de 8 paſſos, la I S, de 6, la I T, de 10, y la S M, de 15, juntando S T, S M, ſe tira T V, paralela a [...]

y la Y N, paralela al Terraplen M T. El Parapeto ſe hara ſolo en las dos Frentes T S, S M, de 12 aſta 15 pies, ſu altura ſera de 10 pies, que ſujete las Plazas altas A, y C, la ſubida ſe hara en T, y ſu Eſcarpa ſera todo el grueſſo del Parapeto. Las partes T V, V Y, Y M, las reviſte de piedra de 4 pies en el Fundamento, y 2 en la parte ſuperior, con 2 de Eſcarpa.

Reprueva todos los generos de *Falſabragas*, que ſe an hecho aſta aora, y ſolo admite la Falſabraga doble debaxo los Flancos en figura Trapecia, que deſcrive aſſi.

Del Flanco *m a*, tira la *m x*, al medio de la Cortina *x*, y paralela *b r*, diſtante 6 paſſos, tomeſe *h n*, de 10, y *a f*, de 15, y *f c*, de 10, y ſe tiran *n f*, *h c*, y luego *o l*, ſu paralela diſtante 4 paſſos; tomenſe *o t*, y *l s*, de 10, y *s z*, de 4, y *o r*, *r u*, ſon perpendiculares a *m n*; formaſe la Ala *k d*, de 4 pies, pero la Linea *k e i*, diſta de la Cortina 6 paſſos: la Linea de puntos *u e i y*, denota una eſtacada plantada en el foſſo. Fig. 5.

En el Parapeto *n f*, ſe abriran cinco Cañoneras con ſus Merlones, y en *t s*, y como ſe à dicho en las Plazas baxas.

El Trapecio *b r*, es una Trinchera levantada 10 pies mas, que el plano de la Eſtrada cubierta, y *o n*, eſtara a ſu nivel: la Plaza *b c f n*, à de eſtar dos pies mas baxa, y *n f*, es ſu Parapeto: la ſegunda Plaza *o t s l*, eſtara 10 pies mas baxa, que la primera, y *t s*, es ſu Parapeto; *s d*, es la baxada a la Eſtacada, que à de eſtar 4 pies mas baxa, que el plano del Foſſo, y con la tierra, que ſe ſaca della ſe levantara tres pies mas el Parapeto, en forma de eſplanada aſta el medio del Foſſo, y tendra 7 pies de alto con dos banquetas. La Comunicacion ſera por debaxo el Terraplen junto al Cavallero.

Con la Conſtruccion deſta Obra, dice, que ſe pueden evitar los Orejones, y Plazas baxas, y ſon de tanto provecho, que ſe doblan las defenſas del Foſſo, y Frente opueſta, en donde ſe puede ofender al Enemigo con 23 Cañones, ſin la Moſqueteria, que ſe puede acomodar en todas eſtas partes ſin ſer enfilada, ni viſta de parte ninguna, ſiendo todo eſto de ſuma importancia, por ſer tan neceſſaria la defenſa del Foſſo, y atacarſe las Plazas con tanta Artilleria, que à meneſter tener muchas Contrabaterias cubiertas.

El Gaſto deſta Obra aſſegura ſera muy poco, porque toda ella es de Tepes, y tierra, que ſe ſaca del Foſſo, que tan preſto ſe empleara en los Parapetos, como ſacarla a la eſplanada.

No ay duda, que eſta Obra ſera de gran defenſa para el Foſſo, particularmente donde las Defenſas fueren algo largas, y ſera aſſi, pues Vauban en todas ſus Fortificaciones haze unas Obras ſemejantes, que llama Tenallones, como ſe vee en ſu Conſtruccion a fol. 26, y 28, y en la Ciudadela de Caſal, que tiene las defenſas largas las à fabricado, pero con eſta differencia, que Vauban las à hecho ſencillas, y reveſtidas de Piedra, y [...]

69. The *Escuela de Palas* entry (continuation) praising Zaragoza's contribution to the military architecture of the Baroque age [BNE, R/15043]. Reproduced with the kind permission of the *Biblioteca Nacional de España.*

and Leganés were respectively responsible for the diffusion of the '*Austriaca*' school of thought from the two principal training centres of the Catholic armies outside Madrid, situated in Brussels and Milan.[126] With the exception of Caramuel and Zaragoza, all these theorists were also leaders of men with considerable battlefield experiences. This was, after all, precisely what the Spanish Jesuits Isasi, Camassa, de Vera, Cassani and so many others had done vindicating John Donne's words that the "Jesuits never content themselves with theory in anything, but straight proceed to practice."[127] As to the underlying philosophy of the '*Austriaca*' school, Villegas in his *Academia de Fortificación de Plazas* (1651), informs us that it was absolutely necessary to observe three things in military architecture as seen by Spanish eyes:

> the first of which was the weaponry with which one had to defend the place; the second of which was the part of the fortification from where one had to administer the main defence and the third of which was that all the parts of a fortification had to be so placed with such a shared and calculated method, that one may defend the other through clear lines of flanking and direct fire.[128]

The *Escuela de Palas* gives a clear picture of the Jesuit Zaragoza's contribution to this distinctively Spanish military thinking in "*Construccion XXVIII*." Having described the Jesuit as the "King's tutor" and as a person who "continuously consulted" by the Spanish monarch about all matters military,[129] Leganés wrote that his old mentor's approach to fortification design started off with a basic assumption concerning the "line of defence" of a fortress where, according to the experience of "great soldiers", a musket shot had a range of 170–200 geometric paces. This implied that, in order to include the "maximum width" of the ditch within the range of the defender, the optimum dimension of one side of a regularly-shaped fortress had to be 150–180 geometric paces. This assumption, according to

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Medrano, Moran and Caramuel and their works see Almirante, *Bibliografia Militar*, 264, 924, 923, 287–289, 539 and 115–116. Regarding Rosetti, a professor of mathematics at the *Accademia di Piemonte* in Torino who in 1678 wrote a book which took the form of a dialogue between 3 *Cavalleros* who were interested in finding a new way of fortifying places, see D'Ayala, *Bibliografia*, 117. Franck was an Austrian military engineer in the service of Spain who later migrated to the New World.

[126] Cobos-Guerra and Castro Fernández, *Arquitectura Militar Española*, 91–92 and 87–91.

[127] Gorman, *Scientific Counter-Revolution*, II citing Donne's *Ignatius his Conclave* (1611).

[128] Villegas, *Academia*, 87.

[129] BNE, *Escuela de Palas*, II, 96. See illustrations 68 and 69.

Leganés, formed the basis of all Zaragoza's mathematical calculations revealed in a table giving inter-related dimensions for the radius, side, demi-gorge, bastion flank and bastion front (nine options) of a polygonal fortress of the "*real*" type. According to Zaragoza's calculations, if one, for example, decided to build a fortress based on a radius (*semidiametro*) of 131 geometric paces ("*fig.1*") one would have to proceed by first drawing a circle corresponding to this radius, then dividing this circle into five equal parts thus establishing points ABEFR. These points could then be joined by drawing straight lines to establish the sides (*lado*) of 154 geometric paces indicated in the table. Using the 27 geometric paces dimension also given in the table (*media gola*) one could then establish points K and C along two adjacent sides of the curtain walls of the fortress. From these points, perpendicular lines—each 27 geometric paces long to establish the flanks of the bastions KI and CH (*flanco*)—could be formed, the dimension of 27 geometric paces being again taken from Zaragoza's table. The fronts of the bastion (*fuente*) could then be drawn by applying the 64 geometric paces dimension given in the table to the two intersecting radiuses originating from points I and H. Any student of Zaragoza could then repeat the process for all the other identical curtain walls and bastions. The ditch could likewise be drawn by first deciding on a suitable width ranging from 10–25 geometric paces and then using the salient point of the bastion to form arc GX up to point X which lied perpendicular to the bastion front, the counterscarp XN of the ditch then being drawn parallel to the bastion front GH. Like other Jesuits, Zaragoza obviously believed that the aesthetic appeal of the finished Baroque fortress which was beautiful to behold from a distance, was inherent in its well calculated geometry, this also giving the desired impression that everything was under the control of the *mathematicus*.[130] Leganés continued his vivid description of Zaragoza's contribution to the '*Austriaca*' school of military architecture by next moving on to describe the other parts of the polygonal fortress designed by the Jesuit applying the dimensions of a second table regarding foundations (*fundamento*), wall (*muro*), banquette (*banqueta*), cordon (*cordon*), parapet (*parapeto*), terraplein (*terraplen*), ditch (*fosso*) and covered way (*estrada cuberta*), to a sectional drawing illustrating the basic outworks ("*fig.2*"). In this respect the Jesuit warned that these dimensions could not be applied with mathematical precision since, according

130 *Ibid.*, II, 112.

to the 'law of probability' in which the Jesuits excelled, any field engineer would want to adjust them within reasonable limits.

The *Escuela de Palas* coverage of the ideas of Zaragoza then moved on to discuss some issues of detail concerning fortified places, within the perspective of the recent achievements of Marshal Vauban. Zaragoza had died in 1676, just when Vauban had entered the most creative and productive phase of his career. There was firstly a discussion by Leganés of the geometrical construction of so called "double flanks" consisting of "low" and "high" positions ("*fig.3*"). He here suggested the use of three pieces of artillery in the "low" positions and four pieces or artillery in the "high" positions, placed "in such a way so that the whole front of the opposite bastion would be exposed to defending fire". A second discussion concerned the geometrical construction of "temporary cavaliers" positioned at the ends of the curtain walls of the fortification ("*fig.4*"). Reminiscent of festive ephemeral artifacts of wood that were so popular in the Baroque age, Zaragoza's cavaliers could also be moved or dismantled with a speed that equalled their erection—their purpose, according to the Jesuit, was to counteract the concentrated fire from the enemy batteries placed opposite to them, this necessitating continuous adjustments which permanent cavaliers could not provide. There was then a final discussion by Leganés on a series of irregularly shaped fausse-brayes (*falsabraga*) placed beneath the junctions of the curtain walls and the bastion flanks ("*fig.5*"). Zaragoza here equated their geometrical construction with their usefulness to defend the ditch at close quarters in the event of enemy sorties. Leganés concluded the description of these works devised by his "first teacher" by giving vent to his anti-French sentiments when he wrote that the Jesuit's fausse-braye fortifications were superior to those designed by Vauban:

> There is no doubt that these works will be of great significance for the defence of the ditch, particularly where the defences may be rather long and it will be so here, because Vauban in all his fortifications made some similar works which he calls 'large tenailles' (as can be seen in his '*construccion*' on pages 16 and 18), which he built in the Citadelle of Casale which also had long defences, with the difference, however, that Vauban made them simple and covered them in stone, while our Zaragoza used earth fill and made them double.[131]

[131] *Ibid.*, II, 98.

Although many Spanish fortifications in Europe, including those designed by Don Carlos de Grunenbergh at Messina used fausse-brayes to defend the ditches, as Zaragoza had advised, these low-lying ramparts were often criticised by other leading theorists like Villegas who opined that "their defects were greater than their virtues."[132] In 1705, the Jesuit Cassani collaborated this view:

> Generally one rejects them nowadays for two reasons: the first because the part of the fausse-braye which corresponds to the bastion flanks remains exposed if the enemy managed to demolish the short barracade that defended it. And an even more pressing reason is that if the enemy, from whatever side it pleases him to attack the fortified place, breaches the walls and manages to direct a few shots towards the earth which falls from the walls, a mound would be formed which would then cover the fausee-braye, rendering it useless. [133]

It is interesting that the *Escuela de Palas* treatise did not mention in conjunction with Zaragoza's contribution to military architecture, the Jesuit's views regarding the use of ravelins, demilunes and other exterior works which the Spanish had by 1650 learnt from Protestant Dutch military engineers in Flanders—as was revealed by one of the most prominent Spanish military engineers in that region, Don Juan Santans y Tapia.[134]

The military thinking of Zaragoza demonstrated several features of synergy with the beliefs of other leading Spanish theorists practising their profession in Baroque Europe. A comparison between his ideas (1674)[135] and those Villegas (1651),[136] Leganés (1693),[137] Medrano (1700),[138] and the Jesuit Cassani (1705)[139] reveals much that was common but also some significant differences of opinion. With regards to sightlines, Villegas, Zaragoza, Leganes, Medrano and Cassani agreed that there should be no part of a fortification that was not visible or incapable of being protected by supporting fire, flanking or direct, this evoking a fundamental principle of artillery defences. With regards to the line of defence, all the above authors agreed that the grand line of defence of a fortification had to be proportioned to the range of a musket and not a cannon. The above-mentioned Santans y Tapia had indicated in 1644 that the Spaniards learnt this

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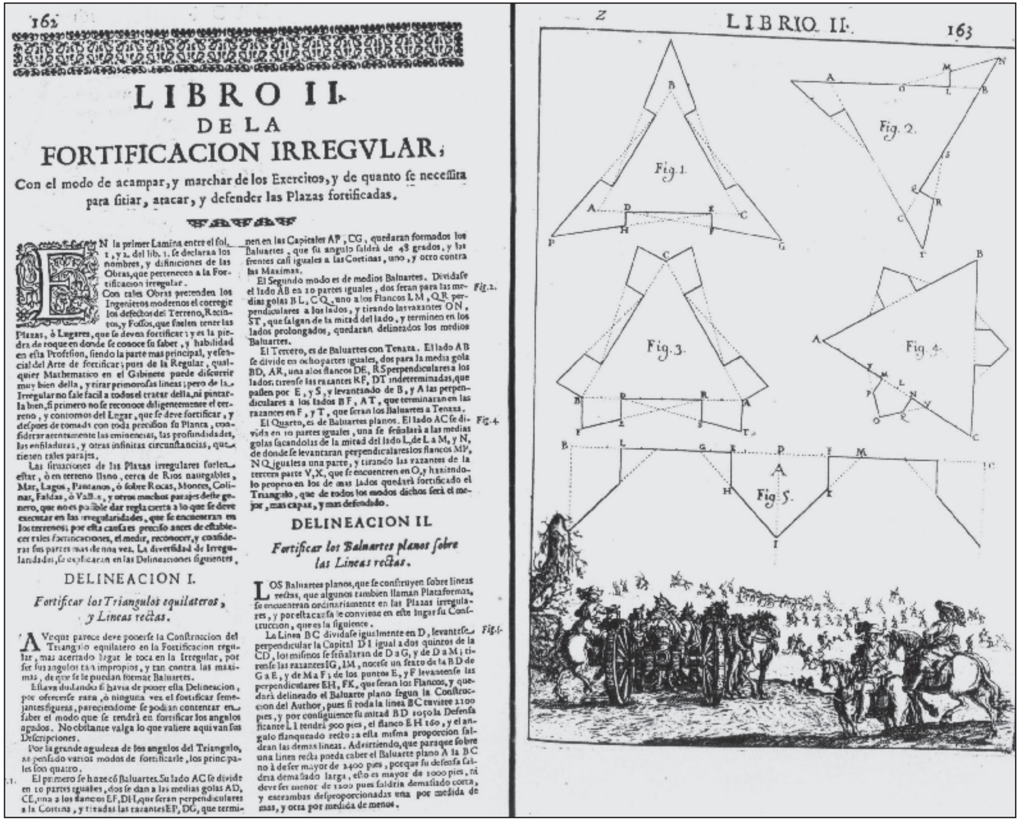
132 Villegas, *Academia*, 437.
133 Cassani, *Escuela Militar*, 85. See also chapter 2, n. 230 a.r.t.
134 Santans y Tapia, *Tratado de Fortificación*, 262–263.
135 See n. 106, 122 and 125 (*Zaragoza*).
136 See n. 125 (*Villegas*).
137 *Ibid.*, (*Author*).
138 *Ibid.*, (*Medrano*).
139 See n. 133.

70. The *Escuela de Palas* references to the fortifications of Don Diego de Villegas [BNE, R/15043]. Reproduced with the kind permission of the *Biblioteca Nacional de España*.

71. Extracts from the *Escuela de Palas* references to the fortifications of the Marquis of Leganés (top) which crystallised the general principles of the '*Austriaca*' or imperial school of military thinking (bottom), here promoted as being superior to the Italian, French, and Dutch schools of thought [BNE, R/15043]. Reproduced with the kind permission of the *Biblioteca Nacional de España*.

72. The *Escuela de Palas* references to the fortifications of Don Sebastian de Medrano [BNE, R/15043]. Reproduced with the kind permission of the *Biblioteca Nacional de España*.



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LIBRO II.
DE LA
FORTIFICACION IRREGVLAR;

Con el modo de acampar, y marchar de los Exercitos, y de quanto se necessita para sitiar, atacar, y defender las Plazas fortificadas.

EN la primer Lamina entre el fol. 1, y 2. del lib. 1. se declaran los nombres, y difiniciones de las Obras, que pertenecen a la Fortificacion irregular.

Con tales Obras pretenden los Ingenieros modernos el corregir los defectos del Terreno, Recintos, y Fossos, que suelen tener las Plazas, ò Lugares, que se deven fortificar; y es la piedra de toque en donde se conoce su saber, y habilidad en esta Profession, siendo la parte mas principal, y essencial del Arte de fortificar; pues de la Regular, qualquier Mathematico en el Gabinete puede discurrir muy bien della, y tirar primorosas lineas; pero de la Irregular no sale facil a todos el tratar della, ni pintarla bien, si primero no se reconoce diligentemente el terreno, y contornos del Lugar, que se deve fortificar, y despues de tomada con toda precision su Planta, considerar atentamente las eminencias, las profundidades, las enfiladuras, y otras infinitas circunstancias, que tienen tales parajes.

Las situaciones de las Plazas irregulares suelen estar, ò en terreno llano, cerca de Rios navegables, Mar, Lagos, Pantanos, ò sobre Rocas, Montes, Colinas, Faldas, ò Valles, y otros muchos parajes deste genero, que no es possible dar regla cierta a lo que se deve executar en las irregularidades, que se encuentran en los terrenos; por esta causa es preciso antes de establecer tales fortificaciones, el medir, reconocer, y considerar sus partes mas de una vez. La diversidad de Irregularidades, se explicaran en las Delineaciones siguientes.

DELINEACION I.

Fortificar los Triangulos equilateros, y Lineas rectas.

AVnque parece deve ponerse la Construccion del Triangulo equilatero en la Fortificacion regular, mas acertado lugar le toca en la Irregular, por ser sus angulos tan impropios, y tan contra las maximas, de que se le puedan formar Baluartes.

Estava dudando si havia de poner esta Delineacion, por ofrecerse rara, ò ninguna vez el fortificar semejantes figuras, pareciendome se podian contentar en saber el modo que se tendrà en fortificar los angulos agudos. No obstante valga lo que valiere aqui van sus Descripciones.

Por la grande agudeza de los angulos del Triangulo, se pensado varios modos de fortificarle, los principales son quatro.

Fig. 1. El primero se haze cõ Baluartes. Su lado AC se divide en 10 partes iguales, dos se dan a las medias golas AD, CE, una a los flancos EF, DH, que seran perpendiculares a la Cortina, y tiradas las razantes EP, DG, que terminen en las Capitales AP, CG, quedaran formados los Baluartes, que su angulo saldrà de 43 grados, y las frentes casi iguales a las Cortinas, uno, y otro contra las Maximas.

Fig. 2. El Segundo modo es de medios Baluartes. Dividase el lado AB en 10 partes iguales, dos seran para las medias golas BL, CQ, uno a los Flancos LM, QR perpendiculares a los lados, y tirando las razantes ON, ST, que salgan de la mitad del lado, y terminen en los lados prolongados, quedaran delineados los medios Baluartes.

El Tercero, es de Baluartes con Tenaza. El lado AB se divide en ocho partes iguales, dos para la media gola BD, AR, una a los flancos DE, RS perpendiculares a los lados; tirense las razantes RF, DT indeterminadas, que passen por E, y S, y levantando de B, y A las perpendiculares a los lados BF, AT, que terminaran en las razantes en F, y T, que seran los Baluartes a Tenaza.

Fig. 4. El Quarto, es de Baluartes planos. El lado AC se divida en 10 partes iguales, una se señalarà a las medias golas sacandolas de la mitad del lado L, de L a M, y N, de donde se levantaran perpendicalares los flancos MP, NQ iguales a una parte, y tirando las razantes de la tercera parte V, X, que se encuentren en O, y haziendo lo propio en los de mas lados quedarà fortificado el Triangulo, que de todos los modos dichos serà el mejor, mas capaz, y mas defendido.

DELINEACION II.

Fortificar los Baluartes planos sobre las Lineas rectas.

LOS Baluartes planos, que se construyen sobre lineas rectas, que algunos tambien llaman Plataformas, se encuentran ordinariamente en las Plazas irregulares, y por esta causa le conviene en este lugar su Construccion, que es la siguiente.

Fig. 5. La Linea BC dividase igualmente en D, levantese perpendicular la Capital DI igual a dos quintos de la CD, los mismos se señalaran de D a G, y de D a M; tirense las razantes IG, IM, notese un sexto de la BD de G a E, y de M a F; de los puntos E, y F levantense las perpendiculares EH, FK, que seran los Flancos, y quedarà delineado el Baluarte plano segun la Construccion del Author, pues si toda la linea BC tuviere 2100 pies, y por consiguiente su mitad BD 1050 la Defensa fixante LI tendrà 900 pies, el flanco EH 160, y el angulo flanqueado recto; a esta misma proporcion saldran las demas lineas. Advirtiendo, que para que sobre una linea recta pueda caber el Baluarte plano A la BC no à de ser mayor de 2400 pies, porque su defensa saldria demasiado larga, esto es mayor de 1000 pies, ni deve ser menor de 1200 pues saldria demasiado corta, y entrambas desproporcionadas una por medida de mas, y otra por medida de menos.

Z LIBRIO II. 163

73. An *Escuela de Palas* entry explaining the geometrical construction of four types of irregularly-shaped fortresses [BNE, R/15043]. Reproduced with the kind permission of the *Biblioteca Nacional de España.*

from siege experiences in the Netherlands where, according to one source "to increase the effectiveness of flanking fire, the space between bastions was reduced from within artillery range to within musket shot range."[140] Leganés confirmed this belief in his *Escuela de Palas* by declaring that "there must not be in the entire fortification, any one spot which is not seen and defended, alternatively, one by the other, from many points of the fortification from the fire of the musket". With regards to the computation of the line of defence, although all the above-mentioned authors agreed that this had to equal the range of a musket, there seems to have been some differences of opinions with regards to the definition of the word '*linea de defensa*' since, according to Cobos-Guerra, Villegas had in 1651 stated that:

> some consider the line of defence as that drawn from the point of the bastion to the place where it meets the flank or curtain wall (whenever that may be, depending on the angle of the bastion) but in my view, the true line of defence should always be taken from the meeting point of the bastion flank with the curtain wall to the point of the opposite bastion, for the very reason that the defence of a bastion front very much depends on supporting fire from the flank of the opposite bastion.[141]

Jesuit authors in general tended to promote this opinion—both Medrano and Cassani confirmed that the use of superior range muskets would put the defenders of Spanish fortifications in an advantageous position with the added perk, that the longer ranges implied that less bastions could be used to cover the same surface area. With regards to the seventeenth-century debate about the so called 'second flank' (*segundo flanco*)—already used in the preceding century by Antonio da Sangallo the Younger and supported by the French Jesuits Bourdin, Fournier, Breuil and Milliet de Chales but heavily criticised by the Spanish Jesuits Zaragoza and Cassini—by 1693, attitudes seem to have differed greatly.

The debate had started when it was realised that if the bastion front could be aligned with some point in the curtain wall which was not the corner point of intersection of the curtain wall with the flank of the opposite bastion, the segment of curtain walling between this point and the above-mentioned corner point of intersection—called the 'second flank'—could be utilised to provide additional flanking fire to protect the

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[140] Van der Hoeven, *Warfare in the Netherlands*, 119 (article on *Maurits van Nassau and siege warfare (1590–1597)* by Olaf van Nimwegen).

[141] Suarez, *El siglo de las Luces*, 476 (article on '*La fortificacion española en los siglos XVII y XVIII: Vauban, sin Vauban y contra Vauban*) citing Villegas, *Academia*, 95.

front of the opposite bastion. In the context of artillery improvements in the 1640's it was realised that 'second flanks' could create problems. In the first place, the main flank would become too exposed to enemy fire and, secondly, that the larger the 'second flank' segment was, the sharper would the angle of the point of the opposite bastion have to be, this being unacceptable to many military engineers of the time who would have considered it as a point of weakness in view of the difficulty in handling large numbers of guns in the confined acute-angled space. While Villegas in 1651 was an unequivocal supporter of this 'second flank' the Jesuit Cassani in 1705 was dead against it, stating that "the line of defence of a fortification must always touch the angle of the flank (of the opposite bastion)".

With regards to the strength of the fortification all military engineers in the '*Austriaca*' camp seem to have believed in the '*firmitas vitruviana*' principle, agreeing with Zaragoza and Leganés that "a permanent fortification had to be invariably made up of flanks, faces and curtains so well built that the first cannonballs from the enemy would fail to demolish them". The point of disagreement, however, was about the ways to attain such resistance. In this respect, one finds the Spaniards Villegas, Zaragoza, Leganés and Cassani joining forces to contradict Vauban. They all declared that earth-filled bastions and outworks would offer a far superior resistance than hollow sections, this providing the added advantage of adopting a wider ditch capable of providing enough excavated material for the building of a well-terrapleined fortification.

With regards to irregularly-shaped fortifications, there seems to have been general agreement with Leganés statement that "irregular fortresses which approximated in shape regular ones should be preferred to those which do not", this echoed by Medrano who believed that "all irregular fortifications should approximate regular fortifications". Vauban had also once said that "a regular fortification is always preferable to an irregular one."[142] The Jesuit treatises of Baegk, Bourdin, Fournier, Masò, Zaragoza and others not only revealed similar attempts to "regularise" irregular fortification traces by the application of complex geometrical solutions of the type that a Jesuit *mathematicus* would enjoy devising, but also produced quasi-identical drawings which reflected much synergy in this field of study. With regards to outworks, Medrano thought that "the entire range of exterior fortifications had to be dominated, supported and over-

[142] Cobos-Guerra and Castro Fernández, *Arquitectura Militar Española*, 479 citing Maxim III of Abbè du Fay's *Manière de Fortifier selon la méthode de Mr. De Vauban*.

looked by the interior fortifications". Leganés also believed that "the parts furthest from the centre of the fortification must always remain within sight, and firmly under the control of those which are closest", a point which was also mentioned by the Jesuit Baegk way back in 1635.

With regards to the computation of the layouts of fortifications, it was here that Jesuit knowledge put the Jesuit military *mathematicus* at a clear advantage over his lay counterparts in the Spanish world. The history of this situation is interesting. During the sixteenth and the first years of the seventeenth century when Jesuit knowledge of military mathematics was still largely unavailable to Catholic army generals, most fortification problems seem to have been basically resolved on a trial-and-error basis by using the ruler and the compass, meaning that once the dimension of the side of the polygon or the line of defence had been decided upon, one could then slowly produce a layout, based primarily on experiment and battlefield experiences concerning the dimensional relationship of curtain walls, flanks, fronts, ditches etc., longer or shorter, wider of narrower according to the ingenuity of their military designer. A case in point had been the defective fort of St. Elmo in Malta, designed by the Spaniard Pietro Prado in 1551–1552.[143]

During the Thirty Years War, the time factor for repairing old or building new fortifications became critical. This led to the introduction of the quicker method where trigonometrical formulae which automatically related the dimensions of the various components of a fortification layout between themselves, started being employed. It was precisely at this point in time that the knowledge of the *mathematicus* would have become useful to army commanders. The acclaimed treatises of the lay mathematicians Marolois (1628)[144] and Freitag (1631)[145] and of the Jesuit Baegk (1635)[146] owed their popularity to the fact that they were among the first of their kind to reproduce numerical tables which (assuming a pre-determined dimension of the side of a fortification or of the line of defence) enabled a field military engineer, hard pressed for time, to rapidly draw the trace of a fortress as Isasi, Camassa, Zaragoza and many other Jesuit

143 Hughes, *Building of Malta*, 16.

144 Marolois' *Opera Mathematica: Tome II—Fortification ou architecture militaire tant offensive que defensive*, (1628) is described in BNE, *Escuela de Palas*, II, 36–39 (*Construccion IX—De Samuel Marolois*).

145 Freitag's *Architectura Militaris* (1631) is described in BNE, *Escuela de Palas*, II, 40–47 (*Construccion X—De Adam Fritach*).

146 See n. 8 a.r.t.

mathematicians were well-known to have been able to do with remarkable dexterity by their superiors. Through this invention of numerical tables, it now became possible to determine the dimensions of all parts of a fortress at a glance, this perhaps explaining why the computation of tables was one of the first things that Camassa did when he had arrived in Madrid in 1633. By that time, matters had been further simplified since Napier had already discovered the science of logarithms (which he had published in his 1614 book *Mirifici logarithmorum canonis descriptio*) while Briggs in 1624 had already published his elaborated tables demonstrating for the first time a method of calculation of incredible simplicity to resolve trigonometrical problems. The application of this mathematical research to military uses seems to have been immediate, this probably explaining why studies in logarithms were soon afterwards introduced in all Jesuit colleges with mathematical faculties. It also explains why Leganés—a typical product of Jesuit mathematical formation in the Baroque age—stated that in 1693 it had become standard practice to delineate a fortification solely with compass and ruler where the angles and lines derive from a mathematical computation which very conveniently provided a regulating pattern to everything and also a general table so that:

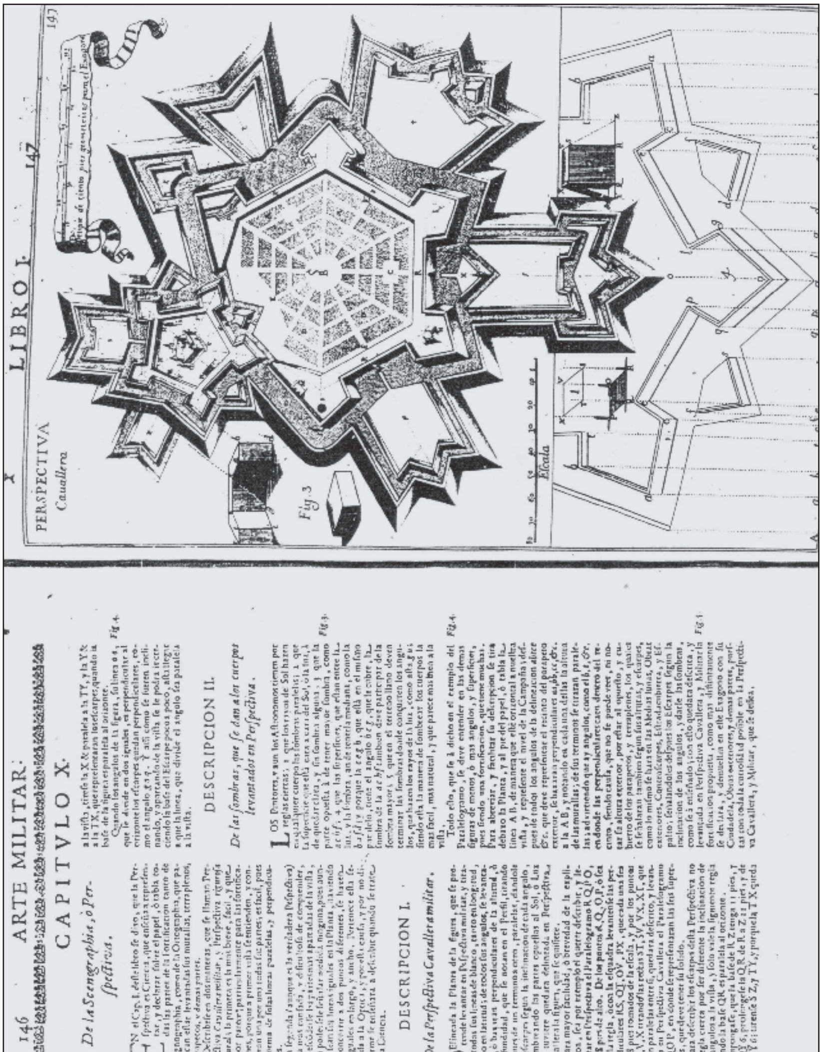
> all who understood it could work with support and brevity, making it clear that this trigonometrical operation was the same as the logarithmic one used in the past with the sole difference, that what the earlier one does by addition and subtraction, this does by multiplication and division.[147]

Since this exercise formed part of the discipline in which the seventeenth-century Jesuit *mathematicus* excelled, it is obvious that the cross-influences that resulted between the Jesuit mathematical faculties and Catholic military leaders were strong. It was a matter of life or death which demanded a workable synergy situation where Jesuits often found themselves in positions of influence to offer their 'useful' mathematical skills as well as their spiritual ones. Within two hundred years, the art of building fortifications had passed from the hands of the Renaissance artists to become entrenched within the realm of the Baroque mathematicians, among whom the Jesuits enjoyed an enviable reputation. Which is what the *Escuela de Palas* masterpiece was all about, as was well understood by its Baroque masked author. After all, this was the age of sumptuous carnivals and '*balli in maschera*', of colourful theatre scenes and

147 BNE, *Escuela de Palas*, II, 130.

playful actors and actresses where the elements of fortification—the lines, angles, lines of defence, bastions, flanks and external works—so well discussed by Leganés, not only dominated the attention of the nobles attending the mathematical classes of the Jesuit Order distributed throughout Catholic Europe but even found their way into the geometric layouts of more mundane pleasure gardens and Pablo Minguet's pack of cards.[148]

[148] Minguet, *Juegos* (1752).


146 ARTE MILITAR.

CAPITVLO X.

De la Scenographia, ò Perspectiva.

DESCRIPCION I.

De la Perspectiva Cavallera militar.

DESCRIPCION II.

De las sombras, que se dan a los cuerpos levantados en Perspectiva.

74. An *Escuela de Palas* entry explaining the application of perspective drawing to military architecture—a favourite subject among students attending Jesuit military classes [BNE, R/15043]. Reproduced with the kind permission of the *Biblioteca Nacional de España*.

75. Grand Master Jean Parisot de Valette defending Malta during the Turkish siege of 1665 [Zabarella, 1902].

CHAPTER FOUR

THE CASE OF GIACOMO MASÒ

Summary

The life history of Giacomo Masò provides a good case study of a Jesuit who applied his encyclopaedic knowledge of the mathematical disciplines to teaching, writing and advising about military architecture in Hospitaller Malta, just five years after Carafa's prohibition. He was then punished by his superiors for his great skill in explaining military architecture to packed audiences attending a purposely set up academy of fortification mathematics which was entrusted to his care by the Grand Master as a response to the Turkish peril. His lectures to young Knights who wanted to know more about defensive and offensive military architecture, were recorded in hitherto unexplored documents kept in the Valletta and Catania archives. After leaving the Jesuit Order in 1664, Masò abandoned his interest in fortification building and met a tragic end in his home town of Syracuse. There is some evidence to suggest that his death was caused by an aggravation of the inner tensions that seem to have affected many Jesuit mathematicians in the Baroque age.

The Life History of *Padre* Giacomo Masò

An eighteenth century biographical sketch of Giacomo Masò (1626–1674) provides us with an account of the manner by which this little known Jesuit, a Sicilian version of the unfortunate Jan Ciermans, managed to focus his attention on the military and other controversial aspects of the mathematical disciplines to the detriment of his spiritual commitments. The following account can be found in Emmanuele Aguilera's book entitled *Provinciae Siculae Societatis Jesu Ortus et Res Gestae ab Anno 1612 ad Annum 1672* (1740):

> The exemplary behaviour shown by *P. Jacob Masonis* when he left Syracuse was significant. He joined the Society of Jesus with a genuine vocation. He was then sent to Rome to study mathematics in the *Collegio Romano*. On completing his studies, he returned to the Province. At first he taught mathematics to the Knights of St. John in Malta and then to local and foreign students in the *Collegio Panormitano*. He taught with great skill so that he was highly recommended for his knowledge and integrity. In the Provincia Sicula, he managed to instil a great interest in mathematics, which was then

in a state of neglect. He divided his course of studies into sixteen parts, dedicating the fourth part to the science of spherology. He also delivered lectures on civil law and wrote a famous treatise on offensive and defensive military architecture (*De Architectura Militari Offensiva ac Defensiva*). He clearly explained the principles of optics and created a number of timepieces (*horarios tabulas*). At one point, however it seemed that (this Jesuit's) behaviour was no longer acceptable to God, this as a result of his lack of communication with the Lord in contrast to the situation in his earlier life when he had lived in closer dialogue with God. He then went to Syracuse to look after his family affairs. He spent a long time in that city so that when his leave of absence was over, he could not go back to his teaching career in Palermo. Since he had by now taken the solemn profession of the four vows, he could not ask to be released from his vows since he was not suffering from any physical disability. He therefore started to think about forwarding alternative reasons that could lead to a release from his vows. He first stated that he had taken his vows against the will of Heaven, implying that they were therefore null and void. He then tried to prove that he was born of Jewish parents but when he realised that he could not obtain his freedom for this reason, he presented a written document, by means of which he hoped to prove, through valid arguments, that the vows he had taken were not binding and absolutely void in view of the fact that he had been forced to give his formal consent against his free will. The Society very correctly declined to accept this as a valid reason to release P. Masò from his vows. It so happened, however, that the members of the community of the religious Order of St. George of Alga were, at this time, relinquishing their communities and going back to their relatives so that there was a real possibility that the Order would soon be dissolved. When the rumour became public knowledge, P. Masò thought that he would be allowed in 1664 to join that Order before the dissolution happened, this after he had spent twenty two years in the Society. This plan did not fail him, since in three years time that Order was indeed suppressed. No longer bound by his vows, P. Masò now returned to his relatives. At first he started living a wanton life of great affluence and continued to do so for seven whole years. However, life for this ungrateful man who had in his youth thought so highly of and kept in great esteem the Society of Jesus, was not without its problems. He finally took his revenge on the Mother of God, whose honour and sanctity he threw away together with the Society. In this respect, I have personally examined all his written material and other documents after they had been sent to Tornamira. P. Joseph Venutus of Messina has also researched these documents in a thorough fashion, and came up with the same conclusion. P. Masò employed a person to whitewash his house. On one wall, there was a painting of Our Lady. Although not of any artistic value, this painting was very old so that the family held it in great esteem. In these circumstances, the whitewasher painted only the area surrounding this painting, leaving it untouched. When P. Masò realised what the whitewasher had done, he told him immediately that he did not want that house

> in Megaera so unskilfully painted, particularly since he had some ornaments which he wanted to place on that wall to give it a better appearance. Having requested the whitewasher to do a better job, he then became furious and hysterical, acting like a child, and expressing his determination to obliterate the old picture on the wall by applying successive coats of whitewash. He wanted to leave no trace of the effigy. But he could not erase the image of Our Lady completely. The faint outlines of the painting kept reappearing so that P. Masò now decided to replace this painting with a more splendid one. Having measured the wall, he gave orders for a nail to be driven in the place where the shadowy eye in the face of Our Lady could still be seen. His servant then moved the ladder and hit the nail with his hammer. At that very moment, a chip of stone broken off by the impact of the nail, flew with great force from the eye of the image straight into the servant's face. The stone severely injured his eye, almost gauging it out. As a result of this misadventure, P. Masò temporarily stopped that which he had started and also accepted this event as a result of supernatural intervention. P. Masò, however, was not scared. Without delay, he himself climbed the ladder, grasped the hammer and hit the nail even harder. The Mother of God could not endure such arrogance. Hammering the nail for the third time, it appeared that the wall pushed away the ladder and the person on it so that, all of a sudden, the ladder slipped and Masò was thrown against the wall. He fell down and hit the floor, head first so that he lost his life in this accident at the age of forty-eight in the year 1674. He had abandoned the Society of Jesus and the Mother of God and had now reaped the reward that he deserved![1]

Aguilera's biased account of the life history of Masò contrasts with Sommervogel's terse biographical notes about him.[2] This author writes that Masò was born in Syracuse on 5 August 1624, enrolled in the Jesuit Order on 9 January 1642 and, after that, was engaged in teaching grammar, philosophy and mathematics in Rome, Malta and Palermo. Sommervogel further states that Masò left the Jesuits to become a Canon of the Order of St. George of Alga but, following the suppression of this Order in 1668 by order of Pope Clement IX Rospigliosi (1667–1669), he was appointed parish priest of S. Tommaso in Syracuse where he died in 1674. The exact date of birth of Masò is somewhat uncertain since 1622, 1624 and 1626 have all been recorded. Although Sommervogel gives Maso`s birth date as 5

[1] Aguilera, *Provinciae Siculae*, 829–831. With regards to the reference in this account to the Joseph Venutus, b[orn on] 21-06-1631 and e[nrolled with the Jesuits on] 06-10-1648, it is documented that this Jesuit was in Malta at the same time as Masò for which see ARSI, *Sic*.159, *Cat*[*alogus*] *Brev*[*is*] (05-10-1653] ff. 110v-111 and 138; *Sic*.159, *Cat. Brev*. (01-12-1656) f. 22 and *Sic*.67, *Cat*[*alogus*] *Trien*[*nalis*] (1655–1658) ff. 75–76.

[2] ARSI, SMV, V, 697.

August 1524,[3] Aguilera states that he died at the age of 48 in 1674,[4] this implying a birth date at some time in 1626. This seems to be confirmed in the more reliable 1651 list of Jesuits in the *Collegio Romano* where the exact birth date of Masò is given as 31 July 1626.[5] A further confirmation occurs in the later records of Jesuits in the *Collegium Melitense* in Malta where the 1655 and 1658 entries both give the date of birth of Masò as 31 July 1626 although one Jesuit document of the *Collegium Montis Regalis* outside Palermo gives a 15 July 1626 date.[6] A third source[7] in Catania gives the birth date of Masò as 1622. Since this is an anonymous secondary source, it can be dismissed so that one can conclusively refer to 31 July 1626 as the actual date of birth of the Jesuit.

There seem to be no records that refer to his early life history. He had a younger philosopher brother called Antonino, author of the *Theatrum Philosophicum* (1657). In 1653 this Antonino, who had also been studying at the *Collegium Romanum,* wrote a thesis entitled *Compendiariae philosophiae theatrum* which was presented under the auspices of Hieronymus Colonna (1604–1666), the Cardinal-Protector of the Masò family.[8] After a seemingly uneventful upbringing in Syracuse, Giacomo seems to have joined the Messina novitiate of the *Provinciae Sicula* of the Jesuit Order on 9 January 1642 but this date given by Sommervogel is also contradicted by the 1651 list of Jesuits studying at the *Collegio Romano* which specifies a 21 December 1641 date.[9] This is collaborated by the 1655 and 1658 *Collegium Melitense* records.[10] By 1649 or thereabouts Masò had been sent to study in Rome[11] where he was helping out with the teaching of mathematics as a '*scholasticus*'. This was the title normally awarded to Jesuit students from the moment that they took their first vows of poverty, chastity and obedience at the end of that period of seclusion and prayer known as the 'novitiate', to the time that they took their last vows and were ordained priests. In that year Masò had already been exposed to two years of study in rhetoric, three years of study in philosophy, two years of study in theology and one year of study in mathematics and he was then classified as a *'vires vali-*

3 *Ibid*.
4 See n. 1.
5 ARSI, *Rom*.59, *Cat.Trien*. (1649–1651) ff. 193 and 204
6 ARSI, *Sic*.67,*Cat.Trien*. (1655–1658) ff. 75–76 and 243–244 for *Collegium Melitensis* and *Sic*.66, *Cat.Trien* (1649–1651) for *Collegium Montis Regalis* records
7 BRCC, Index Card to *Civ*[*ica*]. *Mss*. E. 63.
8 Correnti., *La Sicilia del Seicento*, 153 and 270.
9 See n. 5.
10 ARSI, *Sic*.67, *Cat.Trien.* (1655–1658) ff. 75–76 and 243–244.
11 See n. 5.

	Nomen, & cognomen.	Patria.	Ætas.	Vires.	Tempus Societatis.	Tempus Studiorum.	Ministeria quæ, & quandiu.	Gradus in litteris	Gradus in Societate
115	Jacobus Masò	Siculus	25 31 Julij 1626	Valida	16 21 [illegible] 1641	Rhet.2 Phil.3 Theol.2 Mathem.	[illegible]	[illegible]	[illegible]
116	Jacobus Salvatorius	Florentinus	20 13 8bris 1631	Bona	4 7 [illegible] 1647	Rhet.2 [illegible]	[illegible] 1632	[illegible]	[illegible]
117	Innocentius Innocentij	Tudertinus	27 3 Maij 1624	Bona	11 2 Junij 1640	Rhet.2 Phil.3 Theol.1	[illegible]	[illegible]	[illegible]
118	Joannes Caronius	Romanus	28 31 Januar 1625	Bona	[illegible] 24 Martij 1638	Methaph. in [illegible] Theol.1	[illegible]	[illegible]	[illegible]
119	Joannes Lucarus	Ragusinus	[illegible] 1622	Bona	12 4 8bris 1638	Rhet.2 Phil.3 Theol.4	[illegible]	[illegible]	[illegible]
120	Joannes Marchinus	Romanus	27 8 Novemb. 1624	Bona	10 14 Augusti 1641	Phil.3 Theol. [illegible]	[illegible]	[illegible]	[illegible]
121	Jo: Andreas Pallavicinus	Genuensis	26 20 April. 1623	Mediocris	15 4 Decemb. 1640	Rhet.2 Phil.3 Theol.4	[illegible] 1627	[illegible]	[illegible]
122	Jo: Bapta Menocchius	Papiensis	23 [illegible] Maij 1628	Bona	8 [illegible] 1643	Rhet.2 Phil.3	[illegible]	[illegible]	[illegible]
123	Jo: Bapta Perinellus	Anconitanus	27 [illegible] 1624	Mediocris	7 22 [illegible] 1644	Phil. extra Theol.1 in [illegible]	[illegible]	[illegible]	[illegible]
124	Jo: Dominicus Sabianus	Nicensis	28 April. 1623	Bona	12 14 8bris 1639	Rhet.2 Phil.3 Theol.1	[illegible]	[illegible]	[illegible]

76. Extract from the *Romana Catalogus Triennalis* giving Masò's date of birth as 31 July 1626 [ARSI, *Rom.*.59]. Reproduced with the kind permission of the *Archivum Romanum Societatis Iesu* in Rome.

dae' contrasting with the *'vires bonae'* or *'vires mediocrae'* labels given to other aspiring Jesuits in that same year.[12] The professor of mathematics who was responsible for teaching the subject to Masò was Athanasius Kircher.[13]

Masò completed his studies at the *Collegio Romano* in 1649–1651. He then received instructions to proceed to the college of *Montis Regalis* (Monreale) outside Palermo where his name appears in the 1649–1651 *Catalogo Triennale* of that institution.[14] Maso's stay here must have been short because in the Summer of 1653 he received instructions to proceed to Hospitaller Malta. Having arrived in Valletta, he was assigned teaching duties in philosophy and mathematics at the Jesuit college. According to the 5 October 1653 list of Jesuit members of this college his new colleagues in Malta included the already-mentioned Venutus who was teaching humanities.[15] Apart from being described in this list as the "professor of mathematics", Masò was also described as a "*consultor*", this surely placing him in an official position to give advice about all matters concerning military mathematics.[16] Masò probably travelled to Trapani in 1654 and to his native Syracuse in 1655. The Trapani visit not surprisingly coincided with the long involvement of Francesco Buonamici, the resident military engineer of the Knights, with building operations on the Jesuit church in that town. While in Trapani, Masò received a letter from General Nickel, praising his "*impiego suo in mathematica*" while another letter from the General to the Jesuit Simone Bonafede dated 14 May 1654 mentioned the delight of Nickel at receiving news of the excellent private lessons that Masò had already given to Grand Master Lascaris, for which reason he had acceded to a request made by Masò to send out books on the mathematical disciplines to Malta.[17]

Between 1592—the date of its foundation—and 1653—the date marking the arrival of Masò in Malta—the Jesuit *Collegium Melitense* in Valletta

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[12] *Ibid.*

[13] A 09-08-1655 letter from General Nickel to Masò in Malta (ARSI, *Sic.*16 II, f. 414) mentions that Masò's mathematical knowledge had been praised by Kircher, professor of mathematics at the *Collegio Romano* in 1639–1640 and 1644–1646 [ARSI, *Rom.* 152a, *Cat. Dei Superiori e Professori del Collegio Romano 1551–1773*, f. 20 and AHSI, 103, a LII (1983) 84 and 89]. See also chapter 3, n. 88.

[14] ARSI, *Sic.*66, *Cat.Trien.* (1649–1651) f. 49v.

[15] ARSI, *Sic.*159, *Cat.Brev.* (05-10-1653) f. 138.

[16] *Ibid.*, ff. 110v-111.

[17] For Lascaris' biography, see Mizzi, *Grand Masters of Malta*, Zammit, *Printing in Malta* and chapter 1, n. 68. For Masò's trips to Trapani and Syracuse and the mentioned letters see ARSI, *Sic.*16 II *Epist.Gen.* ff. 283v (Nickel to Masò), 275v (Nickel to Bonafede) and 422 (Nickel to Manthia).

had managed to achieve a reputation as the best teaching institution on the island. Although the legal instruments for the foundation of the Jesuit College in Malta had been signed on 12 November 1592[18] (and formally approved by Pope Clement VIII Aldobrandini by means of a *breve pontificio* dated 29 July 1593)[19] the idea of opening a Jesuit college in Malta can be traced back to 1553 when Ignatius had sent out Paolo Achille, rector of the Jesuit College in Palermo, to Malta to discuss "some matters" with Grand Master Juan d'Omedes (1536–1553) and the Bishop Domenico Cubelles (1541–1572). The talks focused on the possibility of establishing a Jesuit college in Malta which would combat the threat of Protestantism which had already gained a firm foot-hold among the Maltese and train young Jesuits in the Arabic language enabling them to initiate missionary work in North Africa. This had been requested by the rulers of Gerba and Taxora and the governor of Goletta in Tunisia in letters that had been sent to the Sicilian Viceroy de Vega.[20] Ignatius' dream had not materialised and it was only in 1595 that the foundation stone of the new Jesuit college in Valletta had been laid by the Cardinal-Grand Master Hugues Loubenx de Verdalle (1582–1595) when the first students were admitted to study '*Grammatica et Litterae Humaniores*' in 1597.[21] During the fifty years that preceded the arrival of Masò the new Jesuit college had prospered enormously, despite a rude interruption in the Valletta carnival of 1639 when some angry young Knights had burst into the premises to protest at alleged Jesuit attempts to ruin their '*piaceri del mondo*'—pleasures of the world—which, they said, were the only compensation that they had to balance out their miserable existence on what the Jesuits themselves had described as that '*orrido scoglio*'—horrid rock—that was Malta.[22] In the tumultuous circumstances that followed, Grand Master Lascaris had temporarily banished the Jesuits from the island with the exception of

18 ASM, XVI (*Anno IX*), *Fasc*. II (1938) 129–202 and 273–325, (article on '*Il Collegio dei Gesuiti in Malta*' by Pio Pecchiai S.J. which reproduces on page 184 the 12-11-1591 '*Istrumentum Fundationis*' of the Jesuit college in Malta).

19 *Ibid*., 143 and 173.

20 ASM, XVII (*Anno X*), *Fasc.* I (1938–1939) 20–25 (article on '*La Compagnia di Gesù a la Sacra Milizia Gerosolmitana in Malta*' by Antonio Leanza S.J., author of *Gesuiti a Malta*).

21 ASM, XVI (Anno IX), Fasc. II (1938) 143. See also Fiorini and Mallia-Milanes, *Malta*, 111–145 (article on '*The Development of Mathematical Education in Malta to 1798: A Case Study of Cross-Cultural Influences*' by Stanley Fiorini).

22 ASM, XVI (*Anno IX*), *Fasc*. II (1938) 161–168. See also Zammit-Ciantar, *Symposia Melitensia* I, 1–30 (article on '*The Expulsion of the Jesuits from Malta in 1639*' by Joe Zammit Ciantar) and AHSI, 129, a.LXV (1996) 3–29 (article on '*Anti-Jesuit Rioting by Knights of St. John during the Malta Carnival of 1639*' by D.F. Allen).

77. Engraving of Grand Master Jean-Paul Lascaris Castellar [De Lucca, 2001].

Sebastiano Salelles, his personal confessor, and Theodoric Baegk, who was then in Valletta assisting to the spiritual (and military) needs of the Grand Master's guest, Friedrich of Hesse-Darmstadt.

When the Order was recalled in September 1639, Lascaris had made amends for the unfortunate incident by acting decisively to set up a class of mathematics, making it clear in the foundation deed signed in 1655 that he believed this subject to be the "slave and servant" of the disciplines that especially interested "soldiers and mariners".[23] The Grand Master had nursed this vision of establishing a mathematical faculty since his election to the magistracy on 13 June 1636 when he had sent a request to Vitelleschi, asking him to identify a capable Jesuit *mathematicus* who would be willing to travel to Malta for the purpose.[24] According to a letter dated 10 January 1637,[25] the Jesuit General had reacted swiftly by sending a letter to Freidrich Tassis—the Provincial of the *Provincia Flando-Belgica*—enquiring about the availability of an illustrious Jesuit professor of the mathematical disciplines and fortification design in Louvain called Willem van Hees (Hesius).[26] Hees proved unwilling to relinquish his position as 'prefect of studies' at the Jesuit College of Ghent[27] and he was subsequently appointed rector of the college of Aalst in 1641.[28] In a fresh effort to please the disappointed Grand Master, the rector of the *Collegium Melitense*, Giuseppe Manthia proposed the name of a Maltese Jesuit called Fabri[29] but his proposal did not find favour in Rome since soon afterwards the new Jesuit General Nickel asked Masò to leave Monreale and proceed to Malta. The Sicilian Jesuit arrived in Valletta in 1653 with clear instruc-

23 See n. 21. In his work, Fiorini reproduces the foundation deed for the new class of mathematics from the NAV records [Notary Pietro Vella, R 476/38 (21-03-1655) ff. 81v-85]. According to NLM, AOM 119, f. 156v, this class depended upon income from the popular game known as '*Il Maglio*'.

24 I am indebted to Angelo De Bruycher for this information in ARSI, *Sic.*13, *Epist. Gen.* (10-01-1637). So insistent was Lascaris to have a Jesuit *mathematicus* in Valletta that in a later letter I have identified in ARSI, *Sic.*16 (1), *Epist.Gen.* (01-01-1654) ff. 230v-231 (Nickel to Provincial of Sicily) it is written that "*La matematica chiesta da Mons.Gran Maestro nel collegio di Malta si deve concedere con ogni prontezza*". In another letter to the rector of the Valletta college, the Jesuit General stressed that "*noi saremo sempre pronti a servire Sua Eminenza e con la matematica e con ogn'altra cosa che potrà venire da noi*" [ARSI, *Sic.*16 (1), *Epist.Gen.* (01-01-1654) f. 229 (Nickel to Manthia)].

25 See n. 24.

26 ARSI, SMV, IV, 336–337. Hesius, b.1601 (Antwerp), e.22-09-1617, d.1690 (Brussels), an architect, authored a book on domes (1690). See also O'Neill and Dominguez (ed.), *Diccionario*, 1917–1918.

27 *Ibid.*

28 *Ibid.*

29 ARSI, *Sic.*16 (II), *Epist.Gen.* (09-07-1654) f. 301 (Nickel to Manthia).

tions to establish the new chair of mathematics "to train the Knights (*Melitenses Equites*) in the mathematical disciplines".[30] Nickel evidently felt that the interests of the Jesuit Order in Malta would be better served if the new appointee was an expert in military mathematics. This was the time of the war of Candia (1645–1669) when Venice, with the help of the Knights of Malta and many volunteers from Northern Europe, was struggling to prevent the island of Crete from falling into the hands of the Turks. Masò had arrived in the right place at the right time.

In 1653, Malta had been ruled by an iron fist by the Knights of the Hospitaller Order of St John the Baptist for one hundred and twenty three eventful years. This great Military Order had been created in the time of the crusades by Pope Pascal II Raniero (1099–1118). In common with the defunct Templar and Teutonic Orders and the more recent Florentine Military Order of St Stephen, which had been established by Pope Pius IV de' Medici (1560–1565) in 1561, the Knights of the Hospital, now better known as the Knights of Malta, were regarded by the post-Tridentine Catholic Church as being analogous to a monks and therefore, all knights professed the three solemn vows, enjoyed immunity from civil and ecclesiastical jurisdictions and were answerable to the pope alone. They shared with the Jesuits a militant spirit and an obligation to defend Catholicism from its enemies but unlike Loyola's creation—a Religious Order which was subject to the rules of canon law—the Hospitallers had been constituted as a Military Order and, as such, were subject to the rules of war. Unlike the Jesuits they could shed blood on the battlefield. Conscious of the formidable track record of these Hospitallers, first in the Latin Kingdom of Jerusalem where they had proved their mettle as ferocious combatants, skilled castle builders but also dedicated carers of pilgrims, then in Rhodes where they had built a powerful fleet of war galleys to protect their Dodecanese possessions from Ottoman aggression and finally in Malta where they had survived the great siege of 1565, afterwards building the city-fortress of Valletta and now in the process of creating an impenetrable ring of fortifications around the Grand Harbour, the newly-arrived Giacomo Masò would have been fascinated to see how the militant and international spirit of his own Order was so well reflected in that of an ancient Order of noble knights hailing from all parts of Catholic Europe who, however, had been allowed by their Medieval constitution to combine religious duties with active service in the field and on the high

[30] This was the wording that had been used in the 10-01-1637 correspondence mentioned in n. 24.

seas, to better defend the Catholic Faith and their island convent from infidel ambitions of world dominance.

During his six years in Malta (1653–1658), the Jesuit *mathematicus* did not only apply himself to the teaching of mathematics. Apart from advising the Grand Master on the defence of Malta against the Turks,[31] he also compiled several manuscripts which were eventually crystallised in his great work on military architecture entitled *Trattato dell'Architettura militare defensiva, et offensiva*[32] and in a somewhat more concise work, now lost, entitled *Tractatum de optica, ut etiam philosophiam*.[33] The first and hitherto forgotten manuscript on military architecture formed the basis of a book published in Malta in 1657 entitled *Problemi Geometrici Cavati dal Cavaliero F.D. Emanuele Arias y Porres Castigliano della Sacra Religione Gerosolimitano, dal Trattato della Geometria Militare, dettato in Malta dal P. Giacomo Masò della Compagnia di Giesu`, professore della Matematica*.[34] The introduction to this book reveals an interesting detail about the activities of Masò in Malta. He seems to have spent much time in writing since his student mentioned in the introduction to the book several "*ingegniosissimi trattati*", one of which dealt with military architecture—presumably referring to the above-mentioned manuscript. In the true Jesuit tradition of gathering and communicating scientific knowledge, he also placed a copy of his writings in the library of the Jesuit college "*per utilità e esercitio degli Cavalieri di questa Sacra Religione Hierosolimitano*."[35] This would have recorded and reflected the success of his teaching. The several mature students attending his classes, referred to as those "*illustrissimi e nobilissimi Cavalieri della nostra Accademia*"[36] would have certainly used their European connexions to spread their teacher's *bravura* far and wide, justifying Aguilera's comment that the *mathematicus* Masò "taught with great skill and was highly recommended for his integrity and knowledge".

Grand Master Lascaris died on 14 August 1657. By October of the following year, a disgruntled Masò had already left Malta, having being once more transferred by Nickel to Palermo.[37] There is much evidence to sug-

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[31] ARSI, *Sic.*159, *Cat.Brev*, f. 164 specifies Masò's duties in Malta as "*Professor mathematicae, Consultor*".

[32] ARSI, SMV, V, 697. Masò's *Trattato*, kept in the BRCC [*Civ.Mss.*E.63] has also been studied by Luigi Ingaliso of the University of Catania who has recently published a transcript of its contents.

[33] *Ibid*.

[34] NLM, *Libr*[*ary* manuscripts collection], Bc. b. 38.

[35] *Ibid.*

[36] *Ibid.*

[37] ARSI, *Sic.*67, *Cat.Trien*. (1655–1658) f. 243. See also *Sic.*68, *Cat.Trien*. (1660–1665) f. 19v and n. 42.

gest that 1657 had been an '*annus horribilis*' for the Jesuit. On 31 May 1657 he had received a negative reply to a request[38] he had made to go to Venice "*che ha aperto una gran porta per dilatar la gloria diurne*"– an obvious reference to the clearance given to the Jesuit Order at about this time to penetrate the traditional resistance of the *Serenissima* to papal interference. Another document dated 5 September 1657 mentions a second request[39] that had been made by Masò to go to Venice which had also been rejected. Just before the death of Grand Master Lascaris, the professor of mathematics had, for some unspecified reason, also been disciplined by his superiors and this may have been why he had lost all interest in teaching.[40] The choice of the Italian word '*svogliato*' used in correspondence to the Jesuit Provincial of Sicily dated 16 August 1657 is significant since this word was then used to indicate an unmotivated, unwilling, averse or even a disgusted person.[41] It was in this state of sadness and disillusion that Masò reached Palermo in the summer of 1658.

The military mathematics class in Malta seems to have been forgotten till 1681 when Grand Master Gregorio Carafa de Roccella (1680–1690) made two requests dated 1 December 1680[42] and 24 February 1681[43] to the Jesuit general Giovanni Paolo Oliva asking him to send over to Malta a replacement. The wording of the first is interesting:

> His Eminence the Grand Master wishes to bring over to Malta a learned Jesuit who can teach mathematics to his Knights—He must be a person who is proficient in his profession and able to maintain the Chair (of mathematics) with decorum, also to offer any necessary advice.[44]

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[38] ARSI, *Sic.*17, *Epist.Gen.* (31-05-1657) f. 60 (Nickel to Masò).

[39] ARSI, *Sic.*17, *Epist.Gen.* (05-07-1657) f. 68 (Nickel to Masò).

[40] ARSI, Sic.17, *Epist.Gen.* (16-08-1657) f. 78 (Nickel to Provincial of Sicily): "*Il P. Masò riesce molesto alla disciplina in Malta e pare svogliato—Lo richiami, e dovendo continuassi la matematica, dia successore*". See also ARSI, Sic.17, *Epist, Gen.* (16-05-1658) f. 142 (Nickel to Masò) and *Epist.Gen.*(19-10-1658) f. 190v (Nickel to Masò) where it emerges that in August 1658, Masò was in Syracuse on his way to Palermo to the great annoyance of the Provincial who had not wanted him to leave Malta before a replacement had been identified. It is implied in this correspondence that Masò had offended someone important and warned "to keep silent about this matter in the future". The Provincial was ordered by Nickel to send his apologies to the new Grand Master Martin de Redin for the "Masò incident" [ARSI, Sic.17, *Epist.Gen.* (22-11-1658) f. 215 (Nickel to Provincial of Sicily)].

[41] Lysle, *Dizionario*, 841.

[42] ARSI, *Sic.*23 (II), *Epist.Gen.* (01-12-1680) f. 361 (Oliva to Provincial of Sicily).

[43] ARSI, *Sic.*23(II), *Epist.Gen.*(24-02-1681) f. 384v (Oliva to Rector of *Collegium Melitense*).

[44] See n. 42.

The insistence of the Grand Master seems to have produced the desired results since in 1682, the Sicilian Jesuit *mathematicus* Vincenzo Alias was sent out to Malta to teach here for eighteen years till the end of the seventeenth century.[45] Well versed in the Hebrew language which he also taught, Alias' terms of reference were revealed in a letter dated 11 August 1681 which mentions a request made by many Knights of Malta to learn not only about Euclid but particularly about the more practical applications of mathematics to the art of war.[46] At this time, the teaching of military architecture still seems to have required clearance from Rome since the letter also mentioned the fact that the Jesuit's instructions from Rome to teach the military applications of mathematics was only being given in view of the well-known commitment of the Hospitaller Order to the defence of Christendom.[47] Alias retired from teaching at the age of seventy-six. He was replaced in 1700 by a younger Jesuit *mathematicus* called George de Mothu.[48] This Jesuit's stay on the island was full of problems, mainly derived from his unusual eating and recreational habits.[49] He managed to obtain permission to leave Malta in 1708[50] to be replaced in 1715 by another Frenchman called Jean Baptiste Thioly[51] who, however, was unable to come to terms with the Maltese language and climate. He only managed to stick Malta for a year, to be immediately replaced by the Sicilian *mathematicus* Melchior Spedalieri[52] who was in 1719 again replaced by Angelo Aguillera.[53] On arriving in Valletta, Aguillera assumed the professorship of mathematics and also served as rector during the period June 1736–April 1739.[54] He compiled a '*Trattato dell' Aritmetica*

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[45] For Alias, b.17-03-1624 (Messina), e.09-07-1640, d. 07-08-1704 in Malta see ARSI, *Sic.*162, *Cat.Brev.*, ff. 184, 228v, 274v and 322; *Sic.*163, ff. 31, 136, 183, 239, 292 and 439; *Sic.*164, ff. 19v, 102, 202, 283 and 362v. See also AHSI, 103a LII (1983) 84 and 86.

[46] ARSI, *Sic.*23 (II), *Epist.Gen.* (11-08-1681) f. 452 (Oliva to Alias).

[47] *Ibid.* The Italian text reads: "*Cessan corti le difficoltà per le quali altrove i nostri lettori di matematica si debbono astenere dal trattato della fortificatione, mentre in cotesta reggia dell'Ordine Gerosolmitano tali insegnamenti sono indirizzati alla sola difesa del Christianesimo*".

[48] Fiorini and Mallia Milanes, *Malta*, 125, fn. 93 (Mothu: b.04-09-1664 in France, e. 09-09-1681, d. unknown date and place).

[49] *Ibid.*, 126, fn. 94.

[50] *Ibid.*, 126.

[51] *Ibid.*, 126, fn. 95 (Thioly: b.24-09-1646 in Lyon, e.23-09-1693, d.20-09-1720 in Marseilles). See also AHSI, 103a, LII (1983), 77.

[52] *Ibid.*, 126, fn. 96 (Spedalieri: b.05-01-1685 in Palermo, e.13-11-1701, d.30-04-1747 in Palermo). See also AHSI, 103a, LII (1983), 84 and 91.

[53] *Ibid.*, 126, fn. 97 (Aguillera: b.11-08-1676 in Licata, e.08-06-1691, d.27-06-1743 in Malta). See also AHSI, 103a, LII (1983), 84 and 86.

[54] *Ibid.*, 126.

Prattica' based on his 1735–1738 lecture notes on the subject.[55] Aguillera's teaching activities in Malta coincided with many important events, not least being the raising of the Jesuit college in Valletta to university status by means of a decree of Grand Master Antonio Manoel de Vilhena (1722–1736) dated 7 June 1727.[56] The Jesuit *mathematicus* was in 1743 replaced by another Sicilian called Filippo Arena.[57] Arena was in turn succeeded by three other Sicilian mathematicians—Ignazio Spatafora from Palermo, Francesco Speciale from Nicosia and Placido Cuzzaniti from Messina.[58] In 1764, the French Jesuit Francois de la Maddalena travelled to Malta from Lyon to assume responsibility for the teaching of mathematics, only to be soon afterwards thrown out by Grand Master Emanuel Pinto de Fonseca (1741–1773) together with all the other Jesuits on 28 April 1768.[59] The notorious despot of Malta, later so much hated by both his Knights, his mistresses and his people, had managed to terminate the rich Jesuit heritage of mathematical teaching and its military applications that had been established by Masò in the previous century.

Giacomo Masò arrived in Palermo in the late Summer 1658, possibly in September.[60] Soon after moving into his new living quarters in the Jesuit *Collegio Massimo*, he again started teaching mathematics. His performance seems to have been very satisfactory since according to Aguilera, he taught the subject "with great skill" so that "he was highly recommended for his integrity and knowledge", instilling "a great interest in mathematics which was then in a state of neglect."[61] Assuming that at this time the learned Jesuit was scrupulously following the rules for professors

[55] NLM, *Libr.*1245.

[56] *Seminarium Melitense*, X (1955) 1–14 (article '*On fixing the foundation date of the Royal University of Malta*' by Mons.Vincent Borg).

[57] Fiorini and Mallia Milanes, *Malta*, 127, fn. 103 (Arena: b.01-05-1708 in Piazza Armerina, e.14-11-1723, d.1789 in Rome). See also AHSI, 103a, LII (1983), 84 and 86.

[58] *Ibid.*, 128, fn. 105, 106 and 108 (Spatafora: b.01-10-1704 in Palermo, e.02-12-1719, d. unknown date; Speciale: b.19-10-1729 in Nicosia, e.27-10-1743 d. unknown date and place; Cuzzaniti: b.03-11-1724 in Messina, e.20-11-1738 d.unknown date and place). See also AHSI, 103,a. LII (1983), 84, 87 and 91.

[59] *Ibid.*, 128, fn. 111 (Maddalena: b.31-12-1723 in Lyon, e.08-09-1738, d. unknown date and place).

[60] ARSI, *Sic.*17, *Epist.Gen.* (21-11-1658) f. 215 (Nickel to Provincial of Sicily). For Masò's predecessors who taught mathematics at the Palermo College, see AHSI, 103a, LII (1983) 83–84.

[61] Aguilera, *Provinciae Siculae*, 829–831. The contents of 12-07-1660 and 28-08-1660 letters from De Redin to Masò in Palermo (NLM, AOM 1436, ff. 78 and 119) suggest that the Jesuit maintained regular communication with the Order after his departure from Malta.

of mathematics laid down in the *Ratio Studiorium*,[62] he would have spent about three quarters of an hour in class explaining the principles of Euclid and, after two months or so, when his students would have become familiar with the subject, he would have added some geography or astronomy or fortifications, which the students would have enjoyed. In every month or second month, Masò would also have asked a student to solve some mathematical problem in the presence of a large gathering of rival students of philosophy and theology, discussing the solution afterwards. Once a month, generally on Saturdays, he would have reviewed the subject matter completed during the past month in a taxing revision exercise. There is some evidence that in Palermo, Masò was also engaged in the teaching of civil law.[63] According to a 30 July 1659 document, he was on this date also acting as prefect of a Jesuit Sodality called the *Sodalitio Pauperis*.[64] At this time, the Jesuit College at Palermo had a complement of ninety-six teaching staff.[65] Maso was described as having been born on 31 July 1626, as having joined the Jesuits on 9 January 1642, as having studied theology for four years, philosophy for three years and mathematics for two years, as having taught grammar for one year, philosophy for one year and mathematics for ten years, as having been of good health and as being a '*professus*' since he had received his four vows on 31 July 1659.[66] The date 31 July 1659 must have been a turning point in his life. In the sacristy of the church of the Jesuit *domus professa* in Palermo and in the presence of the Jesuit Provincial Joseph Castelnuovo, Masò would have read out two documents which had been written and signed by himself. The first document[67] contained the usual formula, in Latin, for pronouncing the three solemn vows of poverty, chastity and obedience and the fourth solemn 'vow of acceptance' to go wherever the pope may choose to send him—"*Obedientiam Summo Pontifici, circa Missiones*". The second document[68] contained the formula, also in Latin, for pronouncing the additional five simple vows, among them the renunciation of any unauthorised ecclesiastical office outside the Jesuit Order.

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62 Farrell, *Ratio*, 46.

63 Aguilera, *Provinciae Siculae*, 828.

64 ARSI, *Sic.*159, *Cat.Brev.* (30-07-1659) f. 4 : "*P. Jacobus Masò docet Mathem[a] et praef. Sodalitio Pauperi*".According to ARSI, *Sic.*69, *Cat.Trien.* (1660–1665) f. 19v the Jesuit had in 1660 been teaching mathematics for ten years.

65 *Ibid.*

66 ARSI, *Sic.* 69, *Cat.Trien.* (1660–1665) f. 19v.

67 ARSI, *Ital.*14, f. 73.

68 *Ibid.*, f. 72.


CORSO
MATEMATICO
DEL PADRE GIACOMO MASÒ
Siracuſano della Compagnia di Giesù.
LETTORE GIÀ DELLE MATEMATICHE ne' Collegi di Roma, e Malta, e nel preſente di Palermo.
PARTE QVARTA
SFEROLOGICA.
Nella quale con ogni facilità, e breuità ſi ſpiega ciò, che appartiene alla Sfera Armillare, o cognitione di tutti i Cerchi immaginati nel Cielo.

IN PALERMO, Per Giuſeppe Biſagni M.DC.LXI.
Imp. Abbas Geloſus Vic. Gen. *Imp. Marotta Præſ.*

78. Frontispiece of Masò's *Corso Matematico* of 1661 [NLM, *Libr*.E.VI.15]. Reproduced with the kind permission of the National Library of Malta.

The years 1659–1661 seem to have been extremely busy ones in so far as Masò was concerned. This was the time when he was heavily engaged in teaching and in compiling the text of two other important works. The first, entitled *Corso Matematico del Padre Giacomo Masò, Siracusano, della Compagnia di Giesu, lettore già delle Matematiche ne' collegi di Roma, e Malta e nel presente di Palermo*,[69] was clearly intended by its author to consist in a Milliet de Chales type of work covering the whole range of the mathematical disciplines, including military architecture. Unlike his counterpart in Lyon, however, Masò ran into problems when he was ordered to remove the part dealing with fortifications, based on his earlier *Architettura Militare Defensiva, et Offensiva* manuscript which he had written in Malta. As if this was not enough, he was then asked to submit his revised text to a special commission of *Revisores* who were all skilled theologians of the *Provincia Sicula*. Their job was to examine and, if necessary, censor his work. All this emerges from correspondence between General Nickel, the Provincial Castelnuovo and Masò dated 31 July and 4 October 1659. The Jesuit *mathematicus* seems to have been flabbergasted at what he must have surely perceived to be a situation of two weights and two measures so that when permission was finally granted to publish on 25 March 1660, he only published—perhaps as a sign of tacit protest—the fourth volume of the entire work entitled *Sferologia*.[70] This impressive work of 481 folios was produced in the printing press of Giuseppe Bisagni at Palermo in 1661 who in that same year also published Masò's second work in Palermo entitled *Tavola Esattissima, e perpetua per gli Orioli a suono della Mezzanotte, Nascita del Sole, e Mezzogiorno*.[71] The deep involvement of Masò in the fascinating study of time pieces happened at a time when great quantum leaps in the accuracy of European clocks were being registered.[72] His astronomical and time-calculation activities in Palermo coincided with Isaac Newton's great astronomical discoveries in 1664–1666 and the latter's publications about the laws of gravity, light and

69 ARSI, SMV, V, 697.

70 NLM, *Libr*. E. VI. 15. I have found other copies of this work in Palermo (*Biblioteca Gonzaga*) and in Rome (*Biblioteca Casanatense*). The mentioned letters are found in ARSI, *Sic*.17, *Epist.Gen*. (31-07-1659) ff. 328–328v (Nickel to Masò) and 328v-329 (Nickel to Castelnuovo); *Epist.Gen*. (04-10-1659) f. 348 (Nickel to Masò) and *Epist.Gen*. (25-03-1660) f. 434v (Nickel to Castelnuovo).

71 ARSI, SMV, V, 697.

72 Wells, *Time*, 80.

motion which soon afterwards managed to attract the attention of many Jesuit mathematicians.[73]

The great crisis in the life of Masò happened in 1662. The "lack of communication with the Lord" which Aguilera mentions in his book[74] may well have been caused by his intense involvement in the realm of applied mathematics.[75] According to sources in the Jesuit archives in Rome, Masò, although still in Palermo on 9 December 1662, was by then already searching for ways and means to leave the Jesuit Order, petitioning nullity of his vows since, according to him, they were taken "against the will of Heaven", then an unacceptable Jewish ancestry and finally, when all else failed, "coercion" when writing and pronouncing his solemn and simple vows.[76] Such was the *furore* that the desperate Masò was creating in Palermo that his rector was only to glad to accede to his request for leave of absence to enable him "to visit his family" in Syracuse.[77] In the meantime, Masò had formally requested the General Nickel in Rome to allow him to migrate to either the Carmelite or the Franciscan Orders.[78] Gian Giacomo Visconti, the *Padre Visitatore* of the Jesuit Sicilian Province, was requested to send his comments about Masò's nullity and migration requests in a confidential communication to Rome.[79] Nickel's answer did not take long to arrive since on 26 January 1664, he rejected outright Masò's plea for nullity in view of similar past cases that had been refused[80] adding, however, that he would be well disposed towards acceding to the request to migrate to another Order.[81] To this effect, the General wrote to Visconti in Messina informing him that despite the intervention of the Bishop of Syracuse Giovanni Antonio Capobianco (1649–1673)[82] on behalf of Giacomo Masò,

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73 Newton's '*Principia*' was acclaimed as one of the most important scientific works ever written.

74 Aguilera, *Provinciae Siculae*, 829–831.

75 *Ibid.*

76 *Ibid.*

77 ARSI, *Sic.*18, *Epist.Gen.* (09-12-1662) f. 309 (Nickel to Provincial of Sicily) suggests that Masò was then facing some grave personal problems requiring "divine help".

78 ARSI, *Sic.*19 (I), *Epist.Gen.* (29-12-1663) f. 71 (Nickel to Masò).

79 ARSI, *Sic.*19 (I), *Epist.Gen.* (29-12-1663) f. 74 (Nickel to Visconti). According to the rules of the Jesuit Order, it was the task of the *Padre Visitatore* to suggest remedies when problems arose.

80 ARSI, *Sic.*19 (I), *Epist.Gen.* (26-01-1664) ff. 85–85v (Nickel to Masò).

81 *Ibid.*

82 Magnano, *Siracusa*, 68 writes that Capobianco served as bishop of Syracuse 22-03-1649 to 19-05-1673. De Lucca, *Buonamici*, 51–52 cites Capobianco's close links with the Knights of Malta, having invited their military engineer Buonamici to design the splendid Baroque Chapel of the Blessed Sacrament in Syracuse cathedral (1550).

he was still of the opinion that there should be no compromise on the issue of nullity. He again confirmed, however, that he was still disposed to go along with the proposed migration request "to rid himself of the trouble" being caused in the *Provincia Sicula* by this scandalous case.[83] According to further correspondence dated 22 March 1664 exchanged between Nickel and Visconti,[84] the desperate Masò was creating so many problems in his home city of Syracuse that it was suggested that his fresh plea to join the *Canonici Regolari* of S. Salvatore in Lauro in Rome and of S. Giacomo of Mazzara in Sicily (which formed part of the Congregation of S. Giorgio in Alga of Venice) should be rapidly processed by seeking the help of the Cardinal Protector of that Congregation, the influential Cardinal Aldobrandini.[85] A satisfactory conclusion to this unpleasant episode was reached on 29 March 1664 when the Jesuit General finally authorised the transfer of Masò to the *Ordine dei Canonici del B. Lorenzo Guistiniani*, as the Congregation of S. Giorgio in Alga was sometimes called.[86] The 1664 date again contradicts Sommervogel's 1661 date for Maso`s departure from the Jesuit Order, unless this refers to the time when Maso first expressed his intention to leave the Jesuits.[87] Masò's choice of migrating to the Venetian Order raises a number of questions, not only in the light of the impending dissolution of that Order in 1668 (perhaps implying great cunning on his part) but also because Venice was precisely the place that had featured prominently in Masò's 1557 request to be transferred from Malta. Was it therefore possible that his plans to leave the Jesuits had already been made during his stay in Malta? This could suggest some truth in his 1663 written claim of "coercion" in taking his vows. His name does not appear in the 1665 list of Jesuits teaching in the Jesuit college at Palermo.[88]

The Congregation of S. Giorgio in Alga was a strange Order. Originating in 1404 on the small island of S. Giorgio in Alga in the Venetian lagoon, the Order of the "*Celestini*", as it was often called, boasted a prestigious founda-

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83 ARSI, *Sic.*19 (I), *Epist.Gen.* (26-01-1664) ff. 87–88 (Nickel to Visconti).

84 ARSI, *Sic.*19 (I), *Epist.Gen.* (22-03-1664) f. 120v (Nickel to Visconti).

85 The '*Cardinale Aldobrandini*' mentioned in the Visconti-Nickel correspondence must have been Cardinal Baccio Aldobrandini (1613–1665) whose portrait by Giuseppe Maria Testano can be found in the *Museo di Roma*, Rome.

86 ARSI, *Sic.*19 (I), *Epist.Gen.* (29-03-1664) f. 123v (Nickel to Masò) and f. 124 (Nickel to Visconti).

87 ARSI, SMV, V, 697.

88 ARSI, *Sic.*69, *Cat.Trien.* (1660–1665). According to AHSI, 103, a.LII (1983), 83–84 and 91, the successor of Masò was Francesco Santacolomba (b.25-11-1626 in Palermo, e.25-11-1640, d.01-03-1690 in Palermo) who taught mathematics in 1663–1664 and 1674–1679.

tion team composed of Antonio Correr, Gabriele Condulmer, Marino Quirini and other scions of the highest Venetian nobility who, of their own free will, had started meeting regularly in an old Benedictine monastery situated on the small island of S. Giorgio in Alga.[89] On 15 March 1404, Bishop Angelo Barbarico, acting on instructions received from Pope Bonaface IX Tomacelli, had given the necessary authorisation to elevate this gathering of Venetian nobles to the status of *Canonici Secolari*. The first annually elected superior general of the new Order was Lorenzo Giustiniani who was later appointed patriarch of Venice. Soon afterwards, filial centres of *canonici secolari* had been founded in several places including S. Salvatore in Lauro in Rome and S. Giacomo in Mazzara del Vallo in Sicily. The saintly Pope Pius V Ghislieri in 1568 had forced the members of the Order to take solemn vows based, according to their wish, on the Augustinian rule. This unwise decision proved to be their greatest undoing, leading to discontent and disinterest which became so obvious in 1602 that Pope Clement VIII Aldobrandini (1592–1605) had to intervene personally to impose the wearing of the traditional blue tunic instead of the flowing white garb that had become fashionable. The pope, however, failed to control matters. Reaction and disillusion became so widespread that an extraordinary meeting in 1638 had to be called to respond to accusations of unacceptable life styles, indifference to study and indolence among members.[90] It is interesting to see that it was amidst such serious charges that Masò opted to join this discredited Order, still represented in Sicily at Mazzara del Vallo.[91] As he had planned, his new membership was short lived since just four years afterwards Pope Clement IX Rospigliosi acceded to a request of the *Serenissima* to abolish the Order by means of the Bull *Romanus Pontifex* (1668). The pope cited '*gravissime e giuste cause*' which, between the lines, implied his accommodation of requests for financial aid that he had received from Venice to cover the excessive costs entailed by the war of Candia.[92] As was to be expected in the circumstances, ample provision was made by the pope for an annual pension made payable to the few remaining *Canonici,* including Masò, who had during the dissolution period wisely chosen to remain in the Venetian Order.[93]

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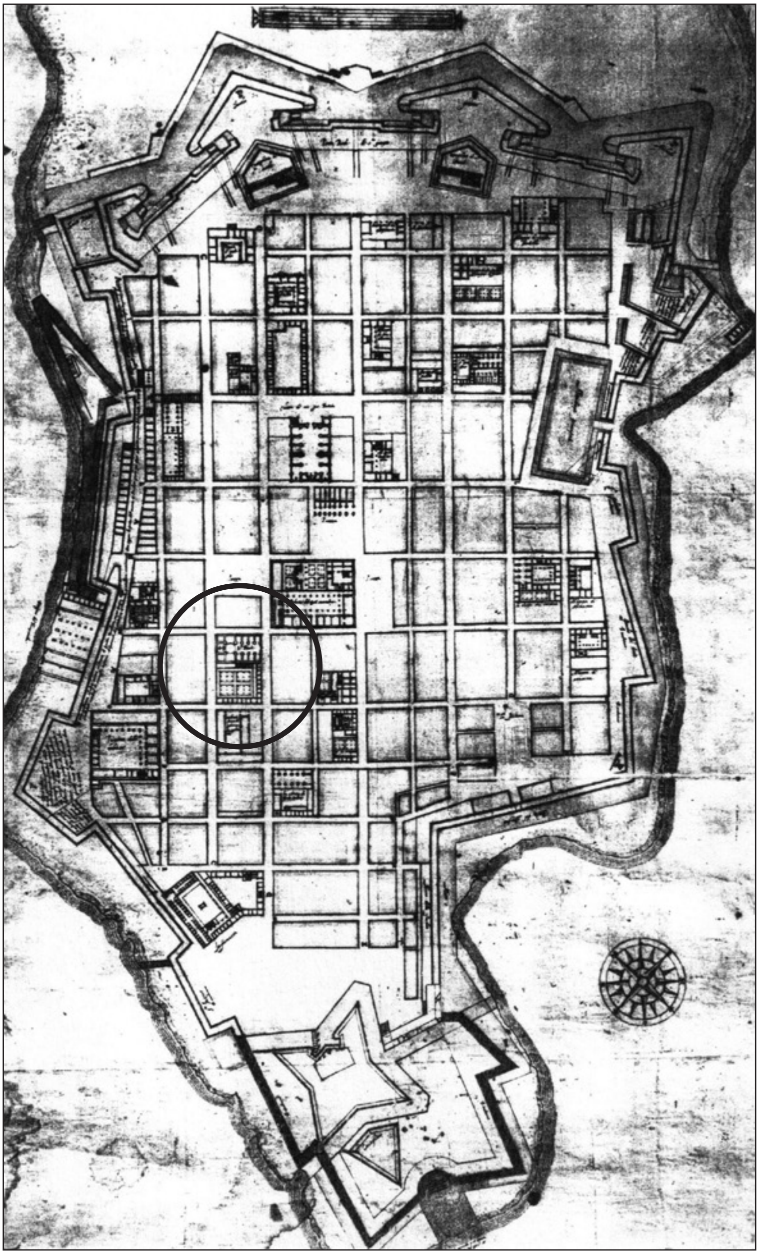
89 Pelliccia and Rocca, *Dizionario*, 154–158 (Entry: *Canonici Secolari di San Giorgio in Alga*). See also ASV, *Fondo Veneto*, 3 inventories concerning the defunct Order which I have examined on the advice of Monsignor Sergio Pagano.

90 *Ibid.*

91 ARSI, *Sic.*19 (I), *Epist.Gen.* (22-03-1664) f. 120v (Nickel to Visconti).

92 Pelliccia and Rocca , *Dizionario*, 157.

93 *Ibid.*



79. A seventeenth-century plan of the city-fortress of Valletta at the time of Masò's arrival in Malta showing the Jesuit *Collegium Melitense* and its adjoining church which was then being refurbished by the military engineer of the Knights, Francesco Buonamici [De Lucca, 2001].

After leaving the Jesuit Order in 1664, Masò seems to have spent the last ten years of his life in Syracuse. After serving for some time as the parish priest of the Mediaeval church of S. Tommaso situated in the '*Spirduta*' district in the heart of that city,[94] he met an accidental death—attributed by many Sicilian Jesuits to Divine intervention—in his residence at Megara Hyblaea, some 20 kilometres away from Syracuse. The tragic episode that has been so emotionally described in true Baroque literary style by Aguilera,[95] was confirmed in a 6 August 1674 entry kept in a death register of the parish of S. Tommaso.[96] According to this single-sentence entry, "*Don Giacomo Masò*" had received the Last Sacraments and was, according to his wishes, buried in S. Sebastiano which had close historic associations with the Knights of Malta. This church, mentioned by Nuzzo,[97] no longer exists.

The Great Turkish Peril and the Establishment of a Jesuit Academy of Fortification Mathematics in Hospitaller Malta

On arriving in Malta in the Summer of 1653 to take up residence in the spacious *Collegium Melitense* situated in Strada San Giacomo in Valletta, close to the Grand Master's sumptuous palace, Masò would have undoubtedly confirmed all that he had heard and read about a land that had constituted, since 1530, a prime target for Turkish occupation. The arrival of the Hospitaller Knights of St. John the Baptist in that year had meant that the attention of the Muslim world would now have been focused on the new island home of the Knights. The 1565 siege of Malta had proved this point clearly. It had ended in a great victory for Catholicism which could have been easily reversed had Sultan Suleyman I 'the Magnificent' (1520–1566) who relished describing himself as the "King of Kings, Sovereign of Sovereigns, Great Emperor of Constantinople and Trebizond, Most powerful King of Persia, of Arabia, of Syria and of Egypt, Supreme Lord of Europe and Asian Prince of Mecca and Aleppo, Sire of Jerusalem and

[94] For information and plans of the Medieval church of S. Tommaso (1199) see Giansiracusa, *Ortygia*, 19–20 and Di Stefano, *Monumenti*, 121–122 and Plate CLXXXII.

[95] See n. 1.

[96] *Chiesa di S. Tommaso* (*Siracusa*), *Libro Defuncti An.1659—An.1761,* f. 31v (06-08-1674): "*Don Giacomo Masò, beneficiato di S^{to} Thomaso havendo preso tutti i Sacramenti morì e si sepelli' a S^{to} Sebastiano*". I am indebted to Don Giuseppe Lombardo for giving me permission to examine this document now kept in the Pantheon Church, Syracuse.

[97] Nuzzo, *Sebastiano*, 85.

Master of all the seas",[98] personally led the onslaught of his Jannissaires on the harbour installations of the Knights, as he had done with great success at Rhodes in 1522. As an avid reader of books, Masò, would also have been aware that although many years had passed, many were those Catholic princes who were still scared of the Turkish peril, now raging as fiercely as ever in the waters around Crete.[99]

This peril had originated on 29 May 1453 when the hordes of Mehmet II (1451–1481) had overrun the city of Constantinople.[100] The Turks—whose powerful artillery had managed to penetrate the walls of that ancient city—were essentially nomads and so they remained throughout the centuries as well testified by the Englishman Charles Elliot who observed, when describing the interior of a Turkish house, that the building he had visited contained "no more furniture that could be carried off at a moment's notice on a wagon back to Asia."[101] After the capture of Constantinople, the Turkish expansionist policy had been initially marked by the conquest of much of mainland Greece from Thessaloniki (1458–1460), by the occupation of Bosnia and Herzegovina (1463), by the capture of Negroponte, Lepanto, Modon, Coron and Zonchio (1470–1500) and, for good measure, by the massacres of Archangelos in Rhodes (1457) and of Otranto in Italy (1480). In the first half of the sixteenth century, these events had been followed by the conquest of Syria, Egypt and Arabia (1512) and by the capture of Belgrade, Rhodes and Hungary (1512–1526)—the last overrun in the wake of "a battle big with consequences for Europe" at Mohacs (1526) which had brought the Turks right up to the gates of Vienna (1529).[102] It was at this time that Suleyman had started operating his pincer strategy targeted on Rome. While Turkish armies were harassing the frontiers of Imperial Austria after the capture of Buda and the occupation of much of Hungary in 1541, other sea-borne Turkish armies started harassing the central Mediterranean area as witnessed at the sieges of Lipari (1544), Tripoli (1551), Gozo (1551) and finally Malta (1565)

[98] Tadini, *Martinengo*, 186.

[99] Finkel, *Osman's Dream*, 226–228, 244, 247–248, 251, 256, 265, 270–271 and 563–564. See also Turnbull, *Ottoman Empire*, 85–87.

[100] *Ibid*. 48–52 (Finkel) and 36–40 (Turnbull).

[101] Fisher, *History of Europe*, 425–426.

[102] *Ibid*., 499. Some interesting perspectives on the rising threat of the Turks in the sixteenth century are to be found in Chambers, Clough and Mallett, War, *Culture and Society in Renaiisance Venice*, 29–56 (article on *Fortress and Fleet: The defence of Venice's Mainland Colonies in the late fifteenth century* by Simon Pepper) and Tracy, *City Walls*, 282–316 (article on *Ottoman Military Architecture in the Early Gunpowder Era: A Re-assessment* by Simon Pepper).

to reach, despite the serious setback of Lepanto in 1571—which was however balanced by the Turkish successes in Cyprus (1571), Tunis (1574) and Goletta (1574)—a maximum level of expansion in the year 1606. These events were crowned by the capture of Crete after a bitter struggle with Venice (1644–1669). The Turkish peril only started abating after Masò's death in the wake of the third unsuccessful siege of Vienna (1683) which was quickly followed up by a series of Turkish defeats at Zenta (1697), Carlowitz (1695), Petervaradino (1716) and Passarowitz (1718).

The newly-arrived Masò would surely have also known from Giovanni Francesco Abela's *Descrittione di Malta* of 1647,[103] that one immediate result of the siege of Malta had been the foundation on 28 March 1566 of Valletta. The mounting of Turkish batteries on the high land of the Sciberras peninsula had made it evident that the key to the defence of Malta was to build a city-fortess on this elevated area, thus enclosing much of the Grand Harbour and controlling from St. Elmo, the entrance to Marsamxett, the other harbour that could be used in an invasion. Valletta had been named after Grand Master Fra Jean de la Vallette Parisot who at exactly forty-two minutes to noon had personally laid the foundation stone of his new Capital in the presence of a mathematician from Syracuse called Giovanni Antonio Inferrera who had brought over to Malta his astrolabe for the purpose of recording the exact time of the birth of the new-city fortress. According to eyewitnesses, the elevation of the Holy Host during High Mass had been signalled to all by the firing of a magnificent salute of all the cannons of Malta, as befitted the momentous occasion.[104] The decision to build Valletta had at the time sent many messages to Catholic Europe. In political terms, the decision of the Knights to remain in Malta despite earlier misgivings had assured the Catholic camp that a powerful bulwark had been added to the Italo-Sicilian line of defence against the Turks. In religious terms, Valletta had been perceived by many as a much needed replacement of those 'Fortresses of God' that the Knights had lost in the Holy Land and in Rhodes—proudly projecting the image of an unconquerable Catholic church, protected by a band of dedicated warrior-monks evoking the crusading ideal. In military terms, the new city-fortress had from its very origins emerged as a most worthy confirmation of a long tradition of architectural achievements in the field that had started in the Latin States of *Outremer* (with the building of *Krak*

103 Abela, *Descrittione di Malta* (1647).
104 Denaro, *Houses of Valletta*, 10. See also Parker, Stafford and Vella Bonavita, *Enarrant Caeli,* 1–8 andDe Giorgio, *City by an Order*, 73–76.

des Chevaliers), continued in Rhodes (with the reconstruction of the Byzantine harbour city) and finally reaching unprecedented proportions in Malta where Valletta now became the hub of an ambitious fortification building programme designed to create an impregnable 'Malta within Malta'[105] capable of attracting the best military minds to come over to Malta to personally contribute to this very Baroque demonstration of military power and prestige. Considered in this context, Masò would have in 1653 been presented with a unique opportunity to teach and practise military geometry in a threatened land that was quite obviously ready to receive him with open arms.

Early consultations between the newly-arrived Jesuit and Grand Master Lascaris held in 1653 would have revealed one of the problems that had plagued the Knights since their arrival on the Island. This concerned the role of 'visiting' and 'resident' military engineers in the design and construction of the fortifications. The first were difficult to bring over because of the reluctance of their princes to release them. The second were even more difficult to engage because of the unwillingness of their superiors to spare them for a long time in overseas service, even when the Catholic cause was invoked in the many requests made by the ambassadors of the Knights for the purpose. The problems that had been encountered in the engagement of visiting consultants have been studied by Hughes,[106] Hoppen,[107] Spiteri[108] and the present author.[109] So severe had been the problem of attracting good military engineers to Malta in the years preceding the Jesuit's coming, that Grand Master Lascaris had in 1638 been constrained to dispatch one of his best mathematician Knights Giovanni Battista Vertova "*della militare matematica intendentissimo*"[110] to visit various princes and military engineers in Italy, taking with him plans of the new fortifications which were then being built or about to be built at Floriana and S. Margherita, so as to discuss their merits and flaws with the leading experts in French and Spanish occupied Italy, among

105 NLM, *Libr.*1301, ff. 1–47 (*Abregè* reproduced in De Lucca, *Mondion*, 41). Once Valletta had been built, all subsequent fortification extensions (the Floriana , Margherita and Cottonera landfronts and Fort Ricasoli in the seventeenth century and Fort Manoel and Fort Tigne in the eighteenth century) were meant to strengthen the role of the new city-fortress in defending the Grand Harbour containing the arsenal and galleys of the Knights.

106 Hughes, *The Building of Malta*, 7–38 and 201–223.

107 Hoppen, *Fortifications of Malta*, 29–187 and 285–289.

108 Spiteri, *Fortresses of the Knights*, 222–357 and 368.

109 Ellul-Micallef and Fiorini, *Collected Papers*, 245–281 (article on '*Baroque Architecture in Malta*' by Denis De Lucca). See also my 1975 B.Arch. (Hons) dissertation.

110 Calvi, *Campidoglio de Guerrieri*, 18–19.

them the Jesuits Grassi and Camassa.[111] With regards to the problem of employing 'resident' engineers, the Knights had only managed, before Masò's arrival, to convince four persons to remain on the island, these being Flavari (1530–1543), Bellavanti (1554–1560), Menga (1560–1567) and Buonamici (1635–1659). The first three were third rate professionals while Buonamici seems to have been more inclined towards painting and architecture, as one would expect from an early product of the *Accademia di San Luca* in Rome who had in 1635 accompanied Floriani to Malta as a Barberini spy.[112] Although entrusted with the supervision of Floriani's new landfront fortifications designed to function as the outworks of Valletta and with the design of a new city-fortress for Gozo, Buonamici (who was continuously under pressure to return to his native Lucca to supervise the building of the new outworks of that city), had very little exposure to mathematical knowledge. The Jesuits of the *Provincia Sicula*, who engaged him to design the façades of their churches in Malta and Trapani, seem to have regarded him as an architect as well as a military engineer of a high standing, describing him as that "*nobile e famoso architetto*" and "*valentissimo ingegniere della Sacra Religione di Malta.*"[113]

Faced by a long history of problems concerning the engagement of competent military engineers, Grand Master Lascaris had, soon after his election to the magistracy, sent an urgent letter to General Vitelleschi requesting his help to identify a good *mathematicus* to come over to Malta to train his Knights in the mathematical sophistications of seventeenth-century Europe. What was not, however, fully explicit at this time of the 'Hesius episode'[114] was what were the real intentions of the Grand Master in engaging a Jesuit. Things were only clarified after the arrival of Masò in 1653 since it emerges that secret Lascaris-Masò discussions held soon afterwards now led to the establishment of a Jesuit academy of military geometry. Masò must have been aware that the Grand Master's idea of promoting such a dangerously utilitarian Jesuit academy that was exclu-

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[111] See chapter 2, nn. 37,38 and 196 a.r.t. Besides Grassi and Camassa, Vertova consulted Bartholomeo Bianchi (Genova), Carlo Castellamonte (Torino), Henrì de Nogaret de la Valette (Felizano), Louis de Nogaret de la Valette (Felizano), Francois Le Camus (Pinerolo), Diego Felipe de Guzman (Alessandria), Diego Francesco de Melo (Alessandria), Alvaro de Melo (Alessandria), Ferrante Attendolo Bolognino (Alessandria), Giovanni de Garay (Alessandria), Giuseppe Barracca (Alessandria), Giovanni de Medici (Florence), Braccilli (Florence) and Gian Francesco Cantagallina (Florence).

[112] De Lucca, *Buonamici*, 37.

[113] *Ibid.*, 49 and 59.

[114] See nn. 24–28 a.r.t.

sively orientated towards the teaching of military architecture—perhaps even intended to produce a corps of 'resident' military engineers for the Knights—would encounter problems in Rome. He unilaterally decided to give his full cooperation to the formal setting up of this academy without bothering to consult General Nickel. As implied in a later 1681 letter sent to the *mathematicus* Alias by General Oliva,[115] his decision to teach military architecture within the framework of such an academy would have required clearance from Rome, this probably constituting one source of Masò's later problems with the Jesuit Order.[116]

The teaching of fortification mathematics in Valletta started in October 1655. Two documents respectively dated 21 March 1656 and 9 June 1656 (corresponding to the academic year 1655–1656) reveal the importance that was being given to the new Jesuit academy. The first document took the form of a notarial declaration by the Grand Master to found the academy specifying the establishment of a legacy of 100 *scudi* per annum to be paid to the Jesuit college for the subsistence of the newly arrived Jesuit *mathematicus* or any future replacement, "to read and teach mathematics to the noble Knights and other members of the Order and Militia of St. John of Jerusalem."[117] Also listed were provisions for the management of the said legacy by a special commission (composed of the Knight Bailiff of Negraponte, Fra Diego de Melo Pereira, the Knight Grand Cross, Fra Lopo Pereira de Lima and the Commendatori Fra Pietro de Blacas-Carros and Fra Giovanni de Blacas-Carros, all seasoned warriors who had experienced several sieges and action on the high seas). The second document took the form of a decree by the Grand Master whereby the Jesuit's subsistence allowance would be provided by the revenue from a popular ball game played at the Floriana Mall which Lascaris now wished to promote further by the building of a *casetta*, "for the better commodity of the players."[118] This was interpreted by many jealous Maltese husbands as a wise move by the pious Grand Master to keep his young Knights off the streets of Valletta. The end result of Lascaris' provisions was the establish-

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[115] ARSI, *Sic.*23 (II), *Epist.Gen.* (11-08-1681) f. 452 (Oliva to Alias).

[116] See n. 40. See also correspondence mentioned in n. 70, particularly ARSI, *Sic.*17, *Epist.Gen.* (31–071659) ff. 328v-329 where the Jesuit General Nickel specified that the "matter of fortifications" was "banned by Our Order". There is however some evidence in ARSI, *Sic.*17, *Epist.Gen.* (16-05-1658) f. 142 (Nickel to Masò) that the Jesuit's *consulenza* (as opposed to teaching) to the Grand Master of Malta could have been tolerated in view of the Turkish threat.

[117] See n. 23.

[118] *Ibid.*

PROBLEMI
GEOMETRICI
CAVATI
DAL CAVALIERO F. D. EMANVELE
ARIAS, E PORRES
CASTIGLIANO
DELLA SACRA RELIGIONE GIEROSOLIMIT.
Dal Trattato della Geometria militare Dettato
IN MALTA
DAL P. GIACOMO MASO
Della Compagnia di Giesù
Professore della Matematica.

Ex libris

IN MALTA CON LICENZA DELLI SVP.

80. Frontispiece of Don Emanuele Arias y Porres' *Problemi Geometrici* book [NLM, *Libr.* Bc.b.38]. Reproduced with the kind permission of the National Library of Malta.

ment in Malta of a unique Jesuit academy exclusively dealing with fortification matters.

Some of Masò's teaching sessions at the newly formed academy were in 1657 recorded and presented to Grand Master Lascaris by a Castillian Knight called *Fra* Don Emanuele Arias y Porres (1638–1717) in the form of the elegantly-bound book entitled *Problemi Geometrici*.[119] This book was derived from the *Architettura Militare* treatise that the Jesuit prepared in the 1653–1654 period for the purpose of teaching the subject in an orderly and sequential fashion, using the usual Jesuit dictation method of teaching used in other colleges but not without much discussion at calculated intervals. One can imagine Don Emanuele, then still seventeen years old, listening attentively to Masò's teachings and taking down notes of the different geometrical solutions explained by the Jesuit. Born on 1 November 1638 to an illustrious family of Alaejos in the diocese of Valladolid, Spain, this ambitious young man had, before being sent out by his parents to join the Knights in 1652, studied letters, mathematics, philosophy and law. According to one source, he had risen rapidly in the service of the Knights after Masò's departure from Malta, becoming Vice-Chancellor (1662), *Commendatore* of Benevento (1668), Viso (1674), Tevenes (1676) and Quiroga (1683), and Grand Bailiff of the Order. Having returned to his homeland as the Grand Master's ambassador to the King of Spain—where he had also been appointed by King Philip V to act as a Councillor of State—Arias y Porres was elected Archbishop of Seville on 28 May 1702. He was consecrated in the church of the Jesuit *Colegio Imperial* in Madrid with which he had always been closely associated. Had he not met his death in Syracuse under tragic circumstances, Masò would have been indeed proud to see his favourite student promoted Cardinal in 1713. Arias y Porres died at the age of seventy-nine in Seville, where he was buried with full ecclesiastical honours in a splendid *festa funebre* in the Chapel of the Blessed Sacrament within the cathedral of that fine and ancient Spanish city.[120]

Arias y Porres' book was introduced by the customary *Escuela de Palas* type poetic verses, here included to link "Euclid in the lyceum" with "Mars in the battlefield" and at the same time to instil a fear of "that Ottoman who has his kingdom in the East whose chest was always armed with a devilish power" so as to "gratify his false god"[121] There is also the expected reference to the

119 NLM, *Libr.* Bc.b.38.
120 Izquierdo, *Episcopologio Español*, 15.
121 NLM, *Libr.* Bc. b. 38, ff. 2r and 3v.

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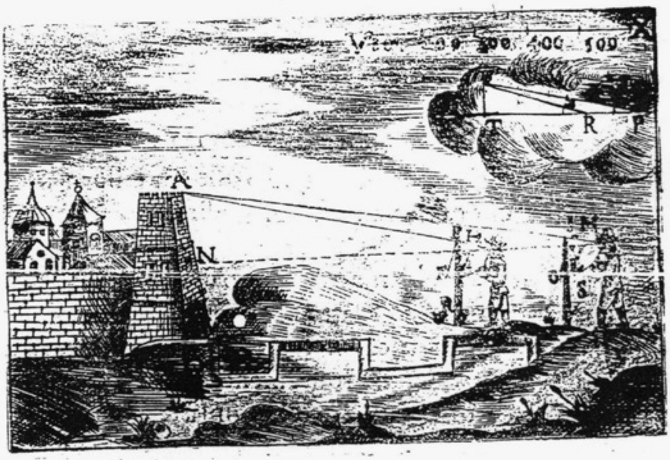
NMA, el'angolo TRS uguale all'ãgolo AHN; ſupponiamo
hora, che queſti angoletti ſi terminino nelli pũti Y, Z, tira-
remo dunque dal punto P una linea, che paſſi per lo Y, e
dall'R un'altra, che paſſi per lo Z; hor non eſſendo queſte
due linee paralelle, già che gl'angoli TRZ, & TPY ſono
ineguali, ſi taglieranno, perciò ĩ qualche punto, come nell'S;
dal quale tirando la perpẽdicolare ST ſopra la PQ, reſteran-
no formati li due triangoletti RST, & PST, che subito ci
moſtreranno li paſſi della diſtanza orizzontale HN; col mi-
ſurare quante particelle, preſe dalla medeſima ſcala VX, ſi
trouino nell'RT, e tanto ſarà il numero delli paſſi della de-
ſiderata diſtanza HN.



La dimoſtratione è queſta. Li due triangoletti RST, & PST
ſono equiangoli colli due maggiori HAN, & MAN, men-
tre gl'angoli N, & T ſono per la ſuppoſitione retti; l'angolo
TRS è fatto uguale all'angolo NHA; come pure il P all'M,
onde l'angolo HAN ſarà uguale per la 32 del primo d'Eu-
clide all'ãgolo TSR, e l'MAN all'ango TSP; eſſendo dũ-
que li due triangoletti piccolini equiangoli colli due mag-
giori; hauranno per la 4 del ſeſto li lati, che riguardano ã-
goli

8

81. Extract from the *Problema Primo* section of the *Problemi Geometrici* book with an illustration of basic surveying procedures [NLM, *Libr.*Bc.b.38]. Reproduced with the kind permission of the National Library of Malta.

newly-arrived Saviour "from high Syracuse" (Masò) who "with so much wit, with so much art, a hero and at the same time a tutor" is here compared to his compatriot Archimedes, that "illustrious engineer, whose works exceeded all others". In presenting his book to Grand Master Lascaris, who is here addressed as the "Prince of Malta, Gozo, Rhodes etc.,"[122] Arias y Porres explicitly stated that the content of his book was derived:

> from the cleverest treatises made by Padre Giacomo Masò, professor of mathematics in Malta and a member of the Society of Jesus, which are now being revealed to the general public by our Academy in order to be used by the Knights of this sacred Religion[123] (focused as they are on a discussion of) military geometry, where various problems are explained through simple but necessary demonstrations needed by military architects, especially those concerning the dimensions of lines, surfaces and bodies[124] (since) there are three parts of Geometry, the first dealing with the rules for the measurement of straight lines such as the height of towers, mountains, palaces, the depth of ditches, the width of rivers, the distances of ships from the port and related issues; the second dealing with the measurement of surfaces and the third dealing with the capacity of regular and irregularly shaped bodies, all this already having been shown very clearly in the treatise on Military Geometry[125] (but here presented) "in the form of a bouquet of flowers so as to find favour with all the Knights of our academy who, excited by this small work, will be encouraged to apply themselves to study similar things,[126] (thus demonstrating to all) "the beautiful alloy of wisdom and use of arms in the formation of a Knight.[127]

Arias y Porres made it clear at the end of the presentation of his book that since his work only dealt with the first part of geometry concerned with straight line measurement, it was his intention in the near future to publish the remainder of his master's teachings but only if his "Jesuit's modesty would so allow it."[128] As events unfolded themselves, the hasty departure of Masò from Malta in 1658 implied not only an abrupt disruption of the good work being undertaken by the academy but also the end of Arias y Porres' intention to publish other books on the same subject.

An interesting insight into the type of practical exercises given to the many young Knights attending the classes of Masò was provided by the

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122 NLM, *Libr*. Bc. b. 38, ff. 2r and 3v.
123 *Ibid*., f. 5r.
124 *Ibid*.
125 *Ibid*., f. 5v
126 *Ibid*., f. 5r
127 *Ibid*.
128 *Ibid*., f. 5v. For the issue of 'modesty' in the behaviour of Jesuit mathematicians see chapter 1, n. 138.

nature and sequence of the contents of Arias y Porres' book. A few pages on basic surveying procedures[129] introduced a first section entitled *Problema Primo*.[130] This section discussed the uses of an instrument called the "*Quadrante Pendule*" for measuring horizontal distances which were not immediately visible—as applied to the construction of underground tunnels and gunpowder chambers which, according to Arias y Porres "would have to be made with the utmost secrecy (by the attacking force) so as not to provoke countermine action (by the defenders)." In this respect, the Knight-author recorded the seven cardinal principles of gunpowder chamber construction which would have been explained by Masò. These were first, that the shape of these chambers should be oval (measuring 10 Roman feet across and 16 Roman feet along); second, that the gunpowder chamber would have to be lined with closely-spaced timber planks to keep the humidity away from the gunpowder; third, that the use of ten barrels of gunpowder in the chamber would result in an explosion which would reach a height of 29 *palmi* while the use of fifteen-twenty barrels would achieve a superior result of a 50–60 *palmi* high explosion which would cause greater damage; fourth, that in the absence of barrels, sacks of canvas packed with gunpowder could be used (provided that they were slit to enable the distribution of the gunpowder on the floor of the chamber); fifth, that the next operation would be to lay ten to twelve copper hollow cylinders containing wicks dipped into camphor and potassium nitrate, connected to the opening of the underground tunnel for ignition purposes; sixth, that after well sealing the gunpowder chamber with timber beams and planks, the tunnel would have to be tamped with earth because "if this is not done, the explosion would not have the desired effect" or else "it would find the weakest point where the tunnel is not well tamped and exit from the mouth causing more damage to the attacking troops than to the defenders";[131] and seventh, that the best time to set off the explosion would be just before an assault on the fortifications because it would then be opportune for the defenders to be blown up together with sections of the wall, "at a time when they would have least expected it."

[129] NLM, *Libr*. Bc.b.38, ff. 6r-9r.

[130] *Ibid*., ff. 9r-10v. A good example of a sophisticated version of the *quadrante pendule* is found in Bion, *instrumens de mathématique*, 188.

[131] *Ibid*., f. 10v.

The second section of Arias y Porres' book entitled *Problema Secondo*[132] dealt with various applications of an instrument for measuring horizontal widths called the "*Radio Latino*", sometimes also called the "*Quadrato Geometrico*". This instrument was named after its inventor Latino Orsini who even wrote a book about it.[133] It consisted of a slider which moved along a central rod causing the deltoid shape formed by the four other rods to change its shape symmetrically depending on the intended application. Since the ends of the rods were fitted with sights, corresponding sight lines could be defined. Since the central rod was like the other rods graduated with various scales, these scales allowed the measurement of not only the angles between the end rods but also the crucial angle having its vertex at one end of the main rod and the sides, making the instrument very useful in siege operations to determine the height of objects and even barrel elevations for cannons. Arias y Porres would have undoubtly heard Masò explain in great detail the application of the *Radio Latino* to mining, harbour works and bridge building operations which were all dealt with in this section of his book.

With regards to mining operations, defined as a reliable means "to reach the foundations of the bastions (without being seen) and then destroying them, so that when they collapse, the attacking forces would be able to enter the city",[134] the *Radio Latino* could be used to calculate exactly the distances that had to be travelled by the sappers in the construction of underground tunnels, as had been first done "by Francesco di Giorgio of Siena"[135] or "Pietro Navarro of Spain". According to the Jesuit, the latter "had first used them in the *Castello dell' Ovo* in Naples for which he had been handsomely rewarded by Charles V".[136] Arias y Porres listed

132 *Ibid.*, ff. 11r-17r.

133 For Orsini (c.1530–1590) see D'Ayala, *Bibliografia*, 110. His book, entitled *Trattato del radio Latino* was introduced by Egnatio Danti da Perugia, alias Pellegrino Ranaldi O.P. (1536–1586). A copy of Orsini's book and a fine example of a *radio Latino* having a gilt handle incorporating a silver compass box with an engraving of the crucified Christ, resembling a sword in its scabbard, were among the exhibits of the *Geometry of War, 1500–1750* exhibition held at the Museum of the History of Science of Oxford University (1998).

134 NLM, *Libr.* Bc. b. 38, f. 13r.

135 *Ibid.*, 13r. In November 1495, Francesco di Giorgio Martini (1439–1502) dug a shaft beneath the Castel Nuovo in Naples, packed it with barrels of gunpowder and brought down a section of barbican in the subsequent explosion, for which see Pepper and Adams, *Firearms and Fortifications*, 17.

136 *Ibid.*, f. 13r. Navarro, also called Pedro de Roncal '*El Salteador*' was a corsair in Spanish service who in June 1503 used a great mine (designed by Antonello da Trani) to capture the Castel Nuovo in Naples from French forces. This action had been followed up by an even more daring achievement when, in July of that same year, Navarro's troops, operat-

ten principles that had to be observed in excavating such tunnels. These were the careful selection of sites which ideally would have little water and practically no sand or stone content (since water could hinder excavation operations while sand could cause damage and stone, considerably lengthen the time factor leading to the wastage of excessive human energy); the draining of any excess water by canals or the use of tools; the lining of the tunnels and gunpowder chambers with timber; the importance of using geometrical knowledge to calculate exactly the right direction of the underground tunnel towards the part of the fortification that had to be blown up; the need of using reliable compasses to maintain this direction during excavation works; the necessity, as one approached the end of the tunnel, to establish the level of the gunpowder chambers which should have a width and height dimension of 9 to 10 Roman *palmi*; that it was recommendable to use indirect rather than direct tunnel routes; that in so doing it would be preferable to use a series of short straight runs of tunnelling, continuously changing direction to facilitate timber lining and frame fixtures and that measures would have to be take to ensure adequate ventilation "by excavating from the starting point of the tunnel, a long canal"[137] to introduce air into the subterranean galleries because experience has shown that "after walking for some distance, breathing tends to become difficult".[138]

With regards to harbour works, Arias y Porres recorded Masò's explanation on how the *Radio Latino* could be used to measure the width of the entry points so as to enable underground chains or other barriers to be employed to prevent the entry of unwanted vessels. Regarding "Some necessary reflections on building river bridges,"[139] Arias y Porres informs his readers that according to his teacher Masò, bridge construction represented one of the most difficult and dangerous operations in war since it involved the judgement of four principal variants. These were the depth and width of the river to be bridged, the nature and strength of the water currents, the nature and strength of the river bedrock and, lastly, the possibility or otherwise of surprise attacks by sea or by land, during construction operations. Viewed from this perspective, eight guidelines would have

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ing from boats under protective cover, managed to secretly excavate another huge mine which was used to blow up the *Castello dell'Ovo*, for which Navarro was conferred with the title of Count of Oliveto. See also Pepper and Adams, *Firearms and Fortifications*, 18.

137 *Ibid.*, f. 13v.

138 *Ibid.*

139 *Ibid.*, f. 16v.

22

ti passi haueuamo trouato la lontananza CA; cominciando dal punto C fino al punto G, e perche li passi della CA suppo- ſimo eſsere 27, per questo dal punto C fino al G piglaremo altre tante particelle; doppo cominciando dal medeſimo pun- to C, applicaremo ſino all' L 29 Particelle, giache la diſtan- za CB ſi trouò eſsere paſsi 29; hor dunque la medeſima pro- portione hà il CG al CL, che il CA al CB, e cosi unendo li punti G, & L colla linea GL, ſi hauranno due triangoli GLC, & ABC coll' angolo C commune, e li lati GC, & CL del trian- goletto GCL proportionali alli lati AC, & CB del triangolo

maggiore ACB, onde per la ſeſta del ſeſto d' Euclide questi due triangoli GCL, & ACB ſaranno equiangoli, e per la quar- ta del medeſimo libro anche proportionali, Perciò come il CL, al CG, coſi il CB al BA; di modo che quante uolte entre- rà il GL nell' LG, tante entrerà l' AB nel BC, preſa perciò col Compaſso la linea LG, e traſportandola nella diuiſione delle parti uguali della facciata inferiore dell' Aſta CE, ſubbito co- noſceremo, che in detta GL ſi racchiudòo 9 particelle di quelle, nelle quali fù diuiſa la CL, ò CG; dunque anche la larghez za del Porto AB cercata, ſarà di paſsi 9, che ſi pretedea.

ANNO

vante ſarà più alzato, con tanta maggior certezza riuſci- rà l'operatione: Poſta dopò l'Aſta CH paralella all'orizzonte il che ſi conſeguirà facilmente, ſe faremo, che il perpedicolo DG ſcèdendo dal pũto D, batta nel mezzo dell'agolo F) fare- mo paſsare il raggio uiſuale per gli traguardi del Braccio DC, ſin che si termini al B, fine della diſtanza da miſurarſi; Oſſeruato poi dove il filo, che perpendicolarmente caſca ſo- pra all' Aſta CE, tocchi la linea del mezzo di detta Aſta, e ſuppongo per hora di toccarla nel punto I, ſe faremo ch'l detto filo DG col ſuo piombo G ſcorra sino all' Orizzonte,

reſteranno formati due triangoli DIC, DAB, ſarà loro propor- tionali, mentre la linea IC è paralella per la ſuppoſitione all' Orizzontale AB, ſopra le quali cadendo perpendicolarmen- te la DG ſarà l'angolo DIC uguale al DAB, e l'angolo D eſſē- do commune al Triangolo DIC, & al DAB, ſarà per la 32 del primo d' Euclide l'angolo DCI uguale all'angolo DBA, dũ- que per la 4 del ſesto la proportione, che hà DI ad IC, haurà DA ad AB: Hor eſſendoci noti tre termini della già detta proportione, cioè le particelle del filo DI (che li ſapranno facilmente applicandole nella diuiſione dell' Aſta) e quelle dell'

82. Extracts from the *Problema Secondo* section of the *Problemi Geometrici* book showing applications of the radio latino to mining and bridge-building operations [NLM, *Libr*.Bc.b.38]. Reproduced with the kind permission of the National Library of Malta.

to be followed to avoid a military disaster. These were, first, that the higher the bridge, the better would be its performance in the event of a sea-borne attack; second, that if not properly protected by land fortifications, an isolated bridge would have to be protected by two or three rows of closely spaced piles placed at a distance of 200 paces from either side of the bridge so as to stop any approaching enemy boats; third, that if the depth of the river would not allow the use of piles, strong barriers composed of horizontal timber beams, joined together if necessary, or even chains could constitute viable alternatives; fourth, that the extreme ends of the bridge should be protected by palisades, redoubts, forts and other similar types of defences manned by soldiery; fifth, that bridges could also be made by roping together several boats, each measuring 27 *piedi* long and 6 *piedi* wide—which could form part of the baggage train of the army where they could be used as horse-driven carts, filled with supplies; sixth, seventh and eighth, that other forms of bridges were those utilising trestles, rope structures, cane and even animal skins filled with straw.

The third section of Arias y Porres' book entitled *Problema Terzo*[140] dealt with the use of the so-called "*Quadrato Geometrico*" to measure from a safe distance the vertical height of a tower where the top would be visible to an attacking force but the base would not—because of the presence of a mound or similar obstacle. Two aspects of this "very important"[141] problem are addressed. One concerned the measurement of the actual height of the tower while the other concerned the computation of the number of ladder rungs that would be needed to scale it. The first could be solved, according to Arias y Porres, by drawing an elaborate geometrical construction of superimposed triangles derived from the use of two instruments—one placed at an angle to the ground and the other horizontal, afterwards applying the rules of the "first book of Euclid"[142] to calculate the partly-concealed height of the tower in question, and also the length of the ladders necessary to attack the tower. This would, however, require adequate covering fire from carefully-positioned batteries and good timing.

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140 *Ibid.*, ff. 17v-20v. The *Quadratum Geometricum* was first used for measuring heights by Georg Aunpeck von Peuerbach of Vienna in 1455. In 1570, Silvio Belli wrote a book about it.

141 *Ibid.*, f. 17v.

142 *Ibid.*, ff. 18v-19r. The reference is to the 29th, 32nd and 47th rules in the first book of Euclid. There is also a reference in ff. 15v and 17v to the work of Clavius, here described as "*dottissimo Clavio*."

The fourth section of Arias y Porres' book entitled *Problema Quarto*[143] dealt with the calculation of depth by a simple square instrument, considered essential because "depth measurement is very important for the conduct of various aspects of war"[144] especially so where battery installations or mining and countermining operations were called for. In the case of countermine action, the depth of a ditch and therefore the depth of the place from where to start excavating the countermine tunnels in the lowest part of the counterscarp, constituted one of the most decisive factors in the defence of the outworks. This had been used very effectively in the 1522 siege of Rhodes by the famous military engineer Gabriele Tadino da Martinengo (1475–1543) who had:

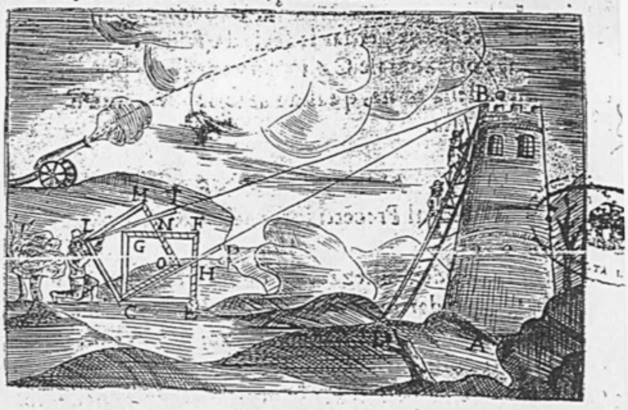
> refined their design and construction to unprecedented levels by excavating a model subterranean gallery at right angles to the ditch which was prolonged in great secrecy to reach the Turkish lines to then cause massive destruction by sudden gunpowder explosions and the emission of intoxicating smoke.[145]

By the mid-seventeenth century, excavating countermines had become a fine art and Grand Master Lascaris often consulted Masò about this matter in Malta. The Knights had already tested the value of Gabriele Tadino da Martinengo's countermines in the 1522 Turkish siege of Rhodes so that it is not surprising that all the fortifications of the island-fortress were eventually fitted with a superb system of hidden countermines consisting of fan-shaped networks of underground tunnels radiating beneath the glacis in the form of branches, complete with listeners and gunpowder chambers.[146] Bearing in mind the dangers but also the importance of countermines, Masò would have patiently explained to the young Arias y Porres and his other academy students, the procedures involved in first measuring the width of ditches having vertical or sloping counterscarps—using two simple squares—and then applying "the corollary to the eight proposition of the sixth book of Euclid."[147] The depth could be likewise calculated by again using the simple squares, this time turning one of them to produce overlapping proportional triangles so that "the thirty second rule of the first book of Euclid"[148] could then be applied to calcu-

143 *Ibid.*, ff. 21r-24v.
144 *Ibid.*, f. 21r.
145 Tadini, *Martinengo*, 28–29. See also Viganò, *Ingegneri Militari Italiani*, 20 and 33–37.
146 Spiteri, *Fortresses of the Knights*, 361.
147 NLM, *Libr*. Bc. b. 38, f. 21v.
148 *Ibid.*, f. 22v.

29

tria Rettágola,ò finalméte per la 47 del primo, già che ci sono noti il CE,& EH) disporremo la Regola Aurea nella forma seguente.
Come le particelle della Dioptra CH. C
Alle particelle del regolo tagliato EH.
Così li passi della Diagónale CB conosciuti nella prima osseruatione.
Alli passi della desiderata Altezza AB,che ci saráno mostrati dalla regola del Tre. Col Quadrato dúque Geometrico s'è misurata, & c. Che si doueua pratticare.



Quát' hora s'è detto, si deueno auuertire due cose, prima che occorrendo d'essere dalla diagonale CP segato il regolo GF, ò'l punto angolare F, si potrà sodisfare al problema, operando proportionalméte à ciò, che horas' è dimostrato. Il secódo Auuertimento ci seruira per conoscere la distanza orizzontale CA, benche ritrovanduci nel punto C, non uedesimo l'altro estremo A, impediti (come s' accénò sv'l prícipio di questo Problema) da monti, ò d'altro edificio; per qual fine non ci sarà bisogno d'altro, che quadrare la diagonale CB, conosciuta per la prima osseruatione, e l'altezza

83. Extract from the *Problema Terzo* section of the *Problemi Geometrici* book showing the application of the *Quadrato Geometrico* to measure the height of fortification walls from a safe distance [NLM, *Libr.*Bc.b.38]. Reproduced with the kind permission of the National Library of Malta.

late the depth of the ditch and the corresponding level of the commencement of the countermine tunnels. Arias y Porres' book was concluded with an annotation entitled "How to make countermines."[149] It is here recorded that the Jesuit Masò had explained three different categories of countermine action. The first consisted in a ramified form of tunnels, the second consisted of random pits intended to penetrate the enemy tunnels thus preventing their completion and the third also involved the excavation of random pits intended to penetrate the enemy gunpowder chambers and enable the removal of the stored gunpowder barrels to "outwit the enemy who will thus be far away from victory when he thinks that he would soon be celebrating his triumph."[150]

Masò seems to have gone to great lengths to explain one of the main problems concerning countermines—that of locating the enemy tunnels and chambers. He rightly criticized the fact that most 'ancient' and 'modern' solutions to do this "were much more suitable to fill pages with ink rather than to discover the whereabouts of the hidden enemy."[151] It is therefore not surprising that Arias y Porres' book on military geometry would have been concluded with a discussion on what the Jesuit considered to be an effective method of countermine action. In this respect, "deep" parallel ditches cut in the ground, excavated with the hope of intersecting the enemy tunnels were, according to him, more reliable than the traditional sound detection method used since antiquity (consisting of bronze shields, copper or brass hollow vases, iron plates and water-filled containers). Masò could have had—at some point in his tragic life—a first hand unrecorded experience of one of those military operations that were so common in the seventeenth century. At any rate, his was a notably well-informed discussion of the practical issues involved, with appropriate emphasis on what may be called 'underground navigation'.

149 *Ibid.*, f. 23v.
150 *Ibid.*, f. 24r.
151 *Ibid.*

PROBLEMA QVARTO

COME PER MEZZO DELLA SEMPLICE SQVADRA SI MISVRINO LE PROFONDITA.

La misura delle profondità è importantissima per uarij accidenti di Gverra, come per esempio douendosi fare una Batteria, che uadi da alto à basso, ò per sprofondarci nell' occorrẽre colle Mine, ò Contramine,&c. Si doura perciò con grandissima diligẽza considerare, come elleno potranno essere formate da termini, che scendono in giù perpendicolarmẽte, come si vede nel seguẽte Fosso ABHI, ò uero da termini iprofondati à pendio, come appare dall' altro Fosso QS, d'entrambi si dovrà qui parlare, e prima della misura del Fosso AB HI, la cui Larghezza AB, non solo c' è ignota, ma ne meno si può per essa caminare, benche sia vguale alla HI, mentre supponiamo di scendere àpiombo li lati AI, & BH. Bisogna dunque prendere la larghezza AB dal punto A, il che potendosi

84. Extract from the *Problema Quarto* section of the *Problemi Geometrici* book with an illustration of depth calculations during a siege [NLM, *Libr.*Bc.b.38]. Reproduced with the kind permission of the National Library of Malta.

Trattato dell'Architettura Militare Defensiva, et Offensiva—An Unpublished Treatise on Military Architecture

Masò's *Trattato dell'Architettura Militare Defensiva, et Offensiva* (1653–1655) seems to have had a twofold purpose. The manuscript was obviously intended to serve as an organised compilation of classroom notes covering Masò's lectures at the new Jesuit academy of fortification mathematics—as explicitly stated by the Jesuit who in the introduction to his work clearly expressed his "burning desire" to record "in indelible script" all that he had "explained about military architecture to those most illustrious and most noble Knights of this academy."[152] This was also confirmed by his student Arias y Porres in his book on military geometry.[153] The treatise of Masò was also intended for the eventual publication in Malta of what could have been one of best Jesuit books on military architecture, written for the defence "the true Catholic Faith".[154] The work was presumably not published because of the transfer of Masò from Malta to Palermo in 1658, which must have interrupted the plan of Arias y Porres to publish the Jesuit's work in its entirety.[155] This was also detrimental to the Knights who lost an opportunity for their new printing press[156] to present the Catholic world with what could have been the only official book of the 'Religion of Malta' dealing with the 'dos' and 'do nots' of military architecture. Efforts by Masò to have his work published in Palermo as part of his *Corso Matematico* also failed.

The treatise of Giacomo Masò is a remarkable achievement. The Jesuit's various arguments on military architecture are developed in a well planned sequence reflecting clarity of thought, a thorough knowledge of the subject and a detailed exposition of the art of fortification building. It reveals the confident hand of a person who has acquired a deep knowledge of the subject while in Rome and who was aware, perhaps even at first hand, of contemporary achievements in different parts of Europe, particularly in the Spanish Netherlands. The encyclopaedic knowledge that this treatise contains stands out when compared to other more publicised Jesuit works on the subject.

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152 BRCC, *Civ. Mss*. E. 63, f. 7.

153 NLM, *Libr*. Bc. b. 38, f. 5r.

154 BRCC, *Civ. Mss* E. 63, f. 328.

155 NLM, *Libr.* Bc. b. 38, f. 24v.

156 According to Zammit, *Printing in Malta*, this printing press was inaugurated by Grand Master Lascaris on 25 May 1654 after he had given a license to Pompeo del Fiore to operate it.

TAVOLA.
Delle Parti; Libri; Capi; e Pro:
blemi racchiusi in questo Trattato
dell'Architettura Militare
Difensiva, et Offensiva
composto
Dal Prè Giacomo Masò della
Compagnia di Giesù.
Parte Prima
Dell'Ichnografia, ò Pianta
delle Fortificationi
Regolari
Che cosa sia l'Architettura Militare
in quante parti si divida e
quale il suo fine.
Libro Primo.
Dell'Architettura Militare
Difensiva Regolare
Delle Conditioni necessarie, che dee te-
nere un Sito, per riputarsi atto
à ricevere la forma di qualche
Fortezza

Fortezza e come queste siano aggiunte à questa perfettione fol. 11.
Capo II. Dell'Ortografia, Militare, e come differisca dall'Ortografia, e Scenografia fol. 19.
Probl. p.° Delli Nomi delle linee principali, che concorrono alla Pianta di qualsivoglia Fortezza fol. 20.
Probl. 2.° Delli Nomi degl'Angoli che si trovano nella Pianta di qualsivoglia Fortezza fol. 21.
Probl. 3.° D'alcune Massime, ò Precetti universali per l'Architettura Militare fol. 22.
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Probl. 2.° Per sapere l'Angolo della Circonferenza fol. 38.
Probl. 3.° Per sapere l'Angolo esteriore del Baluardo, cioè l'Angolo difeso fol. 38.
Probl. 4.° Per investigare l'Angolo fatto della faccia, e del fianco del Baluardo fol. 40.
Probl. 5.°

Probl. 5.° Per conoscer l'Angolo fatto dalla Capitale, e della Mezza gola fol. 42.
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Probl. 11. Per trovare l'Angolo diminuito fol. 45.
Probl. 12. Per sapere l'Angolo di Terminatione fol. 45.
Probl. 13. Per conoscer l'Angolo opposto alla faccia del Baluardo fol. 45.
Probl. 14. Per investigare l'Angolo opposto alla Capitale fol. 47.
Probl. 15. Per sapere l'Angolo opposto al la Semidifferenza fol. 47.
Capo

Capo IIII. Del Modo di trovare la quantità di tutte le linee, che servono per la Pianta di qualsivoglia Fortezza
Problema
Probl. p.° Della Misura, della quale ci dobbiamo servire in tutto questo Trattato fol. 51.
Probl. 2.° Quali cose devono supporsi per ritrovare delle linee fol. 53.
Probl. 3.° Data la faccia coll'Angoli per trovare la sopra faccia, il fianco prolongato, ed il lato esteriore fol. 55.
Probl. 4.° Data la faccia, coll'Angolo del Triangolo, e per trovare la Capitale fol. 55.
Probl. 5.° Per mezzo della Capitale conosciuta nel Problema precedente trovar la linea della differenza, la semidifferenza, il lato interiore la sedia, ed il fianco fol. 57.
Probl. 6.° Per trovare il compimento della Cortina, il 2.° fianco, la faccia prolongata, e la Radente fol. 57.
Probl. 7.° Per calcolare la perpendicolare minore

85. Contents pages of Part I of Maso's *Architettura Militare* treatise [BRCC, *Civ.Mss.*E.63]. Reproduced with the kind permission of the *Biblioteche Riunite Civica e A. Ursino Recupero* in Catania.

86. Contents pages of Part I of the *Architettura Militare* treatise [BRCC, *Civ.Mss.*E.63]. Reproduced with the kind permission of the *Biblioteche Riunite Civica e A. Ursino Recupero* in Catania.

... Ortografia Militare
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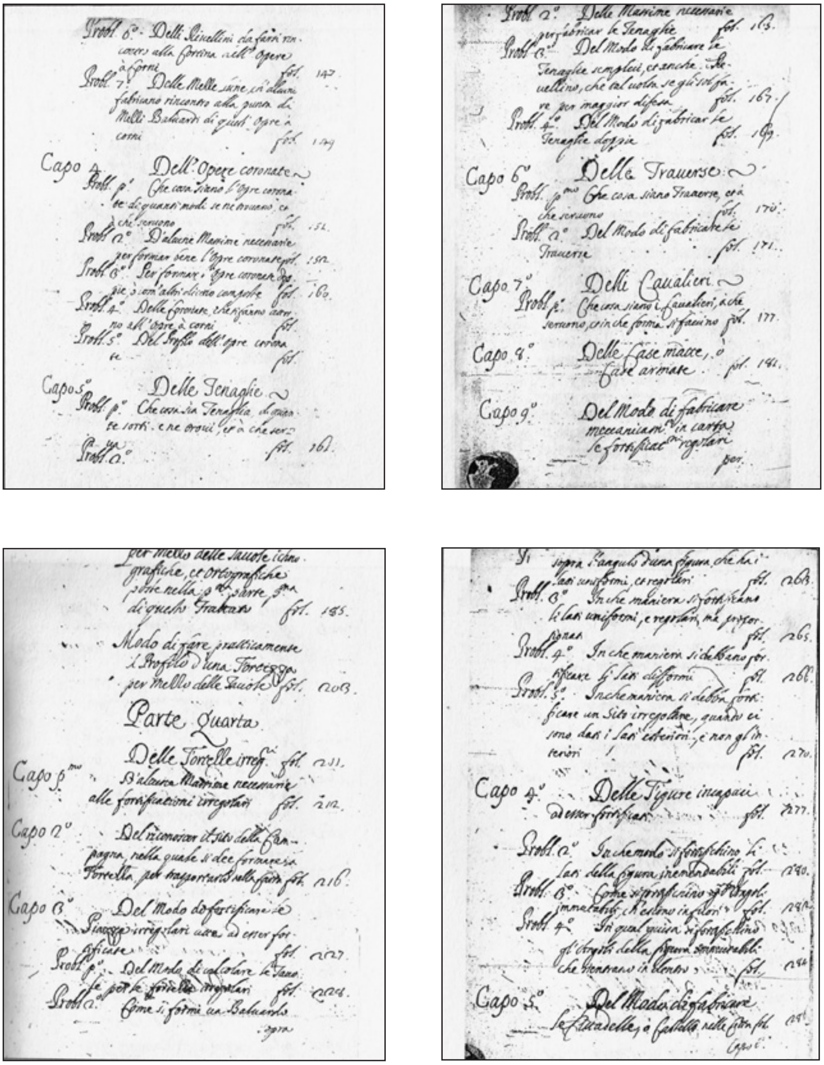

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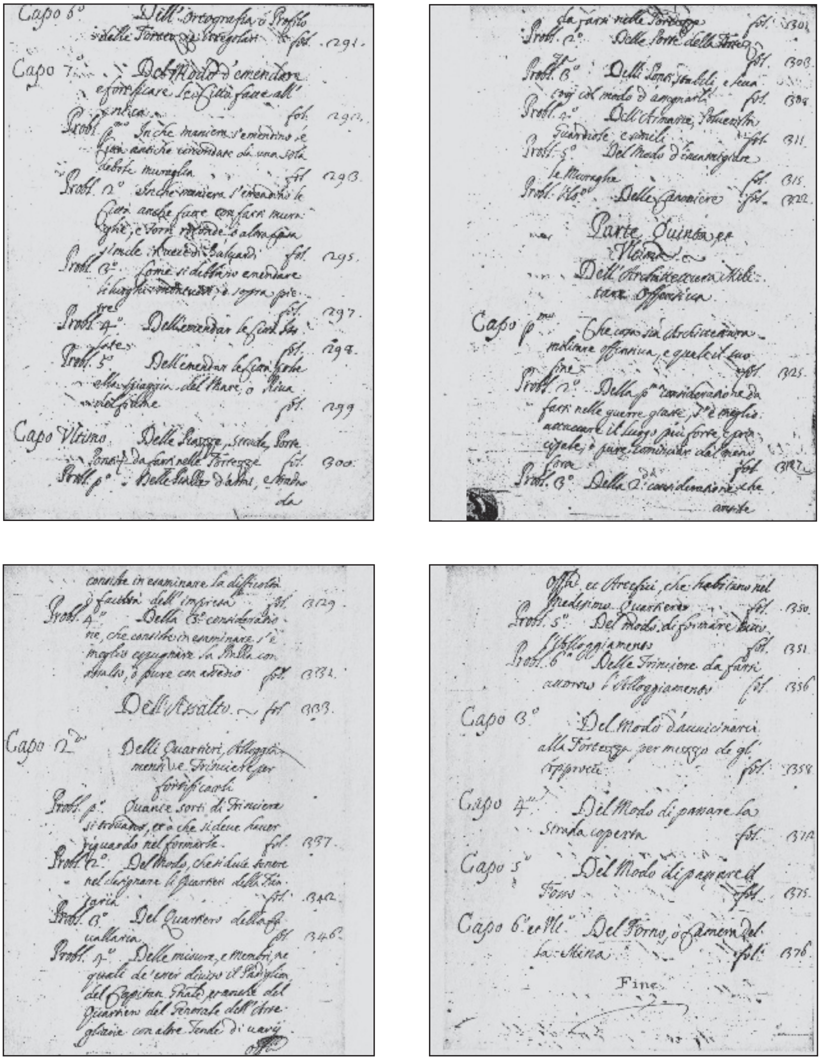
88. Contents pages of Part III (top) and Part IV (bottom) of the *Architettura Militare* treatise [BRCC, *Civ.Mss.*E.63]. Reproduced with the kind permission of the *Biblioteche Riunite Civica e A. Ursino Recupero* in Catania.



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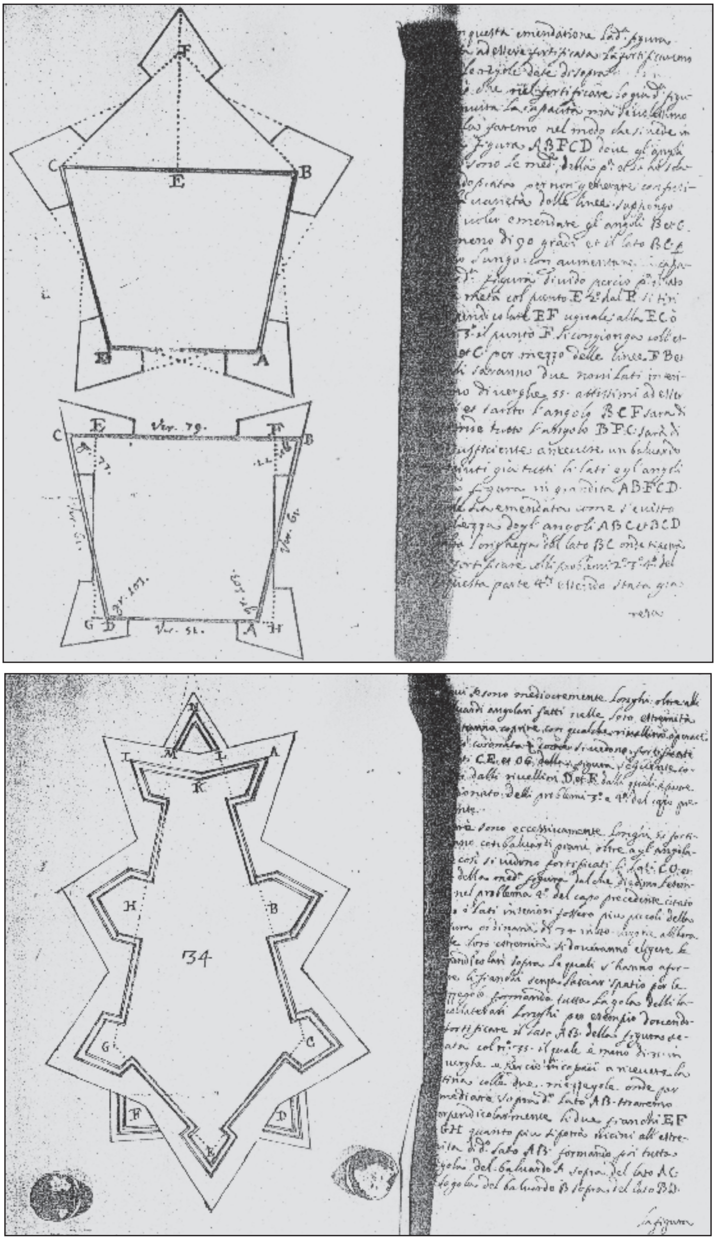
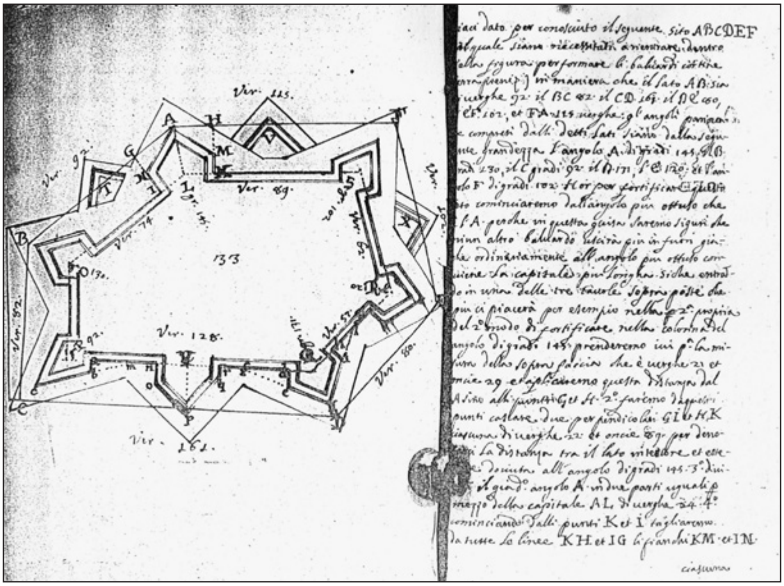
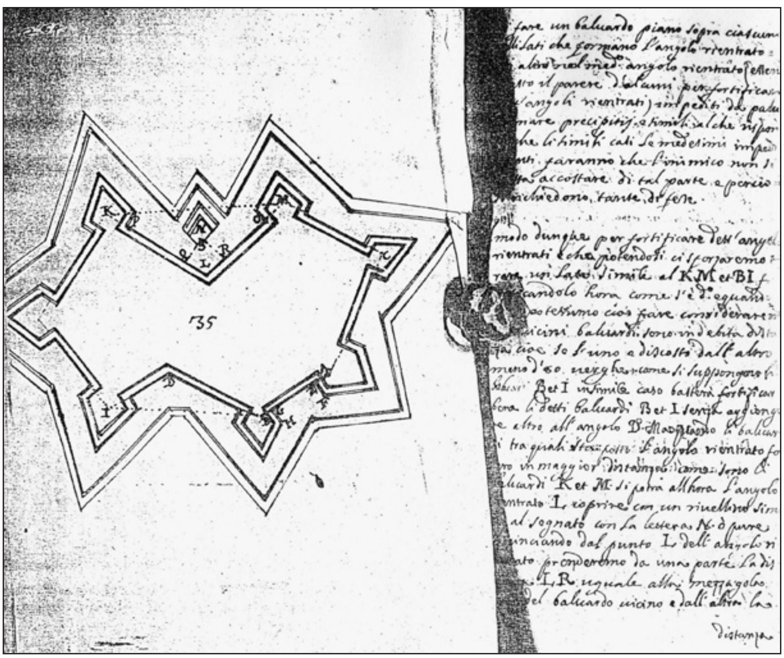
89. Contents pages of Part IV (top) and Part V (bottom) of the *Architettura Militare* treatise [BRCC, *Civ.Mss.*E.63]. Reproduced with the kind permission of the *Biblioteche Riunite Civica e A. Ursino Recupero* in Catania.

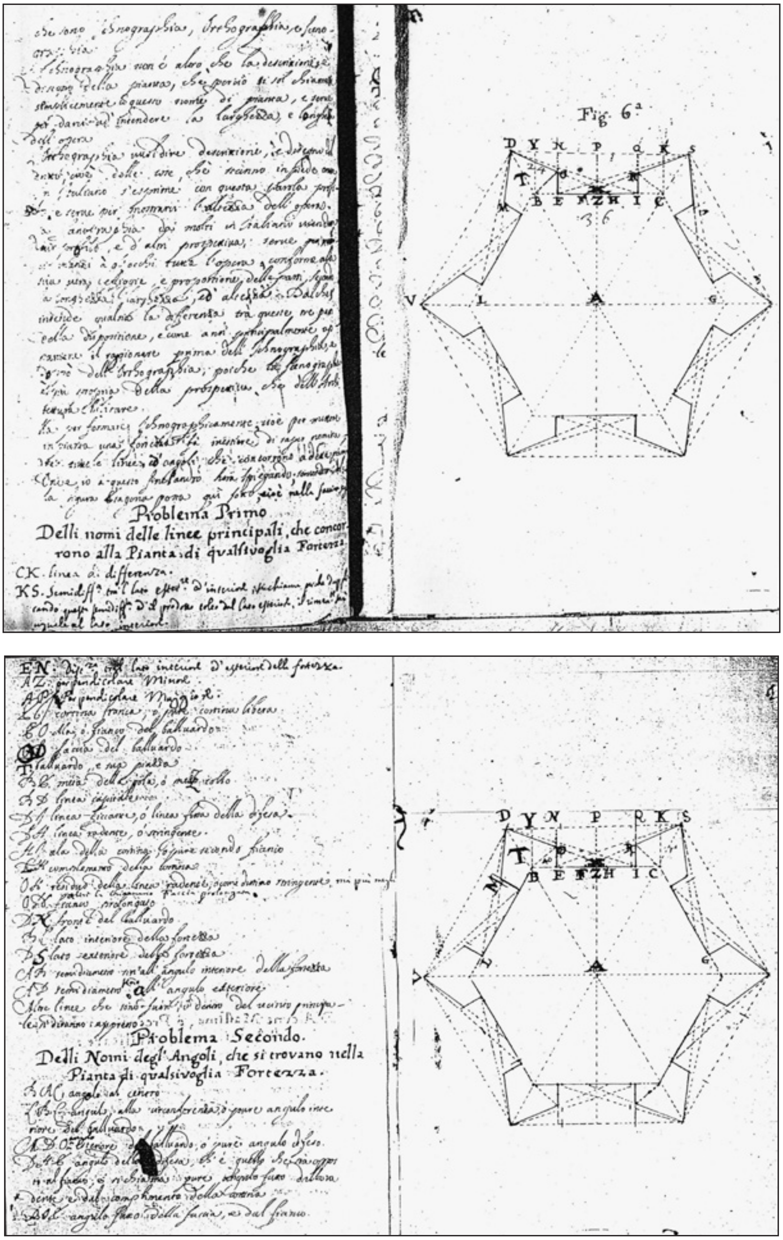


90. Extracts from Part IV of the *Architettura Militare* treatise dealing with irregular fortifications that were considered to be difficult to defend because of problematic configurations dictated by the nature of their site [BRCC, *Civ.Mss.*E.63]. Reproduced with the kind permission of the *Biblioteche Riunite Civica e A. Ursino Recupero* in Catania.





91. Extracts from Part IV of the *Architettura Militare* treatise discussing ways of usingexternal dimensions to improve the trace of irregular fortifications (top) and ways of strenghtening the angles (bottom) of such defences [BRCC, *Civ.Mss.*E.63]. Reproduced with the kind permission of the *Biblioteche Riunite Civica e A. Ursino Recupero* in Catania.



92. Extracts from Part I of the *Architettura Militare* treatise explaining the principal lines (top) and angles (bottom) of a regularly shaped fortification [BRCC, *Civ.Mss.*E.63]. Reproduced with the kind permission of the *Biblioteche Riunite Civica e A. Ursino Recupero* in Catania.

Introducing his voluminous 377 folio treatise with a reference to "that famous military architect Vegetius,"[157] Masò's work was organised into five parts. Part I dealt with the planimetry of regularly-shaped fortifications. Part II dealt with the sections of regularly-shaped fortifications. Part III dealt with all aspects of outworks common to both regularly-shaped and irregularly-shaped fortifications. Part IV focused on irregularly-shaped fortifications. Part V dealt with offensive military architecture. All these parts of the treatise evoked—judging by the unpolished style of writing used—the many discussions that would have taken place in the Jesuit's Valletta classroom which would also explain the type of rapidly-drawn diagrams that one sometimes unexpectedly finds in the corpus of the work. The script and diagrams collectively suggest that one is here dealing with a Jesuit who, seeing himself as an authority on all things military,[158] was writing the draft of a text which he subsequently meant to edit and get published.

Part I of the treatise contained seven chapters of an introductory nature. The first dealt with terrain conditions. The second (with three 'problems') dealt with representation, nomenclature and 'maxims' of fortifications. The third (with fifteen 'problems') focused on 'angle' computation issues. The fourth (with thirteen 'problems') focused on 'line' computation issues. The fifth (with two 'problems') discussed the use of trigonometrical tables. The sixth (with ten 'problems') concerned the design of bastions and curtain walls, according to the Jesuit's 'first' and 'second' methods of fortification. The seventh chapter (with twelve 'problems') concerned the design of bastions and curtain walls, according to Masò's 'third' method of fortification.

Part II of the treatise contained five chapters, all concerned with the design of the main line of a fortified front. The first (with three 'problems') dealt with terraplein issues. The second (with four 'problems') discussed parapet walls. The third (with three 'problems') discussed the use of the fausse-braye.[159] This feature is defined by the Jesuit, as a low-lying platform "invented by the Dutch" to replace the old '*Antemuraglie*' and prevent an enemy who would have penetrated the ditch from coming

[157] BRCC, *Civ. Mss*. E. 63, f. 5. Flavius Vegetius was on Possevino's list of authors in his book *Il Soldato Christiano* for which see illustration 18 a.r.t.(*Flavio Vegetio*).

[158] *Ibid*., f. 178 referring to Masò's authoritarian warning about using cavaliers as a primary source of defence: "*Averto però, che io non dico di fare detti Cavalieri per servirsene di difesa principale*".

[159] *Ibid*., ff. 96–100 (*Delle Falsabraghe*).

dangerously close to the main line of defence to scale and undermine it. The fourth chapter (with seven 'problems') dealt with the ditch,[160] this serving to cover sortie actions by the defenders, to provide material for the building of the main line of defence with terraplein and stone, to make mining action more difficult and to slow down and delay an enemy assault. The fifth chapter (with five 'problems') dealt with the covered way and glacis.[161] The Jesuit considered these features necessary to cover sortie and retreat operations and to prevent the enemy from entering the ditch.

Part III of the treatise contained nine chapters, all concerned with the design of outworks. The first chapter (with six 'problems') dealt with ravelins[162] (defined as detached works placed in the ditch, with or without flanks, meant to protect the curtain wall gateways and the bridges leading to them, to supplement the defence of bastions, to support the demilunes and to make good for any defect in that critical portion of the defence just in front of the main line of fortification). The second chapter (with four 'problems') dealt with demilunes[163] (defined as detached works placed in the ditch, with or without flanks, meant to cover the bastions which, however, had to be introduced with caution so as not to interfere with the artillery fire from the bastion behind). The third chapter (with seven 'problems') dealt with projecting hornworks[164] (defined as those fortifications having "two long sides" and a front composed of two demi-bastions and a curtain wall, most useful to prevent or delay the enemy advance towards the city-fortress as proved "by repeated siege experiences"). The fourth chapter (with five 'problems') dealt with crownworks([165] defined as detached works composed of two demi-bastions at the ends and a large bastion in the centre, linked by curtain walls and used to act as a forward position to defend any patch of raised ground which, if captured by an enemy, could be used to mount cannon batteries to the detriment of the defenders). The fifth chapter (with four 'problems') dealt with tenailles[166] (defined as works classified into two categories—"single" or "double"—built rapidly and positioned in the ditch to delay attacking troops during sudden attacks). The sixth chapter (with two 'problems') dealt with tra-

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160 *Ibid.*, ff. 101–109 (*Del Fosso*).
161 *Ibid.*, ff. 110–117(*Della Strada Coperta della Contrascarpa, suo parapetto, e spianata*).
162 *Ibid.*, ff. 123–131 (*Che cosa sia Rivellino, e che serve*).
163 *Ibid.*, ff. 132–138 (*Che cosa siano Mezze Lune, et a che servono*).
164 *Ibid.*, ff. 138–150 (*Dell'Opere à Corni*).
165 *Ibid.*, ff. 151–161 (*Dell`Opere Coronate*).
166 *Ibid.*, ff. 161–169 (*Delle Tenaglie*).

verse works[167] (defined as rapidly improvised works placed at right angles to the main line of defence so as to render it difficult for an advancing enemy to advance at a quick pace, therefore giving valuable time to the defenders to better organise their defence strategy). The seventh chapter (with one 'problem') discussed cavaliers[168] (compared by Masò—because of their great height—to "knights on horseback", these works were considered to be very necessary to observe the approaching movements of an enemy when still at a considerable distance, also to dominate the position of enemy batteries and trenches during siege operations, to supplement the defensive fire from the lower bastion faces and to harass an enemy who would have been so "fortunate" as to capture a bastion—with the proviso, however, that the cavalier would never be allowed to serve as the principal means of defence). The eight chapter (with no 'problems') dealt with casemates.[169] The ninth and final chapter of Part III (with no 'problems') was dominated by two lengthy discussions about drawing fortifications in plan and in section[170] using the tables given in the first and second parts of the treatise.

Part IV of the treatise contained eight chapters, concerned with irregular fortification traces and town planning issues. The first (with no 'problems') explains the general 'maxims' to be observed in the design of irregularly-shaped fortifications. The second (also with no 'problems') dealt with identification issues. The third (with five 'problems') discussed the applicability of the given trigonometrical tables. The fourth (with four 'problems') dealt with problematic terrain contours. The fifth (with no 'problems') dealt with the design of citadels or "castles inside the town".[171] The sixth (also with no 'problems') dealt with sectional issues in irregularly-shaped fortifications. The seventh (with five 'problems') focused on proposals to amend the fortifications of "old style towns."[172] The eight and

167 *Ibid.*, ff. 170–176 (*Delle Traverse*). It is indicative that Masò does not here mention the value of traverses to protect the defenders from flanking or enfilade fire. It was only at the siege of Ath (1697), where Vauban used a combined form of flanking and ricochet fire,that cannonballs started causing great havoc when they were made to skip over the traverses by striking the ground at a small angle, thus greatly reducing the value of these works.

168 *Ibid.*, ff. 177–180 (*Delli Cavalieri*).

169 *Ibid.*, ff. 181–184 (*Delle Case Matte o Case armate*).

170 *Ibid.*, ff. 185–210 (*Del Modo di fabricare meccanicam*^{te} *in carta le fortificat*^{ni} *regolari per mezzo delle Tavole Ichnografiche, et Ortografiche poste nella p.*^{ma} *parte p.*^{ma} *di questo trattato and Modo di fare pratticamente il Profilo d'una fortezza per mezzo delle Tavole*).

171 *Ibid.*, ff. 286–290 (*Del Modo di fabricare le Cittadelle, ò Castello nelle Città*).

172 *Ibid.*, ff. 292–299 (*Del Modo d'emendare e fortificare le Città fatte all'antica*).

final chapter of Part IV (with six 'problems') dealt with squares, streets, gates and bridges of fortified towns.[173]

Part V of the treatise consisted of six chapters and discussed siege works.[174] The first chapter (with four 'problems') discussed the crucial decisions that would have to be taken during offensive operations associated with "just wars" against the enemies of Catholic Europe.[175] The second chapter (with six 'problems') dealt with the mathematical considerations of castramentation—setting out of the infantry and cavalry quarters, quarters of the high command and entrenchments. As early modern armies increased in size and complexity and operated routinely in all seasons, this issue was becoming an important topic which the Jesuit must have considered worthy of discussion. The third chapter (with no 'problems') discussed the principles of approach systems (anticipating Vauban's later and far more sophisticated parallel approach). The fourth chapter (with no 'problems') dealt with the capture of the covered way. The fifth chapter (with no 'problems') dealt with ways and means of crossing the ditch and the sixth chapter (also with no 'problems') dealt very briefly with undermining operations. Arias y Porres' book on military geometry suggests that this subject was developed much further in the lectures of the Jesuit *mathematicus* who, however, here chose not to record all that had been said.

The overall picture that emerges after reading Masò's treatise, is that this work is the product of a first class mind. Its author seems to have been fully aware of the harsh realities of defensive and offensive warfare in seventeenth-century Europe, leading one to wonder whether Masò had ever experienced the horrors of a battlefield, perhaps as a military chaplain in far off Flanders at some time before coming to Malta? His treatise does reveal at times that he was familiar with the warfare practices in the Spanish Netherlands. Considered from this viewpoint, there are many points of interest in Masò's treatise which require comment.

One point of interest concerned the nomenclature explained in Part I, Chapter 2, 'problems' 1 and 2—the former dealing with the names of the principal lines and the latter dealing with the names of the principal angles in the plan of a regularly-shaped city-fortress. In explaining this basic part of his treatise to his students, Masò seems to have emphasised the great significance in Baroque fortification design of the fixed line of

173 *Ibid.*, ff. 300–324 (*Delle Piazze, Strade, Porte, Ponti e da farsi nelle Fortezze*).
174 *Ibid.*, ff. 325–377 (*Dell'Architettura Militare Offensiva*).
175 *Ibid.*, ff. 327–328. Masò uses the words "*nelle guerre giuste*".

defence DI,[176] the bastion face OD,[177] the bastion flank EO,[178] the central part FH[179] and end parts HI[180] of the curtain wall EI[181] and, more importantly, the angle of defence DHE.[182]

There was then the Jesuit's presentation of the 'maxims' of fortification design, explained in detail in Part I, Chapter 2, 'problem' 3. No less than seventeen maxims are here mentioned by Masò, to be compared with, say, Fournier's seven and Bourdin's ten maxims.[183] They reveal a confident awareness of not only the theoretical side of contemporary fortification design but also a practical experience of the subject. The 'maxims' listed by Masò, unlike those listed in other Jesuit writings on military architecture, rise above the usual references to the Italian, French, Dutch and Spanish 'schools of thought', to unfold, in a clear logical sequence, the underlying common principles of Baroque fortifications as they were universally understood at the time. This suggests the question—did Giacomo Masò shrewdly avoid distinguishing between the above 'schools of thought' to avoid any offence which could have been made to members of his international adult audience of Knights attending the Valletta academy? When one considers that these proud Knights belonging to an international Order were always ready to pick up a fight, even to indulge in street duels at the slightest provocation over a woman or hurt national pride,[184] the Jesuit's prudence in this matter would have been fully justified and certainly well compensated by his acumen in explaining the implications of each and every one of his seventeen maxims with the aid of charts. Put in the order that they are dealt with, the first 'maxim'[185] stated that the art of artillery fortification building was based on the fundamental principle that any exposed part of a fortified place could be chosen by a capable enemy engineer to mount batteries which could cause havoc on the defensive system. It was therefore essential for each and every work of a fortified place to be clearly visible and supported by fire from other works behind and beside

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[176] *Ibid.*, f. 21 (*DI—linea ficcante o linea fissa della difesa*). See illustration 92.

[177] *Ibid.*, f. 21 (*OD—faccia del balluardo*).

[178] *Ibid.*, f. 21 (*EO—ala o fianco del balluardo*).

[179] *Ibid.*, f. 21 (*FH—complemento della cortina*).

[180] *Ibid.,* f. 21 (*IH—ala della cortina o pure secondo fianco*).

[181] *Ibid.*, f. 21 (*EI—cortina franca o pure cortina libera*).

[182] *Ibid.*, f. 21 (*DHE—angulo della difesa, che e' quello che sta opposto al fianco e si chiama pure angulo fatto dalla radente DH e dal complemento della cortina FH*).

[183] See chapter 2, nn. 92 (Fournier) and 81 (Bourdin) a.r.t.

[184] Cortis, Freller and Bugeja, *Melitensium Amor*, 179–184 (article on '*Boys will be Boys: the problem of the Novitiate in the Order of St. John in the late sixteenth and early seventeenth centuries*' by Ann Williams).

[185] BRCC, *Civ. Mss*. E. 63, f. 22.

it. In his second 'maxim'[186] the Jesuit explained that a regularly-shaped city-fortress was always superior to an irregularly-shaped one. Regularity ensured a predictable, uniformly-distributed and equally-matched defence effort, thus avoiding the dangers of having 'weaker' and 'stronger' sectors in a defensive system as had repeatedly happened in the case of irregularly-shaped city-fortresses. In his third 'maxim,'[187] Masò explained that a fortification based on a large number of bastions would always function better than a system having less bastions. An attacking force would then be continuously and simultaneously under fire from several elevated positions where a large number of musketeers and cannon could also be concentrated in case of need. The Jesuit's fourth 'maxim'[188] dealt with the need for progressively increasing the height of the various parts of the fortification as one approached the core of the city-fortress. This would ensure uninterrupted and supportive lines of fire from cannon and muskets. Still addressing sectional issues, the fifth 'maxim'[189] explained that the parts of the defensive system which were the furthest way from the main line of defence, should always be overlooked and covered by fire from other fortifications behind and beside them. If captured, they could then be easily swept by the artillery fire of the neighbouring defences. The Jesuit's sixth 'maxim'[190] dealt with the so-called fixed line of defence. According to Masò (and most of his contemporaries), this had to be calculated on the basis of the range of a normal musket and not of a cannon or "falconet."[191] At this point the Jesuit explicitly stated that he disagreed with the Jesuit-trained military theorist Antoine de Ville, who "having seen the Secretary of State of the Duke of Savoy hit by a musket shot in the vicinity of Savona from a distance of 500 paces", had in his book recommended an exaggerated dimension for the fixed line of defence.[192] Addressing the issue of the

[186] *Ibid.*, f. 22.
[187] *Ibid.*, f. 23.
[188] *Ibid.*, ff. 23–24.
[189] *Ibid.*, f. 24.
[190] *Ibid.*, f. 24.
[191] *Ibid.*, f. 24. Masò explains that the "normal" assumption for the minimum and maximum ranges of a musket was of 150–160 *passi* (60–65 *verghe*, 750–800 *piedi*, 600–650 *palmi*), roughly equivalent to 225–240m. According to Napoli, *Breve Trattato*, ff. 9–10 the ranges assumed by the Jesuits Chales, Zaragoza and Fournier were 730–852, 800–1000 and 1092 *piedi* respectively, while De Ville, Pagan and Medrano worked on ranges of 1092, 917 and 786–850 *piedi*. This implied fortification calculations based on assumed musket ranges of 235–328m. It is possible that Masò's conservative stance could have been prompted by the old-fashioned types of muskets that were then available in Malta.
[192] *Ibid.*, f. 24. De Ville, the author of a best seller entitled *Les fortifications du chevalier Antoine de Ville*, who once had his portrait painted by Artemisia Gentileschi, had studied

design of the bastion in his seventh 'maxim,'[193] the Jesuit maintained—with an air of authority—that the greater the length of the bastion flank and the width of the bastion neck, the better would be its performance in action, particularly so if the length of the said flank would approximate half the length of the bastion face so as to accommodate more defenders and cannon providing flanking fire. This 'maxim' supports the earlier argument that Masò was familiar with the fortification scenarios of the Spanish Netherlands since the Dutch generally favoured long, wide flank batteries as opposed to the Italian preference for concealment. Masò's eighth 'maxim'[194] focused on the issue of the 'second flank' located at both ends of the curtain walls, first mentioned by Antonio da Sangallo the Younger. The value of this second flank was in the mid-seventeenth century one of the most controversial and discussed issues in military architecture. Masò here tries hard to explain to his noble audience why the 'second flank' should, in his opinion, be as long as possible. It had to accommodate as many musketeers as possible and, besides, it had to act as a complementary continuation of the bastion flank. The Jesuit stressed that since the effective defence of a fortress very much depended on the efficiency of flanking fire, the design of the 'first' and 'second' flanks located in the bastions and the curtain walls called for profound thinking at the design stage.[195] Appreciating that the sharpness or bluntness of a bastion determined the amount of space within it and hence its ability to accommodate less or more musketeers and cannon, the Jesuit's ninth, tenth, eleventh and twelfth 'maxims'[196] all dealt with the recommended angles for the "salient point" of the bastion[197] (where the so-called *angolo difeso* should never be less 60º or more than 90º), the "angle of circumference"[198] (which should never be less than 90º), the "angle between the face and flank" of the bastion[199] (which should never be less than 105º) and the "angle between the flank of the bastion and the curtain wall"[200] (which should always be 90º so as to enable the bastion flanks to offer protection to the entire length of the curtain wall,

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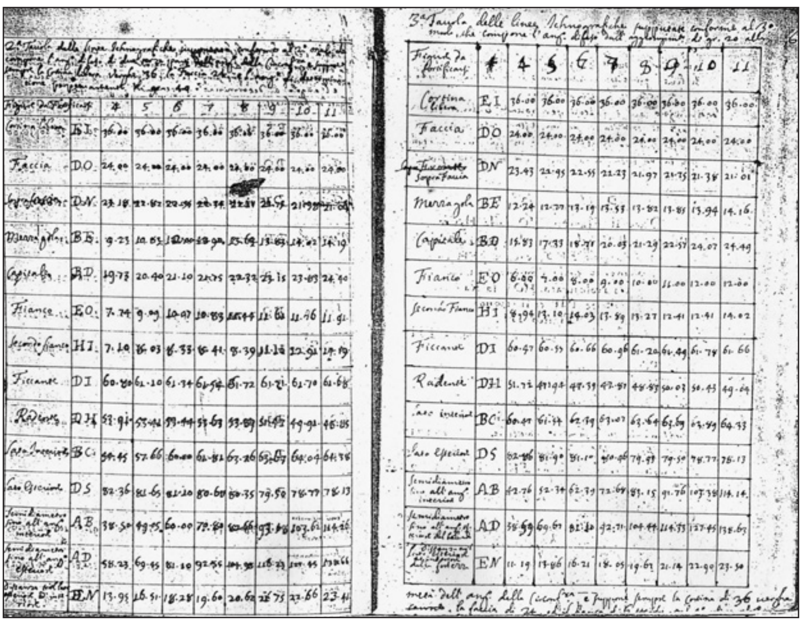
at the Jesuit college of Toulouse where he had reportedly been very critical of his philosophy professors.

193 *Ibid.*, f. 27.
194 *Ibid.*
195 *Ibid.*
196 *Ibid.*, ff. 27–28.
197 *Ibid.*, f. 28 (*L'angolo esteriore del balluardo cioè l'angolo difeso LDI*).
198 *Ibid.* (*L'angolo della circonferenza LBC*).
199 *Ibid.* (*L'angolo fatto dal fianco e dalla faccia DOE*).
200 *Ibid.* (*L'angolo fatto dal fianco e dalla cortina OEI*).

even at night). Masò's thirteenth 'maxim'[201] concerned the length of the bastion face. He explained that this should never be allowed to exceed the length of the curtain wall and certainly not be less than half that length, as specified by Matthias Dogen who in his 1647 work had managed to establish "an ideal 4:6 proportion". With regards to configuration issues, the Jesuit in his fourteenth and fifteenth 'maxims'[202] ruled out convex, staggered or fragmented bastion faces as well as convex, concave or fragmented curtains (such as those used by Bourdin in his *Escuela de Palas*[203] system) because, according to Masò, such fortifications could easily give rise to unprotected spaces. These voids could be easily recognised and exploited by a sharp enemy captain. In the sixteenth 'maxim,'[204] Masò further criticised the use of "broken curtains" by referring to their recent use in Amsterdam where they had proved to be ineffective. The Jesuit would probably have known that such systems had been first used in Italy by Antonio da Sangallo the Younger and afterwards promoted by Giovanni Battista Pelori, Girolamo Maggi, Pedro Brolini and Manuele Alvarez. As a final advice, Maso in his seventeenth 'maxim'[205] declared that bastions, "contrary to the suggestions of some military architects" should never be designed as detached works from the curtain walls. In the unfortunate event of their capture, such detached bastions could be more easily used with impunity against the rest of the fortifications. Besides, the Jesuit added that they would entail the time-consuming and costly construction of exposed bridges or underground tunnels to send reinforcements and artillery supplies.

One finds in Masò's treatise references to a number of fortifications intended to support his very strong views about the 60°–90° angle of defence discussed in the ninth 'maxim'. Among the fortified places mentioned, Masò includes the citadel of Capua, an unidentified citadel situated between Nice and Villefranche, the citadel of Antwerp, the S. Andrea Fortress and the town of Breda in the Spanish Netherlands, the citadel at Bergues in France, Fort St. Angelo in Rome and the citadels of Turin and Casale in Northern Italy, also the famous fortifications of Coevorden in the Protestant Netherlands. This city-fortress had been reconstructed in the early seventeenth century by Maurice of Nassau as a Palmanova-type ideal city having a radial street pattern, extensive outworks and a five-

201 *Ibid.*, f. 30.
202 *Ibid.*, ff. 30–31.
203 See chapter 3, n. 123 a.r.t.
204 BRCC, *Civ. Mss.* E. 63, f. 31.
205 *Ibid.*, f. 32.

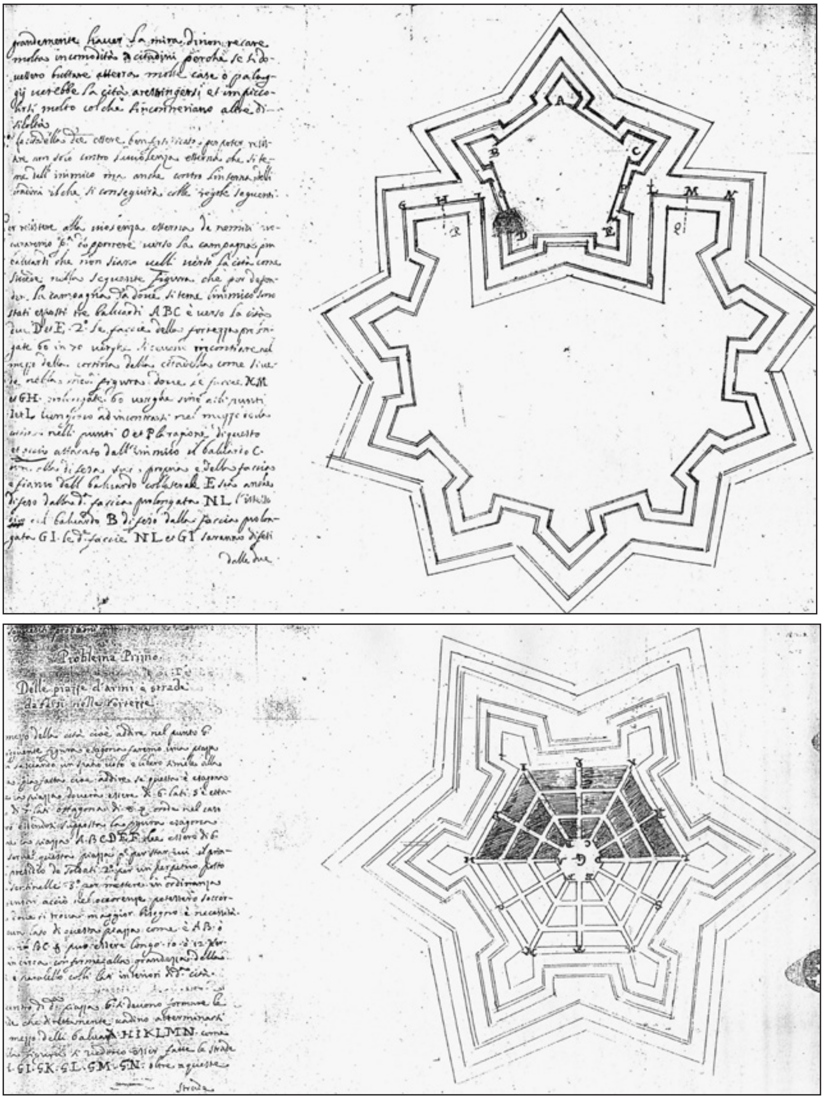


93. Tables of dimensional specifications corresponding to the first (top), the second and third (bottom) systems of fortification that Maso proposes in Part I of his *Architettura Militare* [BRCC, *Civ.Mss.*E.63]. Reproduced with the kind permission of the *Biblioteche Riunite Civica e A. Ursino Recupero* in Catania.

bastioned citadel. Among the prominent military architects mentioned by Masò, one finds the names of Matthias Dogen, Johann Wilhelm Dilich, Adam Freitag, Samuel Marolois, Pietro Sardi and Antoine de Ville. The Jesuit obviously had access to the books of these gentlemen while compiling his treatise in Malta since he often quoted the chapter and verse of their works when discussing solutions to his various 'problems'.

Additional evidence of a strong synergy is provided by the Jesuit's recommended figures of about 220–219–216m for the line of defence (corresponding to his 'first', 'second' and 'third' systems of fortification tabulated in folios 61–63 of his work). These dimensions can be compared to the *Escuela de Palas* dimensions given for the systems of Dogen (190m), Dilich (240m), Freitag (220m), Marolois (200m), Sardi (240m) and De Ville (270m). Masò also agreed with Dogen's contribution to the military architecture of early modern Europe when he encouraged the use of bastion flanks which met the curtain walls at right angles and when he promoted the lavish employment of low-lying Fausse-brayes to cover his dry ditches.[206] The Jesuit was also acquainted with the systems of fortification design promoted by Dilich in the 1640's.[207] In his first system, Dilich had demonstrated a similar geometric precision in the use of enlarged ravelins carefully aligned with the intersecting points of the bastion flanks and the curtain walls. In his second system, Dilich had used an unusual star-shaped tenailled pattern. Masò was also aware of Freitag's work of the 1630's since he considered the latter's work to be a model of good fortification design where spacious bastions were employed having flanks which met the curtain walls at right angles. In Freitag's work, the lines of defence divided the same curtain walls into three parts thus creating the type of formidable 'second flanks' favoured by Masò, complete with fausse-brayes, ravelins (in front of the curtain walls) and demilunes (in front of the bastions).[208] Such points of rapport suggest that Freitag would have provided a main source of inspiration for Masò's three fortification systems. The Jesuit was also influenced by the slightly earlier works of Marolois (1613)[209] and Sardi (1618).[210] Marolois had advocated the use of recessed and casemated bastion flanks which met the curtain walls at right angles at the same time stressing the importance of fausse-brayes beneath all the curtain walls, bastion faces and non-recessed parts of the

206 Fara, *Sistema e Città*, 119. See also BNE, *Escuela de Palas*, II, 48–51 (Dogen).
207 *Ibid.*, 184–185. See also BNE, *Escuela de Pala*s, II, 122–123 (Dilich).
208 *Ibid.*, 183. See also BNE, *Escuela de Palas*, II, 40–47 (Freitag).
209 *Ibid.*, 180. See also BNE, *Escuela de Palas*, II, 36–39 (Marolois).
210 *Ibid.*, 181. See also BNE, *Escuela de Palas*, II, 32–33 (Sardi).



94. Extracts from Part IV of the *Architettura Militare* treatise illustrating Maso's classroom explanations concerning citadels (top) and fortification-town planning relationships (bottom) [BRCC, *Civ.Mss.*E.63]. Reproduced with the kind permission of the *Biblioteche Riunite Civica e A. Ursino Recupero* in Catania.

bastion flanks. Sardi had promoted the use of a five-sided polygon with radial streets running from behind all the bastions and high cavaliers centrally situated behind each curtain wall, to create a Palmanova-Coevorden situation. There was then the influence of the Frenchman De Ville whose 1628 work[211] revealed the evolution of a very influential system of military architecture inspired by Italian contemporary work (*metodo italiano migliorato*). Like Masò, De Ville had used elegant right angled bastions, with the right angle principle also being applied to the joint of the bastion flanks with the curtain wall—complete with an elaborate system of casemates to provide a barrage of added musket and cannon fire from different levels. So well known to Masò was De Ville that on folio 97 of his treatise, the Jesuit reproduced a drawing of a fortified front with three large bastions which was very similar to a drawing in perspective from the French military architect's work.[212] Another synergy observation concerns the computation tables which appear on folios 47, 48 and 49 of Masò's manuscript. These specify the angles to be used in three "best" systems of fortification (*Primo, Secondo e Terzo modo di fortificare*). On folios 61, 62 and 63 this information is 'translated' into linear measurements as also happens in the work of Milliet de Chales.[213] Do such similar approaches suggest a shared fortification knowledge in the Jesuit mathematical world (which was—for obvious reasons—never really advertised or even made public) or was it a case of simply copying? It may be significant in this respect that the work of Masò differs from that of Chales and other Jesuit military writings in that it was not introduced by the usual discussion of moral issues, leaving all references to the 'just war theory' to the last part concerning offensive operations.[214] It is a reflection of his independent mind that even here Masò boldly argued that such issues would be better discussed by "politicians and statesmen" who often violently disagreed on this subject.[215] Written in a way which makes it difficult to understand whether this was a tongue-in-cheek or conciliatory gesture towards his superiors in Rome, Masò stated on page 328 that any war was completely unjustified unless it was waged for "the sole defence of the true Catholic Faith."[216]

211 *Ibid.*, 182–183. See also BNE, *Escuela de Palas*, II, 56–59 (De Ville).
212 *Ibid.*, 183.
213 BNE, *Escuela de Palas*, II, 118–119 (Chales).
214 BRCC, *Civ. Mss.* E. 63, ff. 327–328.
215 *Ibid.*, f. 327.
216 *Ibid.*, f. 328.

Another point of interest in the Masò treatise concerned the design of the controversial fortification, very popular in the Spanish world, called the fausse-braye.This was discussed by the Jesuit in Part II, Chapter 3, 'Problems' 1–3 of his treatise. Like Zaragoza, Masò attached great importance to this component for the defence of the curtain walls of a city-fortress. Relating the ideal width of the fausse-braye to the type of polygonal fortification it was protecting (10 *piedi* width for a four-sided polygon, 12.5 *piedi* for a five or six-sided polygon, 14.5 *piedi* for a seven-sided polygon and 17.5 *piedi* for an eight or nine-sided polygon),[217] the Jesuit explained that the determination of this width dimension was of great importance to enable the defenders to continue using the fausse-braye despite the presence of accumulated rubble caused by enemy bombardment. Demonstrating an acute awareness of current controversies concerning the positioning and ditch-to-floor height of the fausse-braye, Masò could here be seen explaining to his students how some military architects would opt for a height that would enable men with muskets to direct their fire onto the covered way while others would opt for a reduced height that would focus on the defence of the ditch. Masò, with an air of great authority, opted for the latter solution since, he told his students, "the scope of the fausse-braye is not to defend the external works but only the ditch which it would not be able to fulfil if built too high."[218]

Masò treatise also dealt with the burning issue of the dry *versus* the wet ditch, often a source of debate in reports on the fortification of Malta submitted by the military experts of the Knights of Malta. This subject was discussed by the Jesuit in Part II, Chapter 4, 'Problem' 1 of his work. Treating the controversy as "a still undecided issue among military theorists,"[219] with some theorists promoting "a dry ditch in times of peace and a wet ditch in times of war,"[220] Masò clearly favoured a dry ditch. This, according to him, facilitated sorties and orderly retreats by the defenders. It also facilitated the rapid removal of any accumulated rubble caused by falling masonry and the destruction by fire of any "fascines" which could be thrown into the ditch by the enemy. Besides, it prevented the crossing of the ditch in frost conditions as well as all those diseases and unpleasant odours normally associated with stagnant water. According to Masò all these dry ditch advantages had to be carefully weighed against the only two advantages of a wet ditch—to delay sudden

[217] *Ibid.*, f. 99.
[218] *Ibid.*, f. 100.
[219] *Ibid.*, f. 101.
[220] *Ibid.*, f. 101.

attacks and deter undermining action. The Jesuit gave width and depth dimensions for dry ditches related to different types of polygonal fortifications (60 *piedi* width and 8.3 *piedi* depth for a four-sided polygon; 70 and 8.3 for a five-sided polygon; 80 and 8.3 for a six-sided polygon; 90 and 10 for a seven-sided polygon; 100 and 10 for an eight-sided polygon and 110 and 10 for a nine-sided polygon, all the width dimensions respectively diminishing to 48.9, 58.9, 68.9, 77, 87 and 97 *piedi* at the base of the ditch).[221] Masò also seems to have enlightened his audience about the utility of the fashionable water-filled 'cunette', an additional excavation positioned in the centre of the ditch.[222] This feature had the specific function of delaying the enemy by creating a barrier which divided the ditch into two parts. If excavated deep enough (as specified in the table reproduced on folio 109), the cunette could also expose enemy mining operations.

In Part II, Chapter 5 and Part III, Chapters 1–8 of his treatise, Masò gives guidelines for the building of the covered way and the glacis, the ravelin, the demilune, hornworks and crownworks, the tenaille, the traverse, the cavalier and casemates. With regards to covered ways, Masò in a table on folio 111, gave a range of widths starting from 10 *piedi* in the case of a four-sided polygonal fortress to 17.5 *piedi* in the case of a nine-sided shape,[223] applying a similar approach on folio 115 of 57.5 *piedi* for the glacis of a four-sided polygonal fortress to 65.8 *piedi* for that of a nine-sided shape. The different widths that are specified by the Jesuit presumably reflect the different garrison strengths and hence the number of defenders likely to be using the covered ways. Masò also stresses the importance of positioning redoubts in those parts of the covered way directly in front of the curtain walls. These features could conveniently double up as places-of-arms for the deployment of troops in preparation of sortie actions. At this point, Masò criticised the "totally useless" practice of using cunettes at the base of the glacis stating that they "would impede sorties" and "provide shelter" for assaulting troops.[224] With regards to ravelins, he specified that the salient angle should not be less than 60° and not more than 90° and that the ravelin faces had to be within range of musket fire from the sides of the curtain wall (which also had to be positioned symmetrically behind it to ensure a balanced supportive fire from the bastion faces). At this stage, Masò would have provoked a lively discussion on the defensive merits of ravelins that were built with or without flanks, quoting several

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221 *Ibid.*, ff. 105–108.
222 *Ibid.*, f. 109.
223 *Ibid.*, f. 111.
224 *Ibid.*, f. 117.

authors in this respect. Passing on to discuss demilunes, the Jesuit mentioned four applicable 'maxims'. The first was that the salient angle should not be less than 60° and not more that 90°. The second was that the demilune would have to be positioned with great care along the same capital line or "*linea capitale*" applicable to the bastion behind it. The third was that the demilune had to be preferably built without flanks. The fourth was that the demilune would have to be sufficiently but not excessively distanced from the bastion. Referring to hornworks and crownworks, Masò wrote that the maximum length of the projecting works called "*opere à corni*" should never exceed the range of a musket and that the salient angles of the two demi-bastions at the ends should remain within the 60°–90° limit. These works, Masò continued, had to be carefully sited at places dictated by the nature of the terrain which would also determine—in the case of crownworks—whether such "*opere coronate*" would be of the "single" or "composite" type.[225] With regards the tenailles, traverses, cavaliers and casemates, the Jesuit gave several guidelines based on geometrical considerations, reserving his most interesting discussion for the cavaliers. Was he here influenced by the two gigantic cavaliers of St. James and St. John dominating the Valletta landfront, a stone's throw away from the Jesuit college where he was teaching? Contradicting conventional thinking that was in the 1650's expressing serious doubts about the usefulness of these elevated works,[226] Masò insisted on their value to hit out at the countryside approaches. Cavaliers, according to him, were also useful to dominate the enemy trenches and batteries and to protect the uphill approaches of the glacis, making them a valuable deterrent that could act quite independently of the lower bastions and curtain walls of a polygonal fortress. Possibly drawing inspiration from the works of Tartaglia, Zanchi, Cataneo, Alghizi da Carpi, Pasino, della Rovere, Lorini, Buontalenti and Sardi, (most of whom, however, he does not mention by name),[227] Masò ventured to suggest that the independent function of cavaliers in siege conditions should be even visually stressed by the adop-

[225] *Ibid.*, ff. 154–161. The two types of crownworks are discussed by Masò under the headings: '*Problema 3°—Del modo di fabricare opere coronate semplici' and 'Problema 4°—Per formare l'opere coronate doppie o com'altri dicono, composte*'.

[226] Contemporary scepticism about using cavaliers is explicitly mentioned by Masò in f. 178: "*Il luogo dove si devono situare e stato assai controverso appr. i più periti ingenieri*", this explaining his lengthy discussion about them in ff. 177–180.

[227] Fara, *Sistema e Città*, 164–165 (Tartaglia), 162–163 (Zanchi); 165–166 (Cataneo), 168–169 (Alghizi), 170–171 (Pasino), 159 (Della Rovere), 174–175 (Lorini), 171–172 (Buontalenti) and 181 (Sardi).

tion of circular or oval forms. They had to be raised at least 15 *piedi* above the rest of the fortifications and contain five-six cannon pieces to offer an impressive barrage of cannonball fire on enemy installations in the surrounding countryside. Lorini and Buontalenti had once proposed curved and oval cavaliers in their systems.[228] One wonders whether Masò was inspired by the work of the mentioned military architects or whether his idea of using rounded cavaliers was the product of his independent mind. Cavaliers constituted the most exposed elements of a fortified landfront, and it could be that curved forms would also have been preferred by Masò because of their ability to deflect shot.

One indication of the high quality of teaching provided by Giacomo Masò to the young Knights enrolled in his Valletta academy, consists in the methodical and very precise manner in which he would have explained the mathematical procedures involved in the design of regularly-shaped fortifications in plan and in section, as discussed in Part III, Chapter 9 of his treatise. The design process that he would have explained started off with a basic assumption concerning the shape of fortification desired. This depended on the number of bastions allowed by the available budget and the urgency or otherwise of the building operation. At this point Masò would have opted for a "ideal" hexagonal fortress and would have told his students that once a shape decision had been reached, reference would now have to be made to the appropriate table (shown in illustration 91) entitled *Tavola delle linee Ichnografiche al primo modo* where the pre-worked out dimensions (in *verghe*) of the different parts of the Jesuit's 'first system' of fortification could be seen.[229] From this table, one could then choose the basic radial dimension and, using a simple compass, draw the circle corresponding to it. The circumference of this circle, Masò would have continued explaining, would now have to be divided into as many parts as determined by the number of bastions—six in the case of the Jesuit's chosen hexagonal fortress. The process was henceforth simple. The different 'bastion' points in the circumference would firstly be joined to create the six long curtains (*cortine longhe*). At each point, the dimensions of the demigorge (*mezzagola*)—extracted

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228 *Ibid.*, 174–175 and 171–172

229 BRCC, *Civ. Mss.* E. 63, f. 61. Masò used four units of measurement in his treatise: the *Verga* (c.3.60m), the *Passo* (c.1.5m), the *Piede* (c.0.30m) and the *Palma* (c.0.36m). According to BNE, *Escuela de Palas*, II, 4, the *Verga* which was "mainly used in the Netherlands and Germany", consisted of 12 *piedi* and the *Passo* consisted of 5 *piedi*—it is indicative of the Dutch influence on the Jesuit's three fortification systems that Masò used the *verga* and *piede* as his preferred units of measurement, as did Dogen, Dilich, Freitag and Marolois.

from the table—would then be marked to produce the six actual curtain walls (*cortine libere*), each of 36 *verghe*. From the extremities of two curtain walls, perpendicular lines of 21.61 *verghe* would then be drawn, this to be followed by again using the compass to determine the bastion faces of 24 *verghe*, as deducted from the same table. This simple procedure, Masò would have explained, would then be repeated for the five remaining bastions. The dimensions of 'second flanks' could also be determined by prolonging the lines of the two faces of each bastion to meet the curtain wall. By using the table on folio 120, one could extend this mathematical procedure to determine the position and dimensions of all the desired outworks as well as a sectional drawing as shown in the illustration on folio 204.[230]

Three particularly interesting debates with which Masò would have surely "entertained" his students in Malta in 1655–1656 would have concerned the subject of citadels, the upgrading of Medieval fortifications and the military aspects of town planning, all dealt with in Part IV, Chapters 5, 7 and 8 of his treatise.

With regards to citadels, Masò, defined their function as that of acting as a last refuge for the citizens of the town in times of war[231] but also, given *inter alia* the harshness of the Spanish occupations in the Netherlands and in Northern Italy, that of ensuring the safety of an unpopular prince or governor who could take up residence with a picked garrison of bodyguards in the citadel as a safeguard against a popular uprising, as was the case in Antwerp, Turin and Milan. Such secure positions would also have to adhere to certain 'maxims'. They had to be built on the strongest site of the city—ideally on rocky elevated territory to ensure a position of dominance and avoid the possibility of undermining. They would preferably have to control or be integrated with the main gateway of the city. They would have to be strategically located with respect to any rivers or ports likely to be penetrated by a potential attacker. They would need to have two gateway connections—one with the city to allow the help of the citizens in the case of an attack by a common enemy and one with the outside so as to enable rapid evacuation but also to admit reinforcements in the case of a popular uprising. The size of the citadel would have to take into consideration the number of houses that would have to be demolished to avoid the unpleasant result of slum-

230 Masò's systematic explanations about fortification building can be compared to Zaragoza's *Construccion XXVIII* in BNE, *Escuela de Palas*, II, 96–99.

231 See n. 171 and illustration 94.

type residences (which would pose a health and moral hazard), as was happening, Masò may have added, in Valletta at the time. The fortification of the citadel would also have to be devised in such a way as to offer maximum protection from both internal and external assault, this determining all decisions taken with regards to the positioning of its bastions in relation to the fortifications of the city. An important provision in this respect was to remove the flanks from the city bastions closest to the citadel so as to expose them to sweeping fire from the citadel defences from where the muskets and cannons of the garrison could wreak havoc on any rebels occupying these bastions. Masò finally advised his audience to ensure a high level of accuracy in planning citadels because of the severe restrictions posed by the existing contents—sometimes very old—of the urban fabric, this consideration contrasting sharply with the bulldozing attitudes of many military engineers of the time!

Referring to old cities surrounded by Medieval fortifications,[232] particularly susceptible to "the most violent force of artillery",[233] Masò explained that five categories would have to be studied. These were old cities surrounded by a single weak wall; those surrounded by a single wall stiffened with round towers; those situated on elevated or mountainous terrain; those isolated on islands in the middle of rivers or out at sea and those cities situated at the water edge. With regards to the first type, Masò explained that it was never advisable to reinforce these type of cities from the inside since this would entail not only a costly and dangerous exercise of dismantling old unstable walls but also further restrict the available housing space of that town. In this case of such weak cities, the Jesuit advocated a strategy of external additions, sometimes stiffened by raised cavaliers, of the type employed in many old Italian cities like Lucca where the aim of the military architect responsible for such an operation would have been to try and transform the 'irregular' shapes of the Medieval walls into the 'regular shapes' associated with the ideals of early modern Europe. Masò seems to have at this point explained to his students that one way of bringing about this transformation, was to have several traces of regularly-shaped artillery fortresses drawn on transparent paper which he calls "*carte sottilissime e transparenti*"[234] placed on top of the irregularly-shaped plans of the older fortifications drawn to the same scale, so as then to compare the various options that were available. For old cities

[232] See n. 172.
[233] BRCC, *Civ.Mss*. E. 63, f. 292.
[234] *Ibid*., f. 294.

protected by large round towers, Masò explained the dangers of these features in providing 'sheltered' areas for potential aggressors, necessitating the introduction of bastions, ditch widenings and outworks to properly defend such outdated positions. Old cities situated on elevated or mountainous terrain, according to the Jesuit, presented an even more difficult problem if they happened to be overlooked by higher ground where a shrewd enemy could mount batteries besides creating further havoc by undermining operations. Perhaps bringing to mind the example provided by the Medieval citadel of Gozo, Masò would have at this point told his students that two options were here available to them—either destroying the place to prevent it from falling into the hands of the enemy or reinforcing it with high massive cavaliers and deep trenches at the base to interrupt any enemy undermining action, even perhaps constructing fortifications of crownwork form on the surrounding hills to prevent them from being occupied by the enemy. With regards to old walled cities on small islands, any decision to strengthen their vertical walls with bastions and terraplein type fortifications depended on whether or not they were within range of cannon fire from the neighbouring *terra ferma*. In the case of cities built on waterfronts, Masò explained that the principal role of the military architect was to control all sea access routes by building adequate new fortifications at the critical entry points of the port, taking particular care to create a powerful landfront in front of any older fortifications.[235]

The relationship of fortification systems and town planning[236] was one of the last topics discussed by Masò in Part IV of his treatise. Although born in a land which was dominated by Spanish town planning attitudes based on the orthogonal block-platting system of the Carlentini type near Syracuse, the Jesuit only chose to discuss the type of ideal planning that had been used in model cities like Palmanova and Coevorden which were both mentioned in his lectures. The reason for this preference was explicitly explained in military terms in eighth chapter of Part IV of his work where the Jesuit argued that since the city bastions would have to bear the brunt of enemy battery fire and undermining operations during a siege, it was vital to "universally" introduce a type of town plan that could prioritise the movement of troops and artillery along a straight route. This would have to be devised in such a way so as to enable reinforcements to reach all the bastions directly and in the shortest possible time from a

[235] Malta provided cases of this situation for which see De Lucca, *Vertova*, 11–18.
[236] See n. 173.

centrally-placed square where they could be easily deployed in an emergency. Since there could also be the need to rush troops to any threatened city gates and outworks, it would also be important, continued Masò, to plan additional radial streets that would directly connect the gateways to the central square. Considered in this perspective of radial connecting streets, the major military spaces of a town would be the central square or "*piazza d'armi*" and a spacious peripheral street 3–4 *verghe* wide—equated with the ancient Roman "*pomerium*"—linking bastions, curtain walls and cavaliers together. An interesting comment was the Jesuit's relegation to secondary status of possible intermediary squares of "no military value" introduced "for the better commodity of the citizens of the town". Renaissance ideas about town planning seem to have been still vivid in the Jesuit's mind and radial towns also formed one of the main items of discussion at the Jesuit college of Clermont in Paris.[237] Masò concluded his exposition on town planning by giving a detailed exposition on the construction of access bridges and the building of gunpowder magazines, adding comments about the use of different types of facing materials in terraplein-type "modern" fortifications.

The final part of Maso`s treatise concerned offensive military architecture—*Dell'Architettura Militare Offensiva*, only permissible according to the Jesuit, for the defence of "the true Catholic Faith".[238] Within this context, one of the more interesting aspects of the Jesuit's discussion on offensive military architecture, beyond an intriguing comment concerning the employment of the occult ("*occulta*")[239]—which he refuses to discuss to presumably avoid the wrath of his superiors—was a discussion about the logistic problems encountered during the 5 July 1601—16 September 1604 siege of Ostend by General Ambrosio Spinola, described by contemporary witnesses as a long "Carnival of Death." Masò also provides labelled plans of military camps and a drawing depicting an irregular system of trenches, redoubts, batteries, tunnels and underground chambers filled with explosive gunpowder,[240] to be adopted in the assault of one of the bastions of a city-fortress, evoking a similar drawing on seventeenth-century siege operations found in the later 1669 work of the

[237] BNF, *Ms.Lat.*17862, ff. 293–359. Bourdin, unlike Masò, also dealt with orthogonal models of town planning, anticipating the design of the 1663 fortress of Neuhaussel in Hungary where a hexagonal bastioned enciente enclosed a town of gridiron streets focused on a spacious deployment space containing the quarters of the military governor.

[238] See n. 154.

[239] BRCC. *Civ. Mss.* E. 63, f. 325.

[240] *Ibid.*, f. 377.

Jesuit *mathematicus* Tacquet. It is indeed fascinating, in this pre-Vauban *Triomphe de la Methode* context, to see Masò abruptly concluding this manual of offensive military architecture with words of gratitude to the Divine Lord for having given him this unique opportunity of preparing a manuscript which was written, according to him, with a "consecrated pen", for the sole use of the Knights of that most illustrious Religion (of Malta). He requested them to accept "this humble gift from the heart" which resulted from his "little ability but great affection towards them."[241]

Giacomo's Tragic Death in Sicily—A Case of Inner Personal Conflicts?

It has already been explained in the beginning of this work how Clavius, whose name Masò often mentioned with great respect in his lectures to the Knights of Malta,[242] had succeeded in raising the status of Jesuit mathematics in the early Baroque age. He had done this by obtaining clearance from his Order to incorporate the mathematical disciplines in the second year of the philosophy course for Jesuit scholastics and by assigning a specialised Jesuit professor to handle mathematical teaching. Clavius had also managed to entrench all these initiatives in the 1599 *Ratio Studiorum* for universal and uniform application in all Jesuit-run teaching institutions.[243] This integration of the mathematical disciplines in the traditional courses of natural philosophy perhaps represented one of the most important unsung achievements of the so-called 'Scientific Revolution' of early modern Europe.

The interest of several Jesuits in mathematical studies unleashed by Clavius had tended to create grave problems of conscience for Jesuit mathematicians, especially for those who focused their teaching careers on astrological or military matters.[244] Evidence for this is provided by a 1681 letter from the Jesuit general Oliva to the Jesuit *mathematicus* Alias.[245] In a couple of sentences, this letter refers to the military part of the mathematical disciplines—"*quella parte che riguarda il militare*"—that had

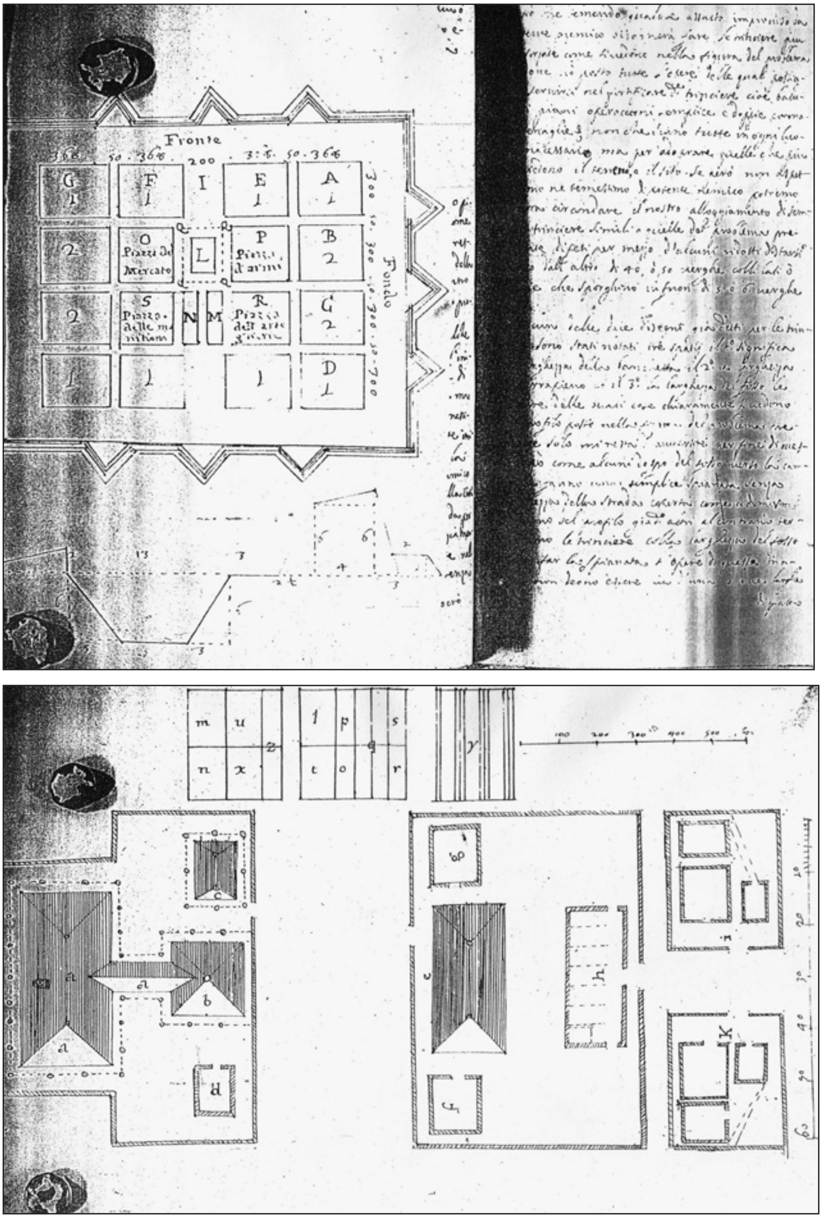
[241] *Ibid.*, f. 377: "*Lascio perciò di ragionare qui finendo solamente per rendere le dovute gratie alla infinita bontà Divina d'havermi fatto ridarle la fine questa mia fattica in servitio de' Cavalieri dell' ilrma Religione Hierosolmitana a quale consacrando la penna il cuore supplico ad accettarla come dono il pover ingegno ma ricco d'affetto*"

[242] See n. 142 a.r.t.

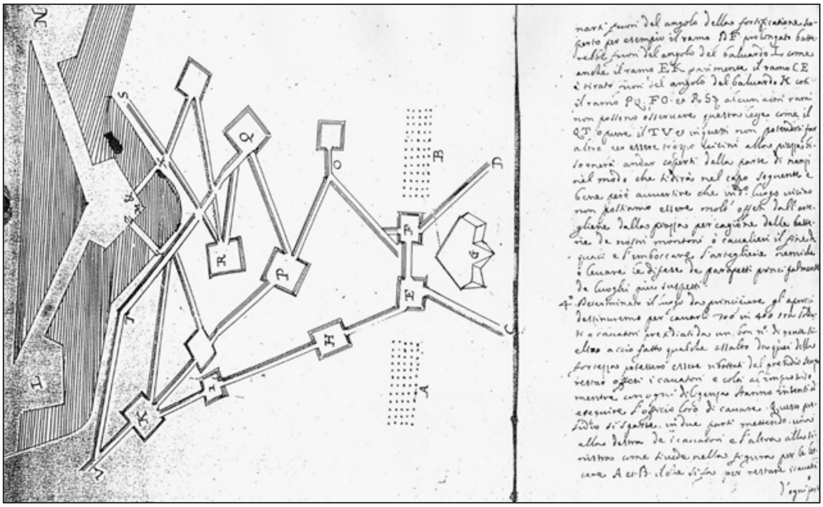
[243] See n. 62 a.r.t.

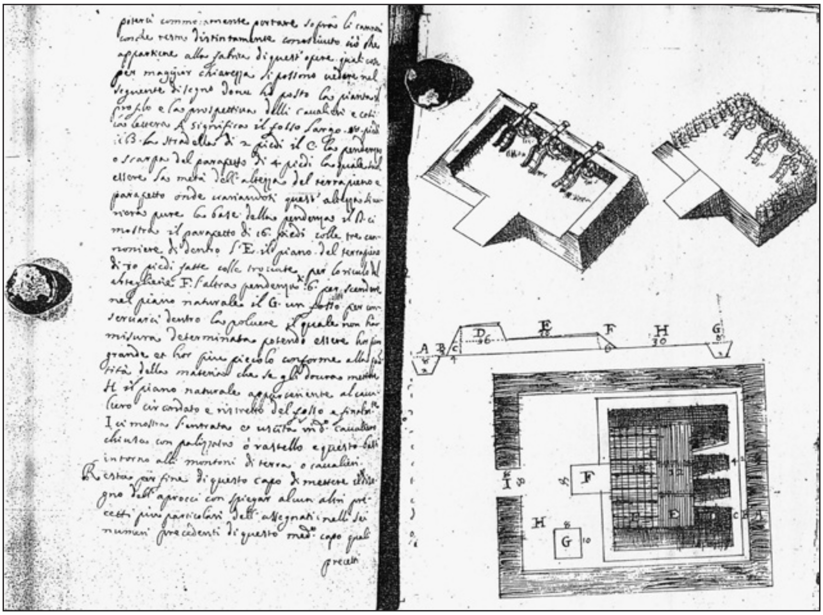
[244] Bruycher, *Matter of Opportunities?*, no pagination.

[245] ARSI, *Sic.*23 (II), *Epist.Gen.* (11-08-1681) f. 452 (Oliva to Alias).



95. Extracts from Part IV of the *Architettura Militare* treatise showing layout of a fortified military camp (top) and details of the quarters (bottom) of the captain-general, the general of artillery and the other high-ranking officers [BRCC, *Civ.Mss.*E.63]. Reproduced with the kind permission of the *Biblioteche Riunite Civica e A. Ursino Recupero* in Catania.





96. Extracts from Part V of the *Architettura Militare* treatise showing oblique approach trenches (top) and assault batteries (bottom) used during offensive operations "for the defence of the Catholic religion" [BRCC, *Civ.Mss.*E.63]. Reproduced with the kind permission of the *Biblioteche Riunite Civica e A. Ursino Recupero* in Catania.

caused numerous problems to Jesuit professors teaching this subject who were, as a result, forced to refrain from teaching fortifications—"*cessan corti le difficolta per le quali altrove i nostri lettori di matematica si debbono astenere dal trattato della fortificatione*". There seems to have been some sensitive issues involved here.

There was, in the first place, a conflict of interest between the elaborate administrative mechanism of the Jesuit *generalizia* in Rome on one hand and the individual Jesuit *mathematicus* on the other. The former was always vigilant to prevent Jesuits from applying their mathematical skills for goals that could be perceived as lying outside the agenda of Ignatius' Constitutions (this because of a great fear that by doing so the entire Jesuit Order could be easily put in a bad light by its many detractors). The latter was always eager to communicate mathematical knowledge to willing audiences despite censure from Rome—sometimes even ready to assume positions and receive royal appointments to please the people that mattered, as had happened with Jan Ciermans in Portugal.[246] There was, secondly, an issue of inner psychological conflict which went beyond the above-described spirit of resistance against the impositions of Rome. This happened when Jesuit mathematicians who had a passion for military geometry would have unexpectedly found themselves caught between their original 'religious vocation' (compounded by their oath of obedience towards their superiors as incorporated in their final vows) and their 'mathematical vocation' which they would have become conscious of while attending the obligatory mathematical classes during their training for the priesthood.

Matters tended to reach a climax when these Jesuits mathematicians would have at some point realised that the new horizons which would have been opened up to them as a result of their newly-acquired knowledge of military applications, could be perceived as going against the '*Ad Maiorem Dei Gloriam*' motto of their Order.[247] Ciermans, to quote one example of such tensions, could not justify his stance as a colonel of the Portuguese army in any way since the parties at war both happened to be Catholic states, one of them being the birth country of Ignatius. On the other hand, Masò, spending his last years in Syracuse in an unholy way as narrated by

[246] See chapter 2, n. 137 a.r.t.

[247] Feingold, *Science as a calling?*, 79–119 writes that the psychological conflicts of Jesuits having a mathematical vocation also occurred among Protestant clergymen. He cites the case of pastor John Pell who in the 1630's refused a benefice, "having made the mathematics his main studie".

Aguilera,[248] seems to have developed a similar psychological conflict for much less. In his case, there was some justification for teaching the Knights about fortifications, since their military Order was universally perceived to be, since the Crusades, in a perpetual state of warfare against Islam. One can only suspect that in this Jesuit's case, things would have worsened considerably because after successfully leaving the Jesuit Order, he still nursed a conscience crisis because of his priesthood. This would have prevented him from returning to Malta to teach and practice military architecture and led him, as a result, to lead a very frustrated life as a libertine, "a wanton life in great affluence",[249] resulting in the alleged tragic happenings during the refurbishing operations at his Megara home where he targeted his sense of frustration, failure and anger on the Virgin Mary, symbolising perhaps, according to psychiatric interpretation,[250] the figure of a deceased mother who may have been so insistent on her son to join the Jesuits and go to Rome to learn his favourite subject from the great Athanasius Kircher.

One would here venture to ask—Did the young Masò on joining the Jesuits, really want to take up a religious vocation? The arguments that he forwarded in 1663 when he first tried to leave the Jesuit Order[251] could suggest that his was really a case of a wrong vocation at the best or alternatively crass opportunism at the worst. What he would not have realised at a tender age was that he was about to plunge into a number of identity conflicts that would very much disturb him in his later life—causing the type of psychological stress and tensions that are still experienced by some Jesuit novices today who would have found themselves in similar situations of wrong vocational decisions. Like many other Jesuit mathematicians who had decided to focus their attention on dangerous terrain such as *De re militari*, Masò would have woken up one morning in his *Collegium Melitense* room overlooking the splendid fortifications of the Grand Harbour to suddenly realise that he had a grave problem of identity—a conflict between his identity as a member of a Religious Order meant to preach the word of God, his identity as a 'mathematician' meant to avoid controversial material related to what Leonardo da Vinci once called "*una pazzia bestialissima*",[252] his identity as a 'scholar' meant to

[248] See n. 1 a.r.t.

[249] *Ibid*.

[250] I have discussed this matter in depth with my colleagues psychologist Professor Mark Borg and psychiatrist Dr Peter Muscat of the University of Malta.

[251] Aguilera, *Provinciae Siculae*, 829–831 supported by primary source research in ARSI.

[252] Mac Curdy, *Leonardo da Vinci*, 806.

write books which would not have to go through the sieve of Jesuit censorship and his identity as a 'consultant' meant to advise Grand Master Lascaris on countermine operations designed to blow up any infidel who might dare to approach the fortifications of the Knights. In the case of some military-orientated Jesuits like Faille, Fournier, Camassa, Eschinardi, or even Verbiest in far off China, their strong personalities would have enabled them to satisfactorily resolve such identity issues but in the case of other Jesuits like Ciermans and Masò, their rebellious characters would have caused them abandon their Jesuit spiritual mission in preference for more mundane pursuits which could earn them favour and even cash rewards (Ciermans was awarded a handsome salary of 600 ducats a month for his military services).[253]

Masò emerges in this context as a weak personality unable to resolve his identity crisis perhaps because a religious way of life had not really ever attracted him but also because both the Italian Princes, the Grand Master of Malta and the Viceroy of Spain in Palermo had never offered him the type of appointment and financial rewards that had been offered to Ciermans in Portugal. For some undisclosed reason, Masò was never again involved in teaching military geometry to the Knights of Malta after his departure from the Island in 1658 and it is significant that the new Spanish Grand Master Martin de Redin did not mention anything about his military contribution in two letters that he wrote to him on 15 July and 28 August 1660,[254] despite the praise that had been heaped on him by the Knight Arias y Porres.[255] The greatest irony of his tragic life after leaving the Jesuit Order in 1664 to take up the role of parish priest of S. Tommaso in Syracuse would have happened just one year before his death in 1674. He would have then been an eyewitness of all the preparations that were then being made by the Flemish military engineer Don Carlos de Grunenberg for installing a massive hornwork fortification that he had designed on the orders of Viceroy Claudio Lamoraldo de Ligne, to protect Syracuse from an impending spree of local insurrections against Spanish

253 According to Ceyssens, *Jansénius*, 571 cited by Angelo de Bruycher, there is a 1648 letter from Adrian Crom SJ to Francois de Cleyn SJ mentioning "*De Patre Ciermans liberato et fortificationibus regis praefecto* (*cum honorario*) *non 16* (*ut Reverentia Vostra scribit*) *sed 160 ducatorum in mensis singulos, scripsit quoque Patre Bivero*".

254 NLM, AOM 1436, ff. 78 and 119.

255 NLM, *Libr.* Bc. b. 38, f. 4r: "*E qui l'ha traporto, ovestà fissò un perpetuo capocentro i nemici di Christo, fatto hà finalmente, che questa sua Religione dia non più soldati ma Capitani alla Chiesa con tanto maggior guadagno, quanto è di più gloria, o di più travaglio formar capi che membri*".

rule that had already broken out at Messina, Trapani and other places with the collusion of foreign powers having an interest in the central Mediterranean area, particularly France.[256] Masò's frustration in seeing Grunenbergh direct the new fortification works would surely have intensified had he lived long enough to see this military architect depart for Malta in 1681, 1687 and again in 1689 to there add several low-lying batteries at Fort St. Angelo.[257] Was the sight of the new fortifications of Syracuse perhaps the reason, or one of the reasons, for his frustration which he would have vented on the image of the Virgin Mary?

Antonella Romano has suggested that in so far as mathematical education was concerned, the Jesuits could not be perceived as a monolithic Order, particularly so since many Jesuits focusing on dangerous aspects of the mathematical disciplines were operating in diverse political and social climates that would have put different pressures on them, this leading them to 'accommodate' such demands and handling their inevitable conflicts of conscience in different ways.[258] Masò—operating in the secure academic environment of Athanasius Kircher's academy of mathematics at the *Collegio Romano,* then in the Valletta and Palermo colleges of the *Provincia Sicula* and finally in the tranquil parish of S. Tommaso in Syracuse—provided ample proof that Jesuit mathematicians were really individualists always ready to accommodate to the best of their abilities such diverse socio-political demands. The tragic death of Masò at the age of forty-eight years would have been caused by an accumulation of psychological problems which seem to have been hinged on his dedication to those dangerous parts of mathematical knowledge that concerned the stars and fortifications, problems that can be summarised as follows:

Firstly, there seems to have been in his case a psychological problem caused by a wrong vocational decision. Had he been motivated to join the Jesuit Order on 26 December 1641 by his mother for family prestige or even, perhaps, to eliminate the stigma of Jewish ancestry? Had he joined the Jesuits of his own free will but for the wrong reasons—either to "see the world"[259] or to learn more about Archimedes' heritage from the eminent Kircher? Had he had just drifted into the Jesuit Order as the result of a suggestion of some friend, perhaps a Jesuit family friend, as is still the case in Catholic countries,

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[256] Carpinteri, *Siracusa*, 37–45. See also Colletta, *Carte Montemar*, 126–127.

[257] Hoppen, *Fortification of Malta*, 95–99, 133–137, 151–156, 219, 244 and 286.

[258] Romano, *Contre-réforme mathématique*, various pages.

[259] Describing Jesuit missionary activity, Wright, *Jesuits*, 60–90 states that "seeing the world often involved high risks of martyrdom or drowning at sea."

especially so in conservative communities of the type that would have existed in seventeenth century Syracuse—which also enjoyed the luxury of a large Jesuit church and a very active '*casa professa*'[260] in the fashionable Bottari district? We shall probably never know the answers to these questions.

Secondly, there seem to have been in Masò's case—at least since the time of his Malta sojourn in the 1653–1658 period—a derivative psychological problem of rebellion caused by a fierce determination to leave the Jesuit Order so as to liberate himself from his spiritual duties and focus on fortification studies channelled in the direction of the new academy of military geometry for the benefit of the young Knights whom he had learnt to admire and respect. His rebellious spirit seems to have progressively increased after being transferred in disgrace to Palermo where he meekly consented to take his final vows, which however, he later regretted saying that they had been imposed upon him against his will.[261] In Spanish occupied territory, matters would have been aggravated by an inferiority complex derived from his Jewish ancestry. The issue of Jesuits having Jewish ancestry had always been a source of problems provoked by an inherent Spanish hatred towards the Jews, this having led Possevino, himself of Jewish ancestry, to rebut attempts to expel these 'new Christians' from the Jesuit Order at the fifth General Congregation (1593–1594).[262] Considered in this perspective, a weak Masò would have probably regarded the Jewish blood in his veins as requiring all the protection that could have been provided by his identity as a fully-fletched Jesuit, particularly so in the oppressive Siculo-Spanish climate.[263] There was then the issue of what he would have interpreted as the Nickel-Castelnuovo 'conspiracy' not to let him include a military content in his *Corso Matematico*—if he had known that other Jesuits had been granted permission to do so, he would have certainly felt snubbed and unfairly treated by the Jesuit Order!

Thirdly, there also seems to have been—at least since the time when he managed to leave the Jesuit Order in a truly Machiavellian fashion (which does credit to his intelligence and cunning)—another derivative problem, leading the newly-appointed parish priest of S. Tommaso in Syracuse, ex-Canon of the abolished Order of S. Giorgio in Alga[264] and ex-member of the influential Jesuit Order, to now want to go a step further

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260 Giansiracusa, *Ortygia*, 69–70. See also Acerra, *Architettura Religiosa*, 35. The Jesuit complex in Syracuse was founded in 1554.

261 ARSI, *Sic.*19 (I), *Epist.Gen.* (26-01-1664) ff. 85–85v (Nickel to Masò). See also n. 1 a.r.t.

262 AHSI, 109, a.LV (1986) 3–31 (article on '*Antonio Possevino and Jesuits of Jewish ancestry*' by John Patrick Donnelly S.J.).

263 Correnti, *La Sicilia del Seicento*, 17–81.

264 See n. 89 a.r.t.

and annul his priesthood. Realising that he could never do this, he would have tried to 'escape' from his latest predicament by using his inherited wealth (the Masò family seem to have been quite rich)[265] to consort with women, perhaps even spending much time in the many notorious taverns of Syracuse. The tensions that would have been created by the conflicting identities of priest and libertine in this last chapter of Masò's life, seem to have progressively increased to reach a climax in 1674 when he would have realised the hopelessness of his situation in that hive of fortification building activity that was Syracuse where Grunenberg had all but completed his powerful bastions.[266] Feeling that there had always been an invisible force dictating his life as implied in his book about astronomy, feeling that he was leading an aimless life which was now completely out of his control to the extent of even abandoning his mathematical studies, one can now figure Masò venting his frustration on that old wall painting in his house at Megara where "he wanted to leave no trace of the effigy (of the Mother of God)."[267] Seeing in this moment of despair the Jesuits and perhaps his deceased mother as the main culprits of his tragic life, the former Jesuit *mathematicus* would have committed the unpardonable 'sacrilege' that was narrated by Aguilera—a 'sacrilege' that according to modern psychological interpretation, could have been caused by some sort of deeply-rooted resentment, perhaps compounded by a mental disturbance of the type that would have been caused by some sexually-transmitted disease, this having been exceedingly common in prostitute-ridden Mediterranean port towns like Valletta and Syracuse.[268] It was then quite acceptable for noblemen and rich prelates to have mistresses or frequent prostitutes leading one to speculate whether Masò would have been one of those. If it was so, it would have considerably added to his grave personal problems.

An examination of the life history of Giacomo Masò leaves one confronted with the factual case of a brilliant person who had missed an opportunity in life to achieve the level of prestige that had been attained by other Jesuits with similar interests in *De re militari*. They had perhaps been wiser and sought alternative ways of operation—more subtle and

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[265] Acerra, *Architettura Religiosa*, 58 mentions a notary, also called Giacomo Masò, who was asked to draw up a foundation deed for the church of S. Anna in Syracuse (04-11-1604).

[266] See n. 256 a.r.t.

[267] See n. 1 a.r.t.

[268] Cutrera, *Storia della prostituzione* cited in Correnti, *Sicilia del seicento*, 54.

more diplomatic—to develop their natural talents in military architectural applications within the rigid structures of their Order, displaying in a more persevering way those Jesuit attributes mentioned in 1657 by Arias y Porres. According to their Constitutions, all members of the Jesuit Order had to display "modesty", "humility" and "religious maturity" by keeping their heads pointing straight ahead, with their necks inclined slightly downwards, with their eyes kept down especially when talking to others, avoiding movements of the nose, walking less quickly that was necessary and particularly, taking care that all gestures were to display humility "without giving any messages of impatience or pride" with "a mode of speech also meant to display discretion and edification."[269]

As opposed to other Jesuit mathematicians who had remained in the Jesuit Order, the life of Masò in Palermo and Syracuse had demonstrated a rebellious reaction, a complete negation of all the behaviour admonitions that he had tried hard to observe as a Jesuit in Malta. This leads one to speculate about what he could have contributed to the seventeenth-century world of military architecture had he won the battle to reconcile himself with the rules of the Jesuit Order or had he thrown his lot in 1641 with the Viceroy of Sicily rather than with the Jesuit General, whom he had defied while lecturing military geometry to those brave Knights of Malta whose war galleys so often visited Syracuse.[270] It was probably his greatest disappointment that he had not been able to leave the Jesuits earlier and remain in Malta teaching military architecture "with so much wit and with so much art"[271] to his devoted students. These young Knights were possibly the only human beings in his tragic life who had probably really meant something to him. In the last moments of his tragic life on earth, Masò seems to have found the courage to make peace with his creator. The *Libro Defuncti* of the church of S. Tommaso informs us that he had accepted to receive those Sacraments[272] that, according to beliefs of the Catholic Church, would have guaranteed for him that happiness in the afterlife that he had not managed to find in this world.

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269 Ganss, *Constitutions*, 155–156. See also ARSI, MI, III, 514–527 (*Regulae Societatis Iesu 1540–1556*).

270 De Lucca, *Buonamici*, 47–52. The very conspicuous presence of the Grand Admiral of the Knights of Malta during the 13 December festivities of *S. Lucia*, patron saint of Syracuse, constituted one such occasion.

271 NLM, *Libr*. Bc. b. 38, f. 2r.

272 See n. 96.

97. Louis-Michel van Loo and Claude-Joseph Vernet painting depicting a satisfied Marquis of Pombal watching the last Jesuits leave Portugal in 1759.

CHAPTER FIVE

THE CONTRIBUTION OF THE JESUITS TO THE MILITARY ARCHITECTURE OF THE BAROQUE AGE

Summary

The General Suppression of the Jesuit Order in 1773 did not stifle the dedication of many ex-Jesuits to military applications of the mathematical disciplines. The dispersed former Jesuits continued producing works about military matters, focusing on fortifications and artillery. As an end result of the achievements of the Jesuit mathematical community in early modern times, these post-1773 works must be seen in the perspective of a number of conclusions that can be drawn about the largely forgotten Jesuit contribution to the dissemination of knowledge about military architecture in the Baroque age. In the slow and uneven consolidation of the restored Jesuit Order in the nineteenth century, teaching and research about military architecture was discontinued.

The End of an Era—The General Suppression of the Jesuit Order in 1773 and its Aftermath

The systematic destruction of the Jesuit Order by the Bourbon kings and their European allies took place between 1759 and 1773. The Jesuits were expelled first from Portugal (1759), then from France (1764) and finally from Spain, Naples, Parma and Malta (1767–1768),[1] all this happening amidst unproven accusations that the Order was putting together a formidable army in their Latin American territories which was already 60,000 strong and which could certainly be used to enable "those nasty Italian monks" to realise their old dreams of world domination.[2]

Despite the efforts of Pope Clement XIII Rezzonico (1758–1769) to resist such negative perceptions, his sudden death under mysterious circumstances on 2 February 1769 and the subsequent election on 19 May 1769 of the new Pope Clement XIV Gangarelli (1769–1774) seems to have brought matters to a head.[3] The very persuasive rhetoric of the Spanish

[1] Bangert, *Society of Jesus*, 363–430. For details about the expulsion of the Jesuits from Malta see Ciappara, *Enlightenment*, 25–26.

[2] Blanning, *Pursuit of Glory*, 384.

[3] Rendina, *I Papi*, 735–741. See also Bangert, *Society of Jesus*, 393–398.

ambassador to the Vatican, Don José Monino y Redondo soon led to the pope's enactment on 16 August 1773 of the Bull entitled *Dominus ac Redemptor*, a lengthy document which, according to the prominent Catholic historian Hales[4] constituted "the most serious defeat the Church had suffered since Luther's revolt" but which, according to the equally prominent Protestant historian, Von Ranke, reflected the "serene wisdom" of Clement in sacrificing his "Jannissaries."[5] Harney described the scenario in Rome in 1773 as one where "the Jesuit is no more,"[6] echoing an earlier comment made by Le Rond d'Alembert in 1766 about the Jesuits in France. "Such", declared D'Alembert, was "the fate of all human grandeur and power" since it was "in their very nature to grow worse and become extinct at the time when they had arrived at a certain degree of greatness and lustre" adding that just as this fall from glory had happened to the Persians, the Assyrians, even to the ancient Romans, it had now happened to the Jesuit Order.[7] With the seventy-year old Jesuit General Lorenzo Ricci (1758–1773) languishing in a dark cell in *Castel Sant'Angelo* with boarded up windows, proclaiming the innocence of his Order only to die soon afterwards,[8] with some 600 precious Jesuit libraries containing some half a million books falling prey to the many institutions and old book collectors who had for long been eager to get hold of them[9] and with some 728 Jesuit colleges being forced to abandon over a quarter of a million students,[10] the immediate effect of the suppression of the Jesuit Order must have been devastating.

The facts indicate that it was least felt by those distinguished mathematicians who remained very much in demand during the period of time that elapsed between *Dominus ac Redemptor* (1773) which "dissolved, suppressed, extinguished and abolished" the Jesuit Order[11] and *Sollicitudo Omnium Ecclesiarum* (1814) which restored it throughout the whole world through the re-employment of "those vigorous and experienced rowers for the storm-tossed bark of Peter which only the Society could provide", as was reported to have been said by Pope Pius VII Chiaramonti (1800–

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[4] See n. 2.
[5] *Ibid.*
[6] Harney, *Jesuits in History*, 345.
[7] *Ibid.*, citing Alembert, *Jésuits en France*, 8.
[8] Bangert, *Society of Jesus*, 402.
[9] Bangert, *Society of Jesus*, 401. See also Wright, *Jesuits*, 206.
[10] Wright, *Jesuits*, 208.
[11] Blanning, *Pursuit of Glory*, 383.

1823) on the occasion of the restoration of the Jesuit Order.[12] It is also recorded that when Monsignor Cristaldi had finished reading the Papal Bull to the cheers of the nobility and of some 150 former members of the suppressed Order purposely assembled in the Gesù church in Rome, the venerable Monsignor stepped down from his dais to give the precious document to the elderly Jesuit *mathematicus* Aloisio Panizzoni, who was most eager to hear the words of encouragement that were later whispered to him by a smiling Pope Pius.[13]

It was certainly a sign of those troubled times of anti-Jesuit sentiment that one of the principal treatises of military architecture designed for universal application in the Catholic world at the end of the Baroque era did not mention one Jesuit author in its text. In contrast to the *Escuela de Palas*, the *Principios de fortificacíon* authored by Don Pedro de Lucuze (1772)[14] omitted all Jesuit names from its contents. Considered in this context of downright hostility towards the achievement of the Jesuit Order in *De re militari*, it is surprising that during the 1773–1814 suppression, many ex-Jesuit mathematicians had continued producing military publications. Among these one can mention the ex-Jesuits Franz Paprocki[15] who authored a book entitled *Flavii Vegetii Renati, viri nobilis* (1776) and Carlo Borgo[16] who authored a work entitled *Analisi ed Esame ragionato dell' arte della fortificazione e difesa delle piazze* (1777). This last work was translated into the Spanish language by another ex-Jesuit called Pierre Xavier Cásseda (who added notes on *De Aggeribus mobilibus*).[17] Borgo's contribution also provided the inspiration for another ex-Jesuit, the Abbe Rossignol de Vallouise, to reproduce its text in French in 1805.[18] Vincent Requeno y

12 Bangert, *Society of Jesus,* 429.

13 *Ibid*., For Panizzoni's biography see chapter 3, n. 77.

14 For details of this work see bibliography (Lucuze).

15 ARSI, SMV, VI, 190. Paprocki, b[orn on] 10-06-1723 (Lithuania), e[nrolled with the Jesuits on] 02-09-1740, d[ied on] unknown date, served as rector of the Vilnius, Kamieniec and Warsaw colleges. After the suppression, he obtained a canonate in Lowicz.

16 ARSI, SMV, I, 1797. Borgo, b. 26-07-1731 (Vicenza), e. 22-10-1746, d. 1794, focused his activities on mathematical research. His fortification system, as explained in BNM 33.D.52 **was** inspired by Michelangelo's work at Prato d'Ognissanti, and is briefly discussed in Fara, *Sistema e Città*, 248–250. SMV writes that the King of Prussia bestowed upon Borgo the honorary title of Lieutenant-General.

17 ARSI, SMV, II, 816. Cásseda, b. 02-08-1739 (Pamplona), e. 11-07-1757, s. 1816 (Barcelona) spent some time in the Philippines after his exile from Spain in 1767, afterwards being deported to Italy.

18 ARSI, SMV, I, 1798 and ARSI, SMV, VII, 183. Rossignol, b. 03-07-1726 (Vallouise e. 16-09-1742, d. 1817 (Torino), was a renowned professor of mathematics at the Jesuit *Seminarium Nobilium* of Milan (1768–1773).

Vives[19] authored two unusual works—one on war rhethoric entitled *Principi, progressi, perfezione, perdita e ristabilimento dell'antica arte di parlare da lunghi in guerra* (1790) which was also translated into the Spanish language by Don Salvador Jimenez Coronado, *Profesor real de astronomia* in Madrid in 1795[20]—and one on the use of drum signals to control troop movements entitled *Il tamburo, strumento di prima necessità per regolamento delle truppe* (1807). The ex-Jesuit Juan Francisco Blasco[21] wrote a fascinating memorandum (1782) to Bartolomè Monton—a friend of Galvani and Volta—about a project that he had devised about electric telegraphy which could be used to direct a planned siege of Gibraltar from Madrid. Antoine Pilgram[22] authored a book in German about the military engineer Bernard Forest de Belidor (1698–1761)[23] entitled *Anfangsgründe der artillerie* (1793). Jean Joseph Claude Descharrières[24] published two works entitled *Conseil aux Suisses sur leur artillerie* (1794) and *Commerce littéraire militaire entre un Anglais et un Suisse* (1795). At the dawn of the nineteenth century Rossignol, Descharrières and Bresciani contributed five significant works which heralded the emergence of new ideas about warfare practice. These were Rossignol's *Ballistique* (1802) and *Pensée sur l'art de fortifier le places* (1805), Descharrières' *Essai sur l'artillerie de France* (1814) and *Observations sur les anciennes fortifications de la ville de Strasbourg* (1818) and Bresciani's *L'armeria antica del rè Carlo Alberto* (1841).[25] As indicated in its full title, this very last Jesuit military

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[19] ARSI, SMV, VI, 1670–1672. Requeno, b. 04-07-1743 (Calatrao), e. 02-09-1757, d. 16-02-1811 (Tivoli) made a name for himself after the General Suppression as a scholar of antiquities based in Rome.

[20] *Ibid.*, 1671

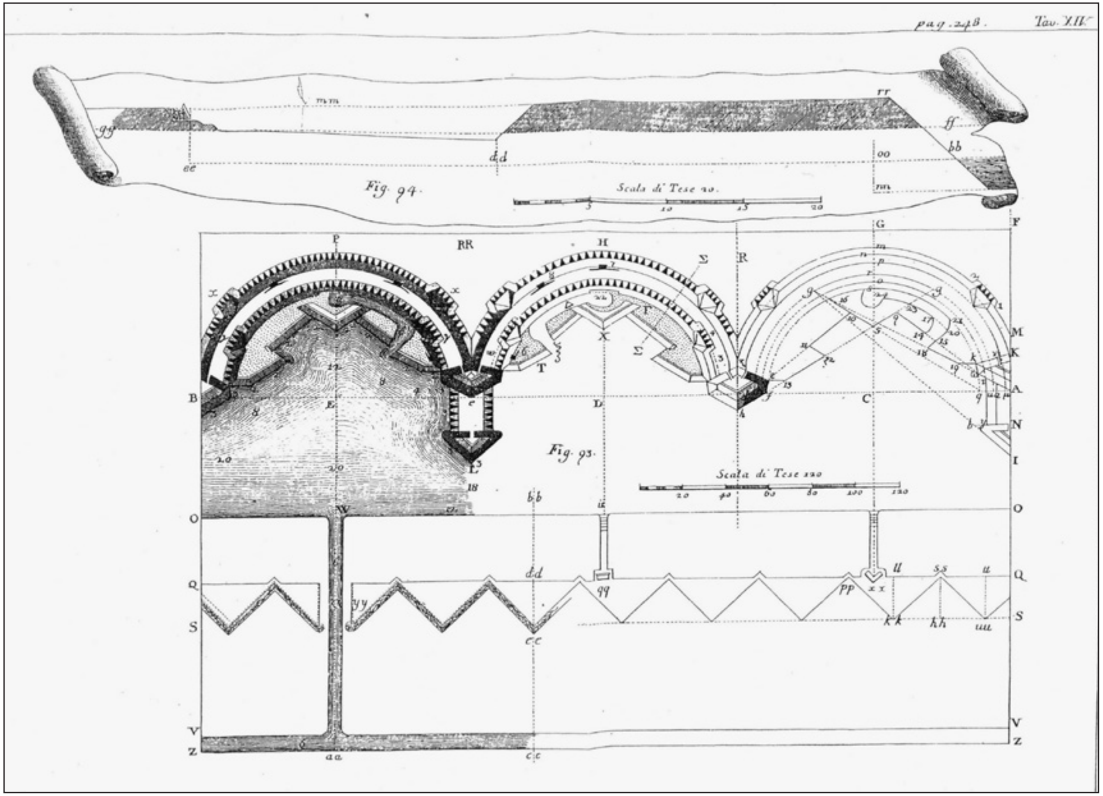
[21] O'Neill and Dominguez (ed.), *Diccionario*, 1247 (*Enseñanza Militar*).

[22] ARSI, SMV, VI, 753–754. Pilgram, b. 03-10-1730 (Vienna), e. 18-10-1747, d. 15-01-1793 (Vienna) published several mathematical works and was also responsible for the Jesuit Vienna observatory.

[23] Belidor authored the books on military mathematics mentioned in the bibliography (Belidor).

[24] ARSI, SMV, II, 1959–1961.Descharriéres, b. 20-06-1744 (Val-d'Ajol), e. 03-10-1759, d. 08-05-1831 (Strasbourg), was after the exile of the Jesuits from France, appointed to serve as chaplain to a Spanish artillery regiment, afterwards as professor of mathematics at the *Collegium Nobilium Theresianum* in Vienna.

[25] ARSI, SMV, II, 119. Bresciani, b. 24-07-1798 (Ala), e. 21-11-1824, d. 14-03-1862 (Rome), served as rector of the Torino, Geneva, Modena and Rome colleges, publishing extensively on socio-economic issues in a new journal that he launched on 06-04-1850 called '*Civiltà Cattolica*". As member of the exclusive *Arcadia* academy he used the pseudonym '*Tionide Nemesiano*'.



98. Borgo's contribution to military architecture as revealed in his *Analisi ed Esame dell'arte della fortificatione* treatise of 1777 [BNM.33.D.52]. The ex-Jesuit promoted an innovative system of artillery fortifications using semicircular curtain wall batteries protected by elaborate tenailles and fitted with alternate recessed and projecting bastions. Reproduced with the kind permission of the Italian *Ministero per i Beni e le Attività Culturali—Biblioteca Nazionale Marciana.*

work was a literary appreciation of the impressive collection of weaponry owned by King Carlo Alberto Amedeo of Savoy (1831–1849).[26]

These were the last overtly military works from the Jesuits. For the restored Order the military culture of the 'age of the soldier' with its elaborate siege works and splendid fortifications now gave way to the civil culture of the age of reason with its intellectual 'gurus' and aggressive print culture where "to preach Christ poor and humble with fidelity and courage" became the one objective of the reborn 'Society of Jesus.' In this respect it was indeed significant of the changed times that Antonio Bresciani, the last Jesuit author about matters military was also one of the founder members of the still popular Italian Jesuit monthly magazine entitled *Civiltà Cattolica*.[27]

Concluding Remarks

This book has dealt with the contribution of the Jesuit Order to the dissemination of ideas about military architecture in the Baroque age. In the first chapter, it has been shown that the Jesuits developed an extraordinarily militant form of religious expression that included in its agenda their involvement in 'just wars' against Protestant 'heretics' or Turkish infidels, these being considered to be the two prime enemies of the Catholic Church. The military mind of St Ignatius of Loyola, the preaching, confessional and wider educational ministries of his Order and the compilation of early Jesuit books on war ethics were all addressed together with the relationship that quickly evolved between the mathematical disciplines entrenched in the Jesuit curriculum of studies known as the *Ratio Studiorum* and the geometry of war. In the context of the great religious divides and numerous wars that characterized early modern Europe, it has been shown in the second and third chapters how Jesuits assisted Catholic leaders by using the mathematical faculties attached to many of their colleges and seminaries for nobles to disseminate knowledge on fortifications. This was achieved through teaching, writings, consultation and, at times, even active service in the field by Jesuit experts in fortification mathematics attached to Catholic armies. These fields of operation and the roles of some of the major personalities involved have for the first

[26] Bresciani's work was published just eight years before the king's abdication and subsequent death in Portugal, following his defeat at the battle of Novara by general Radetzky's Austrian army (1849).

[27] See n. 25.

time been mapped and openings have been established for future research on specific topics. Jesuit military activity was by no means restricted to the European continent. In South America, the Philippines and China, the Society of Jesus formed armies, built fortresses and even manufactured cannons to protect and propagate its missionary work for the greater glory of God—*ad maiorem Dei gloriam*. The involvement of Jesuits in warfare and their fortification treatises, not surprisingly, sometimes provoked a negative reaction from Generals of the Order who saw them running counter to Loyola's religious vision of world evangelization. But the expertise was real and recognized as such by contemporaries. By examining a late seventeenth-century Spanish treatise on military architecture entitled *Escuela de Palas*, the third chapter has produced evidence to show that Jesuit mathematicians who taught and wrote on fortification (sometimes using pseudonyms to protect their identity) were often regarded as experts in military architecture, rivaling the achievements in this field of knowledge of leading military engineers such as Vauban. In the fourth chapter, the career of the Sicilian Jesuit *mathematicus* Giacomo Masò has been examined in depth because it provides a good case study of the controversy and crisis of conscience that Jesuits contributing to the dissemination of fortification knowledge often had to face. It has also been shown that the interest of several Jesuits in the subject of military architecture remained strong in the 1773–1814 suppression period but was discontinued afterwards. At this stage, some conclusions may be drawn regarding the contribution of the Jesuits to military architecture in the Baroque age.

The "commander and creator" of the "powerful and influential" Jesuit Order[28] belonged to a closely-knit family of soldiers. Inspired by the military exploits of *Amadis de Gaula*, the young Spanish nobleman Iñigo had experienced violence and bloodshed in the border warfare of north-east Spain. He would have become conscious of both the battle tactics and discipline of the Spanish soldiers and also of the superiority of the French artillery employed against the fortifications of Pamplona in 1521. It is therefore understandable that his Jesuit Order evoked traits of belligerency, discipline, drill and organisation that only an experienced soldier could have instilled in his new '*Regimini Militantis Ecclesiae*' which was then required to combat the Protestant 'heretics' and Turkish 'infidels' that were challenging the religious monopoly of Rome. The military mind of the former defender of Pamplona

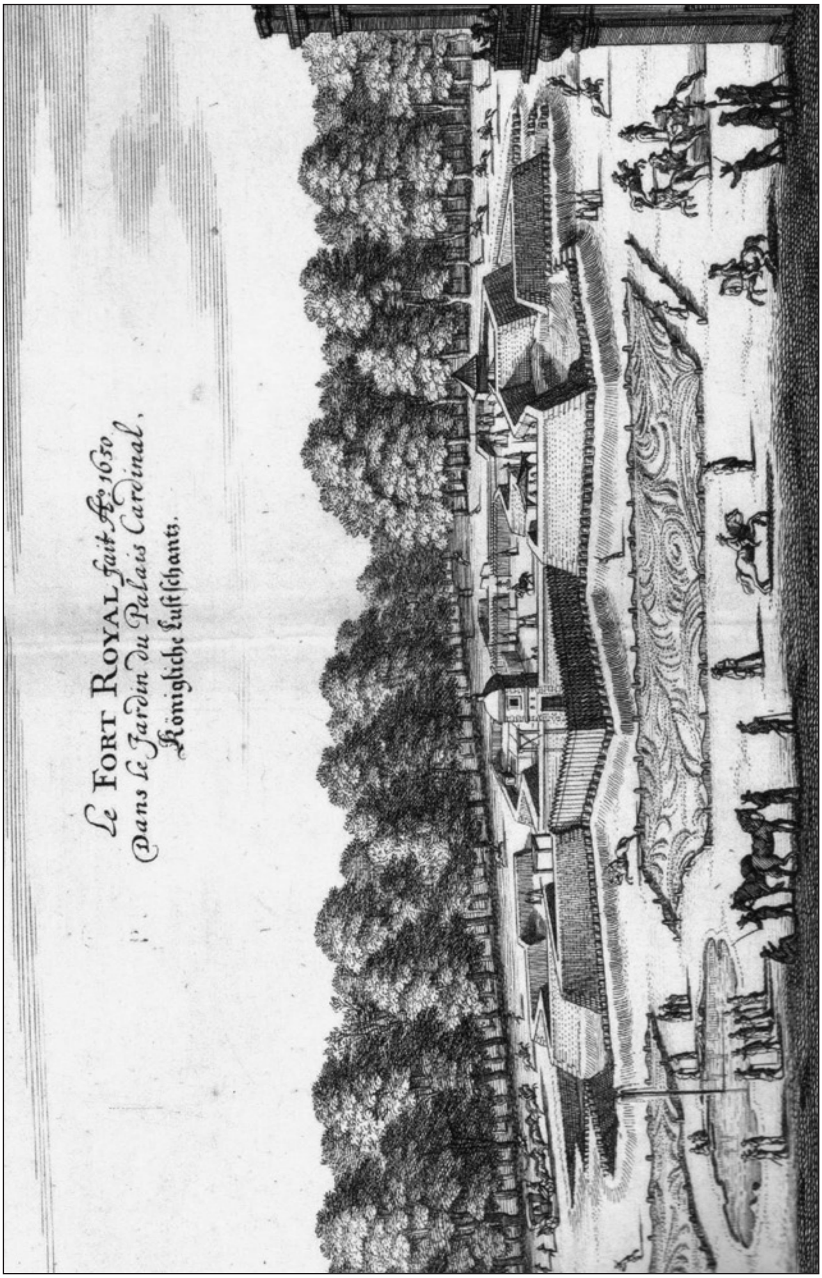
[28] Worcester, *The Jesuits*, 44.

was revived towards the end of his life when Ignatius sent a warning letter to Charles V outlining his plan for the defence of the Mediterranean region against the Turks.

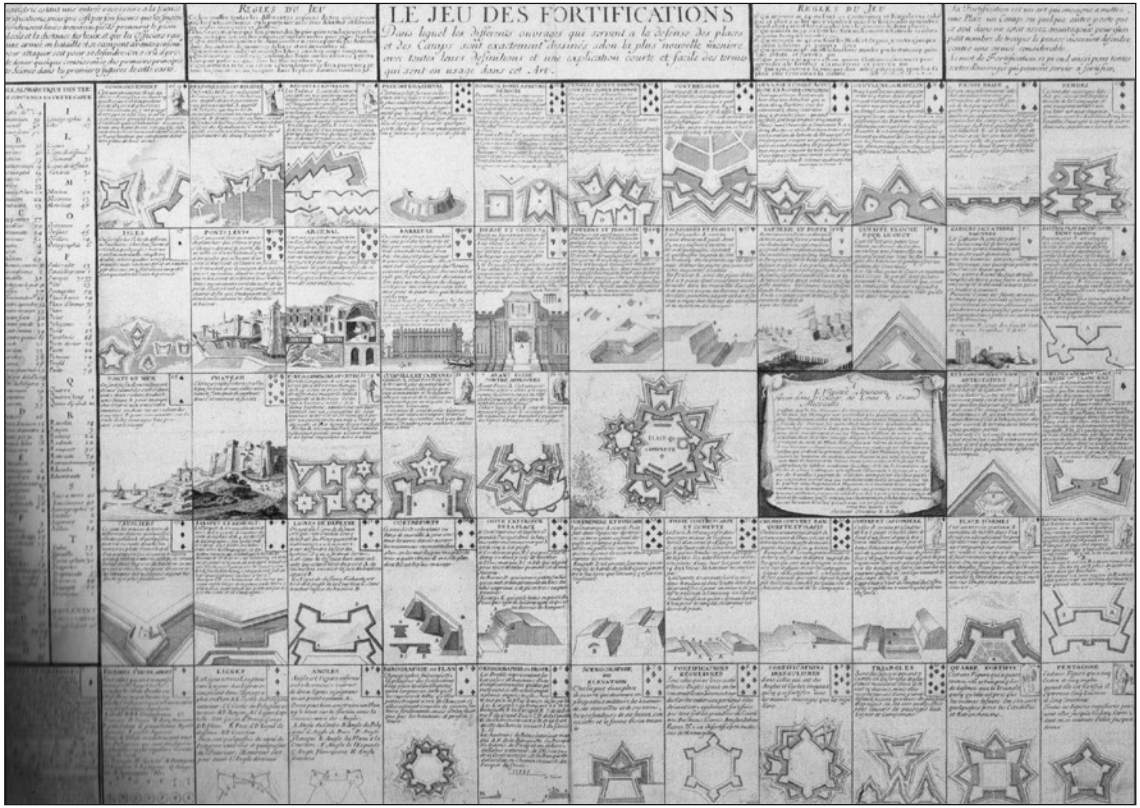
A number of early decisions taken by Ignatius and his successors in 1556–1618 seem to have provided the *rationale* for the Jesuit involvement in fortification building. One was that of establishing the bases of Jesuit operations in the cities of Europe, close to the palaces of the ruling elites. Another decision was that of training a new class of preachers whose impressive rhetorical skills were soon seen by the leading Catholic commanders of the day, as being most valuable to exhort their troops in their wars against Protestants and Turks. This led to the formation of a Jesuit military chaplaincy—the *Missio Castrensis*. A third decision was to train a new class of confessors who sometimes used their diplomatic skills and noble family backgrounds to influence those in positions of power. The discourses and writings of Jesuit confessors of the ilk of Auger, Sailly and Possevino were instrumental in providing a model and a goad for Jesuits who wished to involve themselves in '*De re militari*'. It is possible that repeated accusations of political manipulation were linked with this involvement. A fourth decision was that of adopting formal education as a major ministry based on the 1599 *Ratio Studiorum*. The rigours of the new Jesuit education system emphasised the link between theory and practice which was soon used to appease the appetites of the nobility by applying a superior knowledge of Euclid to the geometry of war. Students who attended the many Jesuit colleges and seminaries for nobles used their positions of power and influence to reward those Jesuits who had taught them so much about fortifications and siege tactics.

In the sixteenth century, fortification knowledge was concerned with applications of the so-called *trace italienne* of ramparts and polygonal bastions meant to enable small garrisons to withstand sieges by larger armies. Major protagonists of this novel type of artillery fortification were Antonio da Sangallo the Younger (1483–1546) and Michele Sanmicheli (1484–1559). As from 1600, when the Jesuits had just formalised their educational mission by means of the Ratio Studiorum, it was realised that bastioned landfronts alone were insufficient to resist assault unless design relationships were adjusted and tabulated to take into consideration musket ranges and a carefully-studied array of outworks placed in and beyond the ditch, to guard all possible approaches. It has been shown in this work that mathematical applications to these fortification developments would have suffered had the Jesuit Order not allowed Clavius to set up a 'centre of excellence' in the mathematical disciplines at the *Collegio Romano*. This remarkable German Jesuit persuaded his superiors to include mathematics in the *Ratio Studiorum*, despite its perceived associations with the dark world of alchemy and astrology. Clavius had argued that it was advantageous for Jesuits to demonstrate and disseminate their superiority in mathematical knowledge when invited to social occasions by the key power players of Catholic Europe, who were obviously interested in military applications. Clavius had also set up an ever-expanding network of Jesuit mathematical faculties in frontier locations facing either 'heretic' enclaves or 'infidel' territory. At the same time lay mathematicians started incorporating military applications in their teaching programmes—providing a solid reason for the Jesuit *mathematicus* to do the same. Children of noble lineage would have been aware of these applications at a tender age and there are many examples of fortifications and fortress warfare becoming incorporated physically into Baroque courtly culture. The young Louis XIV had played martial games in a *Fort Royal* that was built in 1650 in the gardens of the royal palace while Peter the Great, aged twelve, had constructed a wooden fortress complete with walls, ditches and bastions, afterwards dividing his companions into two bands to 'defend' and 'attack' Preshpur.[29] The arrival of Christine of France in Piedmont in 1619 had been marked by lavish festivities on Lake Moncenisio where the paper walls of an ephemeral 'City of Rhodes' was assailed by galleys amidst impressive fireworks displays.[30] The young nobles of the Baroque age were also fond of card games of the '*Juegos de la Fortificación*', '*Le Jeu de la Guerre*' and '*Le Jeu des Fortifications*' type[31] which would have put them in the right mood to receive further explanations from the Jesuit *mathematicus*. This was also the time of re-enactments, whether on the scale of courtly spectacles or the retirement project of Tristram Shandy's Uncle Toby.[32] Wounded at the siege of Namur, the former soldier retires to the country with the idea of re-enacting a 'siege' in his kitchen garden—targeted at a scaled replica of a fortress. Shandy, the satirist, has Uncle Toby boring family and friends as he revels in the technical terminology of eighteenth century siege warfare. Various writers, he declares, were "apt to confound" the names of the different fortification works—

29 An illustration of *Fort Royal* can be found in Zeiler's *Topographia Galliae*.
30 Oliva, *I Savoia*, 251.
31 Warmoes and Sanger, *Vauban*, 108–109. See also chapter 3, n. 148.
32 Sterne, *Tristram Shandy*, 67 and 356–357.



99. Martin Zeiler's contemporary engraving of *Fort Royal* constructed in 1650 for the entertainment of the young Louis XIV of France.



100. The *Planche du Jeu des Fortifications* card game "*invent et dessin par Gilles de la Boissiere, ingenieur ordinaire du Roy*" was published in eighteenth-century Paris by N.J.B. de Poilly for the use of "*l'illustre jeunesse élevée dans le collège de Louis-le-Grand*" [Warmoes, 2007]. It forms part of the collection [Inventory no. IS.94.63.50] of the *Musée Francais de la Carte à Jouer* in the city of Issy-les-Moulineaux by whose kind permission it is here being reproduced.

which was no doubt true. It perhaps explains why so much emphasis was given in the Jesuit texts examined to '*explicatio terminorum*'.

Prior to 1600, the Jesuits felt uneasy about applying their mathematical knowledge to fortifications. The subject was not initially included in Clavius' programme—although the study of Archimedes' achievements at the siege of Syracuse was. During the Thirty Years War, increasing pressure was brought to bear on the Jesuit *mathematicus* to address military applications. Zealous Jesuits used their rhetoric and writings to justify their involvement in the art of war in the context of the *Jus in bello* and *Jus ad bellum* principles embedded in the so called 'just war theory'. The main inspiration for these Jesuits—who on the basis of their writings could possibly be classified into 'extremist' and 'moderate' factions—was St Thomas Aquinas who had once written that heretics were "not only to be separated from the Church by excommunication, but also severed from this world by death". This was perceived by many Jesuits as constituting a licence to expand their agendas to include not only infidel Turks but also Protestant Christians—then branded as 'heretics'. At the same time Possevino, reacting to the publication of the Protestant Noue's *Discourses Politiques et Militaire*, started promoting a Jesuit interest in military matters, eventually entrenching it in his *Biblioteca Selecta*. The establishment of the Jesuit *seminarium nobilium* and mathematical applications to fortifications also featured strongly in Possevino's plan for world evangelisation.

Conscious of Possevino and Noue's writings, the ruling elites of Catholic Europe after 1600, intensified their military demands on the Jesuit Order. Their army generals required Jesuits to exhort their unruly soldiery. They also wanted them to provide advice which could possibly give them advantage in the heat of a battle. They wanted to learn more about the design of fortifications and siege works. They needed readable manuals which would enable them to take the rapid and right decisions in offensive and defensive operations. They wanted to be informed about Jesuit opinions on ethical issues so as to morally justify their tendency to adopt harsh disciplinary measures during war operations. In this respect, the Jesuit contribution to the dissemination of knowledge about fortification in the Baroque age, can be conveniently classified into five categories of operation: classroom teaching; consultancies; active service; the compilation of fortification treatises and writings on war ethics. Using 'accommodation' skills which they had employed to conquer the souls of many in their overseas missions and goaded by Ignatius' admonitions to cultivate the benevolence of princes, the post-1600 Jesuit Order became more and more inclined to accommodate the demands of a powerful Catholic nobility. In return the Order was protected from the tirades of its enemies.

The Jesuit dissemination of fortification knowledge from their many college and *Seminarium Nobilium* institutions was in the seventeenth century rivalled by many attempts to set up lay military schools. Most of these attempts were short-lived. The Jesuits viewed these schools (which were open to both Catholics and Protestants) as a threat to their militant mission of converting Europe to Catholicism. The nobility also tended to view them with suspicion since their middle-class and lower-class sources of enrolment could ultimately pose a threat to their existence as a privileged class. A manifestation of such fears had happened when Raimondo Montecuccoli, influenced by the Turkish system of training their Jannissaries, had dared to propose the establishment of military academies in each province of the Habsburg empire to receive emarginated members of society.[33] It is probable that the Jesuit success in disseminating military knowledge in the seventeenth century could well have constituted one of the factors that delayed the establishment of permanent lay military academies.[34]

The warring princes of non-Spanish Italy provided a good example of their willingness to employ Jesuits in military teaching and consultancy positions. The *Collegio Romano* and other Jesuit institutions in Bologna, Brescia, Ferrara, Mantova, Modena, Parma, Ravenna, Siena and Trent have been identified as places where Jesuit tuition in military architecture took place. A number of characteristics stand out. There was the international nature of the audiences that attended these Jesuit classes. Formal classroom education was often supplemented with a more intensive form of private tuition which seems to have been limited to the sons of the higher nobility. These institutions were equipped with 'mathematical' libraries where books on military architecture were intended to serve as reference works for the numerous presentations that Jesuit students were expected to make on the subject. The rectors of colleges and seminaries in Italy demonstrated tolerance in permitting military instruction to form part of a wide-spectrum curriculum covering all those subjects that were considered necessary to give a proper Catholic education to young nobles aspiring to future civil and military careers. The remarkably uniform and systematic manner adopted by Italian Jesuit mathematicians in teaching

33 Negro, *Scuole Militari*, 127–130.
34 *Ibid.*

military architecture, suggested a tacitly 'agreed' syllabus, perhaps even shared with their counterparts outside Italy. Numerous tables and charts were used and the lectures were invariably focused on the practical design of some 'ideal' city-fortress. In this classroom scenario, the 'terms', 'maxims' and 'geometrical steps' to be followed as well as the 'controversies' calling for clear decisions, were carefully explained. Lessons were also held on the representation of fortifications using perspective. This is suggested by five splendid engravings in a bilingual volume entitled Fernsehkunst Derenmahlern und Bawmeistern von Andrea Pozzo published in Rome in 1700. It would seem that at some point of his career this famous Jesuit artist, better known as the designer of the magnificent altar of St Ignatius in the Gesù church in Rome, used his unparalleled knowledge of perspective mathematics to teach the subject and at the same time underline the concern of his contemporaries with all that was beautiful and refined in the geometry of the military architecture of the Baroque city.

In France and Portugal, Jesuit mathematicians were subjected to national pressures to involve themselves in military affairs. French Jesuits were asked to participate in expansionist policies which superseded the old Catholic-Protestant wars of religion but which still depended on Euclid to create better armies, better artillery and better fortifications. The requirement to promote the glory of France explains the excellence and thoroughness of Jesuit military teaching and consultancies hinged on a large number of colleges with mathematical faculties. It was here that the French Jesuit *mathematicus*, provided a military education which not only demonstrated the same systematic approach of his Italian counterparts but also indoctrinated students with regards to the superiority of the French school of fortification building over its Italian, Dutch and Spanish (*Austriaca*) versions. The Portuguese Jesuit *mathematicus* was likewise drawn into a bitter struggle for independence from an unacceptable Spanish domination. Jesuit Provincials in Portugal were requested to provide the king with able mathematicians to supervise the build-up of fortifications along the country's sensitive border with Spain. In view of the close links that traditionally existed between Spain and the Jesuits, it was inevitable that the activities of Portuguese Jesuits met with censure from Rome but on the other hand the evidence indicates that they were allowed to establish with impunity centres of military excellence in the colleges of Lisbon, Coimbra and Évora. A Jesuit military faculty was also established at Elvas, intended to train young officers of the Portuguese army

(1651–1666). Portugal was also the only Catholic country where Jesuits were encouraged to attend classes in military architecture to better serve the national interests. The Jesuit involvement in military architecture in both Portugal and France in the Baroque age, caused great embarrassment to the Order since the perceived military role of the Jesuit *mathematicus* in these two Catholic countries was often interpreted as going against the interests of Spain and the Habsburg Empire—and of contradicting precedents which had only allowed Jesuit involvement in military operations against the enemies of the Catholic Church.

Spain was different again. The classes in military architecture that were held within the *Reales Estudios* programme of the *Colegio Imperial* as from 1625 constituted a case of official approval of a request that had been received from the King of Spain to place the Jesuit military knowledge at the disposal of the Habsburgs. The careers of mathematicians of the ilk of Isasi, Camassa and Zaragoza indicate that Jesuit teaching and consultancy activities in *De re militari* were closely interwoven with a state policy that strove to create a hitherto unidentified 'invisible force' of educators, advisers and spies that were by reason of their vows, absolutely loyal to the Catholic cause. It is indicative of the close collaboration that had always existed between Jesuit Generals and Spanish Kings, that unlike developments in Italy, France and Portugal where belligerent Jesuits had often been criticised, disciplined or even, like Ciermans, thrown out of the Order, the Jesuit *mathematicus* in Spain and its dominions was officially permitted to teach and practice military architecture, creating a unique synergy in Spanish armies where Jesuits were not only inserted in the high command but also allowed to participate in military parades with impunity. The military prowess of the Jesuit *mathematicus* in Madrid—addressing the type of violence-charged climate portrayed in the Spanish film *Las aventuras del Capitan Alatriste*[35]—affected not only Spain's European dominions in the Netherlands, Milan, Southern Italy and Sicily but also the vast territories of the Habsburg Empire. In many places, Jesuit colleges and seminaries for nobles supported by well stocked libraries featured prominently in the formation of a vast network of fortification instruction that highlighted the close links that existed between Jesuit mathematicians, Spanish and Imperial governors and Catholic army generals. Jesuits operating in the dominions of His Catholic Majesty continued to teach,

[35] This 2006 film, produced by Alvaro Augustin—Antonio Cardenal and hinged on the exploits of a *tercio* commander in the Netherlands called Diego Alatriste (Viggo Mortensen), was based on the work of the Spanish author Arturo Pérez-Reverte.

advise and write about *De re militari* in the second half of the seventeenth and eighteenth centuries despite General Carafa's 1648 prohibition. The more promising students were encouraged to advertise their credentials among those involved in shaping their military careers. They defended their theses in festive public events which echoed the lavish spectacles held at the *Collegio Romano* where, in 1626 and 1687, the academic battle of wits between student and examiners had been likened to a mock battle, of the kind that only the Baroque age could produce. Introduced by a chorus singing "To arms, to arms, soldiers!" and closed by another singing "Victory, victory", the proceedings had been held in a grand hall which was decorated with flowers, tapestries, damasks and beautifully-engraved theses 'posters'—with loud fanfares played at strategic moments of the battle![36]

The Jesuit *reducciones* in Paraguay were meant to provide physical and spiritual shelter for indigenous Indios who had been converted to Catholicism by an Order which here again implemented with great zeal the political agenda of the Spanish monarchy. The Jesuit 'fortresses of God' in Paraguay were well protected by trained native troops and Spanish artillery and were well planned using gridiron systems focused on a large plaza. They were protected by a defensive system of palisades and ditches and the role of their Jesuit governors was not only to provide 'physical protection' (achieved through the military training of the Indios and the furnishing of military chaplains to accompany the Jesuit army in its numerous expeditions) but also 'spiritual protection' (achieved through the creation of splendid churches, elaborate rituals and colourful religious artefacts). Other situations existed in the Philippines where the Jesuits Sedeño and de Vera respectively masterminded the rebuilding and fortification of Manila after the great fire of 1583 and devised a system of artillery fortresses in the Zamboanga region hinged on the model *Real Fuerza de San José*—intended to protect Jesuit converts from Muslim and Protestant Dutch pirates. Jesuits in China were, as in Europe, often asked to give military advice to the Ming and Qing emperors. In return, the Jesuits obtained from grateful Chinese emperors, the liberty of exercising their missionary zeal without fear of reprisal. The Jesuit *mathematicus* obtained papal approval and here emerged as the designer and manufacturer of powerful cannon. In the eighteenth century the Jesuit scholar Amiot masterminded the building of new

[36] O'Malley *et al.*, *The Jesuits*, 158–159 (Chapter 6 on '*Jesuit Thesis Prints and the Festive Academic Defence at the Collegio Romano*' by Louise Rice).

artillery fortifications around Peking and translated a masterpiece of ancient Chinese war literature entitled *Sun Tzu*. Jesuit artists also recorded the battlefield exploits of the Emperor Qianlong in superb copper engravings.

The compilation of treatises about military architecture, like fortification teaching and consultancies, was always viewed with suspicion by the Generals of the Jesuit Order. In 1628, Vitelleschi had shown his reservations about the military chair of the *Reales Estudios* programme, even prohibiting Jesuits from fighting alongside their *Indios* converts in Paraguay. In 1648, Carafa had banned teaching and publications on fortifications after throwing Ciermans out of the Order. In 1658, Nickel had expressly prohibited Masò from integrating his fortification knowledge in his proposed *Corso Mathematico*. In 1681, Oliva had only reluctantly given permission to Alias to lecture about military mathematics in Malta which was then facing a renewed Turkish peril. Despite such persistent censure, Jesuit military treatises were numerous. While most French Jesuits seem to have readily obtained permission from their Provincials to publish, others like the unfortunate Sicilian Masò did not, leading one to conclude that the different political climates in different Jesuit provinces could have led to the adoption of a 'two weights and two measures' practice which would have caused internal resentment and frustration. The grand total of some 113 Jesuit military treatises is indicative of the determination of their mathematician-authors to disseminate their views on fortifications in an age when Catholic armies were becoming increasingly exposed to Protestant influences, partly the result of the infiltration of unacceptably-tolerant elements in the corps of military engineers serving them. A glance at the "Jesuit military writings" section of the bibliography will reveal that 64 treatises were published. These books were intended to disseminate the theoretical fortification knowledge being taught in the Jesuit colleges and seminaries for nobles to the people that mattered. Apart from serving as key reference works in college and palace libraries, these Jesuit books sometimes also served as campaign manuals, as the dedication in Fournier's 1648 book suggests. Their contents were criticised by Vauban because of their 'theoretical' approach which, according to him, failed to respond to terrain conditions and practical experience. The unpublished Jesuit fortification manuscripts assumed the form of either classroom notebooks or consultancy reports. The production of military treatises was continued by several ex-Jesuits during the 1773–1814 suppression years but stopped soon afterwards.

The synergy that existed between Jesuit studies on military architecture and the treatises of the leading military architects of Baroque Europe can be seen in the 1693 *Escuela de Palas* document. This Catholic encyclopaedia of fortification knowledge placed the achievement of the Jesuit mathematicians Bourdin, Fournier, Breuil, Milliet de Chales and Zaragoza in context—indicating that their fortification systems were recognised by the leading military captains of the times as a valid contribution to contemporary knowledge on military architecture. The schemes proposed by these Jesuits reveal their determination to use mathematical knowledge to refine fortification typologies that had been devised in the sixteenth century to resist cannon attack. Anticipating the later role of small firearms to properly defend a place, the Jesuit *mathematicus* was now primarily concerned with the establishment of novel relationships between the range of the musket and the 'line of defence', leading him to tabulate inter-related 'ideal' dimensions for the various fortification components based on the role of the seventeenth-century musket which now became as important as that of the sixteenth-century cannon. In this context, the defensive potential of 'fausse brayes'and 'second flanks' manned by musketeers was also studied in depth. The *Escuela de Palas* document also highlighted the use of pseudonyms by some Jesuit authors to protect their identity as Religious.

The case of Giacomo Masò—a focal point of this work—reveals the multi-faceted type of problems that would have faced most Jesuit mathematicians interested in military architecture in the Baroque age. Educated in the *Collegio Romano*, teaching and writing about military architecture in Malta—where he had managed to obtain the support of Grand Master Lascaris for running an academy of military geometry—and finally abandoning the Jesuit Order in Palermo because of what appears to have been an inner conflict of conscience between his spiritual and mathematical vocations, Masò reflected many of the contradictions of his age. General Nickel and Provincial Castelnuovo regarded him with suspicion and mistrust. They joined forces not allow him to include the contents of his earlier classroom notebook on military architecture in his *Corso Matematico* informing him that this subject was banned to Jesuits but not informing him that five years before, Bourdin's military works had gone into print with the full blessings of the Provincial Cellot. A Jesuit turned libertine was the result of this unfair treatment—to be contrasted with the praise and elaborate funerals afforded to the far more belligerent Jesuits Milliet de Chales, Verbiest and others who had all dealt with the military arts. It was ironic that Masò's lectures in Malta on military surveying and countermines were published by a delighted Spanish Knight of Malta who later became the Archbishop of Seville. This influential nobleman would surely have appreciated the contribution of the seventeenth-century Jesuit college in Valletta to the military concerns and many debates underlying contemporary building developments in that fine military city, succinctly described by the French traveller Albert Jouvin de Rochefort in 1664 as '*une des plus fortes places de l'Univers*.'[37]

The metamorphosis of a Knight of Malta into an archbishop of a large Spanish city brings us perhaps to a core issue that has been discussed in this work. Although mathematics today has ceased to be considered as a bellicose art, the appearance of fortresses and cannon in many mathematical books of the Baroque age does indicate that the contrary was also true in the violent climate of the time. Considered from this viewpoint, it was understandable that any person with a spiritual calling who also happened to be interested in the mathematical disciplines, would, at some time of his career, have been seduced into studying military architecture, as one of the most discussed subjects of that age. This is precisely what had happened to many Jesuit mathematicians but also to a Dominican priest called Tommaso Maria Napoli who in 1722 decided to crown his mathematical investigations with the publication of a *Breve Trattato dell'Architettura Militare Moderna* dedicated, for good measure, to that hero of the Turkish wars, Prince Eugène of Savoy.[38] It would therefore be opportune to conclude this book with a word of defence on behalf of all those brave Jesuit mathematicians who risked so much to teach, write and advise about fortifications.

The great Leonardo had once said that he felt that he had a moral obligation "to find, when besieged by ambitious tyrants, a means of offence and defence in order to preserve the main gift of nature, which is liberty".[39] When one considers that the declared mission of the Jesuits was to protect Catholicism from Muslim enemies and European 'heretics' *Ad Maiorem Dei Gloriam*, the involvement of several Jesuit mathematicians in fortification building becomes as justified as the efforts of Giacomo

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[37] De Lucca, *A Description of Baroque Malta*, 9 and 39.

[38] BCRS, DOPPI.2586.8. Prince François-Eugène of Savoy-Carignan (1663–1736) was one of the best Catholic generals who had ever served the Austrian Habsburgs. According to Henderson, *Prince Eugen of Savoy*, xi, Napoleon Bonaparte considered him to be one of the seven greatest commanders of history, the others being Alexander, Hannibal, Caesar, Gustavus Adolphus, Turenne and Frederick the Great.

[39] MacCurdy, *Leonardo da Vinci*, 806.

Masò's illustrious predecessor, Archimedes of Syracuse, who very skilfully used his superior mathematical knowledge to preserve the liberty of his city from Roman aggression. In their efforts to shield the Catholic Church from its many enemies, Jesuits mathematicians not only managed to successfully use and disseminate their knowledge about the nature and usefulness of mathematically-designed fortifications among an unusually large international audience, but also to goad—as the Zaragoza-Leganés-Chafrion case indicates—their brighter students to improve upon all those innovative refinements that distinguished Baroque fortifications and siegeworks from their sixteenth century predecessors. This largely forgotten contribution of the Jesuits in the realm of defensive and offensive military operations was mainly targeted at assisting those absolute rulers of the Baroque age who had chosen to remain faithful to Rome and who, moreover, had ostensibly shown that they were capable of resisting the enemies of Catholicism. As such, the resulting interaction between Jesuit mathematicians and the courtly culture of early modern Europe may be likened to the mutually-supportive action of two adjacent bastions during the assault of some Baroque fortress. Evoking the metaphorical subtleties of this theatrical age, one of the bastions in this duet performance would have symbolised the mathematical expertise of the Jesuit Order while the other bastion would have stood for the warmongering dexterity of some exalted prince, sometimes gifted and sometimes imbecile, sometimes strong and sometimes weak but on whose survival the justified reputation of the Jesuits as the best preachers, confessors and teachers in the militant Catholic world of the Baroque age very much depended.

101. The Emblem of the Jesuit Order.

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