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"Il cordone in fin della scarpa fa bel vedere": On the Purpose of the Cordon in Fortification Architecture

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Abstract

In Early Modern fortifications, the cordon typically takes the form of a semi-circular projecting band positioned at the top of the scarp, marking the transition between the sloped base and the upper vertical wall. This study focuses on the controversial question of whether the cordon served an aesthetic purpose or rather a strictly functional one. The idea of a practical function originated with Francesco di Giorgio Martini (15th century), who imagined that a specially shaped cordon could prevent the enemy from scaling the ramparts with ladders. Through an analysis primarily of treatises by 16th- and 17th-century engineers, this paper shows how they understood the role of the cordon in the fortifications of their time.

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Introduction

[1] This paper examines the cordon in fortification architecture.[1] In its most typical form, the cordon is a horizontal, semi-circular projecting band that separates the fortress wall into a sloping lower section (the scarp) and a vertical upper section (Fig. 1). There is some uncertainty as to whether the purpose of such a cordon was aesthetic, strictly functional, or both. In analysing this issue, I will refer to various occurrences of this architectural feature in fortifications, to the comments of modern researchers, and above all to historical sources, mainly treatises by engineers and other contemporary authors from the 15th through the 17th centuries.

1 Example of a cordon: Rocca di Sarzanello, 1493–1502, Sarzana, Province of La Spezia, Liguria (photo: author)

[2] In civil architecture, horizontal mouldings extending along the entire façade, or a large portion of it, were already present in the ancient civilizations of Mesopotamia and Egypt, the era of Classical Antiquity as well as the Middle Ages, and continued to be a prominent feature during the modern era up to the 20th century. It was only then, notably within the framework of the International Style, that completely unadorned, 'clean' facades were introduced. Throughout these long and diverse periods, architects saw the need to articulate the facades of their buildings, from prestigious ones through to simple houses, by using elements such as mouldings. While a string course (or: belt course) serves to horizontally articulate the storeys of a facade, the cornice refers to the crowning moulding at the upper edge of a building. This enduring desire over the centuries to articulate the façade indicates that the mouldings served an aesthetic purpose. But the question immediately arises whether this was also the case in military architecture, and if so, why fortress designers even considered the aesthetic dimension of their buildings.[2] This last question, however, already goes beyond the scope of this paper.

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[1] This work was supported by a fellowship from the Herzog August Bibliothek in Wolfenbüttel.

[2] See John R. Hale, *Renaissance Fortification. Art or Engineering?*, London 1977; John Bury, "Are Renaissance Fortifications Beautiful?", in: *Fort* 8 (1980), 7-20; Nicholas Adams, "Military Architecture and Renaissance Art History or 'Bellezza on the Battlefield'", in: *Architectura* 14 (1984), no. 2, 106-118.

The Cordon in 15th-Century Treatises: Leon Battista Alberti and Francesco di Giorgio Martini

[3] Among the relevant comments on our topic, the earliest was by Leon Battista Alberti (1404–1472). Although in his *De re aedificatoria* (written between 1442 and 1452) military architecture holds a secondary position, the following sentence is crucial and specific to our topic:

> *The cornices of the towers and walls act both as ornament and as a bond to strengthen them, while they prevent the use of scaling ladders.*[3]

The term for cornices Alberti uses in his Latin text is *coronae*, which undoubtedly refers to the crowning cornice or uppermost part of a fortification. This cornice, admittedly, does not correspond to the cordon as it is generally understood, namely as a moulding that in Early Modern fortifications separates the wall into two sections, into the scarp and, above the cordon, the vertically rising wall. But the statement is still of immense importance, because the author points out the aesthetic effect of the cornice, thus affirming beauty in the field of fortification architecture. The cornice's practical purposes of strengthening the structure and preventing the use of ladders, are also mentioned.

[4] In his treatise Alberti frequently refers to the "ancients", meaning ancient builders, and this is no different in the sections dedicated to fortification architecture. By the time of his treatise, in the mid-15th century, the first examples of Renaissance architecture had already been realised, and in the field of fortification construction epochal changes were just beginning to take place, driven by the development of firearms: due to increasingly destructive cannons, fortresses were built with ever lower, but at the same time thicker, walls. Furthermore, instead of the predominant square towers, an increasing number of cylindrical ones were erected. Despite this development, the practice of scaling walls with ladders mentioned by Alberti continued, and would remain relevant in subsequent periods.[4]

[5] In his 1984 essay on military architecture in the Renaissance, Nicholas Adams already discussed the dual purpose of the top cornice mentioned by Alberti.[5] Adams then tested Alberti's statement on a well-known building, the bastion near Porta San Viene in Siena, built to a design by Baldassarre Peruzzi between 1527 and 1532. His analysis suggested that the bastion is effective as a defensive structure, but also possesses beauty in a narrower sense, as decoration. For example, he describes its cornice as "a work of high sculptural beauty". The lower-placed cordons

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[3] Leon Battista Alberti, *On the Art of Building in Ten Books*, Cambridge/London 1988, 105. In the original Latin text, this sentence reads: "Turribus murisque coronae et decori sunt et firmitatem ex nexura afferunt et admotarum scalarum irreptiones prohibent"; Leon Battista Alberti, *L'architettura (De re aedificatoria)*, ed. Paolo Portoghesi, 2 vols., Milan 1966, vol. 1, 301. See also Franco Borsi, *Leon Battista Alberti. Das Gesamtwerk*, Stuttgart 1980; Kim Williams and Marco Giorgio Bevilacqua, "Alberti and Military Architecture in Transition", in: *Nexus Network Journal* 16 (2014), 523-541.

[4] A number of treatises mention scaling ladders: Alghisi (1570), Specklin (1589), Busca (1601), Fiammelli (1604), Lorini (1609), Pellicciari (1619), Tensini (1624). More about this further down in this paper. See also: Jean-Marie Balliet, "Ein paradoxerweise wenig bekanntes Angriffsmittel: die Sturmleiter", in: *Festungsjournal* 66 (2025), 22-31.

[5] Adams (1984), 108.

of other fortifications, which are precisely the ones of interest here, are described by him as a means of articulating the division, in other cases as a means of slimming the wall or, conversely, emphasizing its massiveness.[6] But in any case, an aesthetic function is always associated with the cordon.[7]

[6] Adams does not address Alberti's remark about the ladders, but it could have been important for another Quattrocento theorist of architecture, Francesco di Giorgio Martini (1439–1501). He was a fortress architect frequently employed throughout Italy, but also the author of a treatise on architecture. There he discussed the cordon and offered a formulation of its purpose that may already have been influential in the Renaissance and is still relevant to modern academic discourse.[8] Francesco was deeply concerned about the danger that a fortress might be taken by assailants scaling the walls with ladders. Therefore, his idea was to create a cordon in the upper section of the ramparts or towers that would serve as a defense against ladders. Francesco's formulation reads: "In addition, 3 feet under the corbels make a semicircular cordon, with a flat side underneath, for protection against the ladder."[9] Above that cordon, a similar belt course could be created which Francesco calls a *gola*: "Above the said cordon, at 2 and a half feet, a moulding projecting 1 and a half feet can be made for the same purpose."[10] Obviously for better protection, further belt courses of various profiles could be envisaged, all with the purpose of preventing the use of ladders:

> *Besides this, some bands of various half sticks with the flat side turned towards the ground. And beyond this, other moulded and half-round belt courses can be made with other sticks proportionate to the size of the tower. After this, some round or convex ones. And conversely, reverse curved, or concave mouldings, very useful for the same purpose*.[11]

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[6] Adams (1984), 116-117.

[7] Let us add that the cordon can be perceived as a belt that envelops the body of the fortress, thus visually reinforcing it. This may be an appropriate moment to briefly consider an additional layer of meaning associated with the cordon – one that is sometimes referred to as aesthetic in a broader sense, or more precisely, cultural or symbolic. The presence of a cordon could indicate that the fortress was properly constructed, and therefore functionally effective and structurally resilient. Moreover, it implies that the person who commissioned such a fortress spared no expense – as with a decorated gate – thereby demonstrating his power.

[8] In contemporary literature, the cordon is often interpreted as a protection against ladders, but without reference to Francesco di Giorgio, e.g. Antonio Averlino detto Il Filarete, *Trattato di architettura*, ed. by Anna Maria Finoli and Liliana Grassi, introduction Liliana Grassi, Milan 1972, LIII; Leonardo Villena, "Fichier multilangue de fortification bastionée", in: *Bulletin. Institut international des châteaux historiques* 33 (1977), 65; Gianni Perbellini and Lino Vittorio Bozzetto, *Verona. La piazzaforte ottocentesca nella cultura europea*, Verona 1990, 117.

[9] "Oltre a questo, sotto li beccatelli a piedi 3, si facci uno circulare cordone di mezzo tondo, e la faccia piana sia situato di sotto, per defensione delle scale"; Francesco di Giorgio Martini, *Trattati di architettura ingegneria e arte militare*, ed. Corrado Maltese, 2 vols., Milan 1967, vol. 2, 437.

[10] "Sopra al detto cordone piedi 2 e mezzo si può fare al medesimo fine una gola di sporto piedi 1 e mezzo"; Martini (1967), vol. 2, 437.

Francesco's manuscript is accompanied by drawings of towers showing different variations of such belt courses (Fig. 2a). Finally, with the same defensive intent, he proposed adding sharp triangular protrusions to the surface of the wall, as shown in one of the drawings.[12]

2a (left) Francesco di Giorgio Martini, *Trattato di architettura*, ca. 1496–1501, fol. 54. Biblioteca nazionale centrale di Firenze, Florence, Fondo Nazionale, II.I.141 (photo: Biblioteca nazionale centrale di Firenze)
2b (right) Baldassarre Peruzzi, *Trattato di architettura militare*, ca. 1530, fol. 44r. Accademia di Belle Arti, Florence (reprod. from: Baldassarre Peruzzi, *Trattato di architettura militare*, ed. Alessandro Parronchi, Florence 1982)

[7] What conclusions can be drawn from Francesco's proposals regarding the design of the cordon and its connection to the use of ladders? The possibility that he was inspired by studying Alberti should not be ruled out. There is no definitive evidence that he made use of Alberti, but it is considered likely that he was familiar with his treatise. However, an important difference between their ideas lies in the fact that Alberti envisioned a protective role against ladders for the top cornice (*corona*), whereas Francesco assigned this function to a specially designed cordon, or possibly several of them, at a lower position on the wall.

[8] When examining the drawings on the relevant page of Francesco's manuscript (Fig. 2a), it can be observed that the variously profiled cordons resemble his drawings of classical column

[11] "Oltre a questo alcuni ricinti di riversi e mezzi bastoni voltando la faccia piana inverso el fondamento. Et oltre a questo si può fare altri ricinti di gole e mezzi tondi con altri bastoni proporzionati alla grandezza del torrone. Dopo questo alcuni tondi colmi overo convessi. E per contrario riverse curve o concave gole, utili assai al medesimo fine." Martini (1967), vol. 2, 438.

[12] See Marion Hilliges, *Das Stadt- und Festungstor. Fortezza und sicurezza – semantische Aufrüstung im 16. Jahrhundert*, Berlin 2011, 43-55.

bases and bands on vases, such as those in his Cod. Saluzziano 148 in Turin.[13] Among them are profiles that Francesco describes as "riversi e mezzi bastoni" or "riverse curve o concave gole"; the former refers to profiles that do not have a full semicircular cross-section but are flattened at the bottom, while the latter describes those with a cross-section shaped like an owl's beak,[14] that is, a downward-curved edge.

[9] These imaginative profiles appear exclusively in Francesco's manuscript drawings and are virtually absent from completed fortifications, including those he himself designed.[15] Cordons, in general, can be executed quite differently in terms of dimensions, profile and material. However, it can be stated that there is no distinct example of a cordon design matching Francesco's idea of a cordon placed below the *corona* to prevent the use of ladders.[16]

[10] Since Francesco's idea has prompted the central question of this essay, let us briefly digress to consider his role in the history of fortification architecture. His realised fortifications, dating from the 1470s and 1480s,[17] undoubtedly confirm him as an experimenter, but do not support the claim that he was the inventor of the bastion, as has sometimes been asserted.[18] His work was thoroughly and balancedly evaluated by John Rigby Hale in 1965. The British historian, however, reached a negative judgement regarding Francesco's fortifications: "towering and underarmed, they represent the massive doodling of a genius who is not prepared to sacrifice fantasy to logic".[19] Recently, Francesco Paolo Fiore came to a different judgement, claiming that Francesco di Giorgio's fortifications were precisely suited to the methods of warfare and

[13] Biblioteca Reale, Turin, Ms. Saluzzo 148, fol. 15, 16, 17, 100, 100v. See also Martini (1967), vol. 1, pl. 25, 27, 29, 185, 186.

[14] Martini (1967), vol. 2, 438. This is how the editor describes the term *riverso* (n. 1).

[15] Fortifications by Francesco di Giorgio Martini include: Rocca di Mondavio, Rocca e Torrione Martiniano in Cagli (this could be a discreet attempt to defend against scaling by ladder), Rocca Ubaldinesca in Sassocorvaro, Rocca Malatestiana in Fossombrone – all located in the province of Pesaro e Urbino – or Forte di San Leo in the province of Rimini.

[16] And one question that arises is why the cordon, if it was intended to prevent the use of assault ladders, was not common in the Middle Ages but became frequent as late as the Renaissance?

[17] As footnote 15.

[18] Luigi Serra, "Le rocche di Mondavio e di Cagli e le altre fortezze di Francesco di Giorgio Martini nella Marca", in: *Miscellanea di storia d'arte in onore di Igino Benvenuto Supino*, Florence 1933; Roberto Papini, *Francesco di Giorgio architetto*, Florence 1946 (according to John R. Hale, "The Early Development of the Bastion: an Italian Chronology, c. 1450–c. 1534", in: *Europe in the Late Middle Ages*, London 1965, 484). As Hale has demonstrated in this work, the creation of the bastion was a broad process and cannot be attributed to a single individual – and therefore not to Francesco di Giorgio either. See also Nicolas Faucherre, Pieter Martens and Hugues Paucot, eds., *La genèse du système bastionné en Europe (1500–1550)*, Navarrenx 2014.

[19] Hale (1965), 485.

weaponry of his time.[20] According to Hale, however, Francesco was "still primarily concerned with the moment of assault rather than with long-range bombardment",[21] and this obviously included an interest in defence against ladders. When considering Francesco's influence on subsequent treatises and military engineers, it is clear that this influence was chiefly exercised through his manuscripts rather than through the fortifications built according to his designs.

The Cordon in 16th-century Treatises: A Survey

[11] Unlike Alberti's treatise, which was published as early as the 15th century, Francesco's remained unpublished until the 19th century. However, this does not mean that it was unknown or had no impact – quite the contrary. During the Renaissance, ideas among engineers and authors of treatises spread not only through printed works but also through the circulation of manuscripts and their multiple copies. For example, it is known that Leonardo owned a copy of Francesco's treatise,[22] as did Antonio Sangallo the Younger, and Francesco himself borrowed extensively from the older Mariano Taccola (1382–1453).[23] There were no clear rules or general awareness of what we today understand as copyright; thus, the practice of borrowing and copying both textual passages and visual information, i. e. drawings, was widespread. In this context Baldassarre Peruzzi, who actually copied Francesco's treatise, is worth noting (Fig. 2b).

[12] It has been stated above that it is preferable to rely primarily on the testimonies of 16th-century authors themselves, since they may provide credible answers to the question of the role of the cordon in fortification architecture. When taking a brief, panoramic look at 16th-century treatises, even those from somewhat later decades, one finds very few references to the cordon. These works are mostly concerned with the horizontal layout of fortresses, paying little attention to the vertical structure, where the cordon appears as a defining element. The texts focus predominantly on the number and shape of bastions; on which outworks should be employed and how they should be arranged; on the building materials to be used in the construction of fortresses; on whether dry or wet ditches are to be preferred; on whether it is easier to defend towns built on elevated ground or in the plains; and on whether it is more advantageous to fortify existing towns or to build new ones. In such works, the cordon is often not even mentioned, and if it is, its existence is taken for granted. In the following, I will focus on those authors who left some record regarding the design of the cordon or its purpose. From the extensive corpus of 16th- and 17th-century treatises I reviewed, those that do not contain statements pertinent to our topic have, for obvious reasons, been omitted.

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[20] Francesco Paolo Fiore, *Architettura e arte militare. Mura e bastioni nella cultura del Rinascimento*, Rome 2017, 78: "purché si tratti beninteso di quella artiglieria, e non dell'artiglieria perfezionata del XVI secolo".

[21] Hale (1965), 485.

[22] Fiore (2017), 92.

[23] Mariano Taccola, *De ingeneis*, Siena, ca. 1427–1441, Munich, Bayerische Staatsbibliothek, Clm 197, II, paper, 136 fols., 30 × 22 cm, urn:nbn:de:bvb:12-bsb00113809-3; see also the facsimile: Mariano Taccola, *De ingeneis. Facsimile of Codex latinus monacensis 197, part 2*, ed. notes on technology in Renaissance Italy by Gustina Scaglia, 2 vols., Wiesbaden 1984, vol. 1, 28-31.

[13] Among those who devoted somewhat more attention to the cordon was the engineer Giovanni Battista Belluzzi (1506–1554), who was active as a military architect in the service of Cosimo I de' Medici. His written works were widely used and copied in the 16th century, but his treatise was not published under his name until 1598, and even then only in an unauthentic form.[24] In it, Belluzzi presents his understanding of the purpose of the cordon as primarily aesthetic: he considers the cordon to be an ornament, along with decorated gates, corners or bases. Although he argues that ornamentation is lewd and superfluous in fortification,[25] he nevertheless allows for the implementation of such details to some extent. A more detailed treatment of the execution of the cordon was provided by Francesco de Marchi (1504–1576), a highly innovative engineer whose treatise was also copied but only published posthumously. De Marchi asserts the cordon as an aesthetic element, noting that it should be executed in a contrasting colour to enhance the beauty of the structure.[26]

[14] In the mid-16th century, a treatise was published by Giacomo Lanteri (1530–?), an engineer and mathematician about whom not much is known. He also argues in favour of the cordon, as it contributes to the appearance and beauty of the building.[27] Finally, an interesting and useful comment about the cordon can be found in the treatise by Jacopo Castriotto and Girolamo Maggi, which Maggi published in 1564, after Castriotto's death. The authors depict a situation in which the cordon along the curtain wall is not at the same height as the cordon on the bastions, which they regard as aesthetically displeasing.[28] Consequently, its execution is also evaluated according to aesthetic criteria, and a solution is sought to make the building more visually harmonious. Additionally, it was common practice to connect cordons of different heights using vertically placed stone blocks (Fig. 3). Such an approach by the builders of the time makes the decorative purpose of the cordon indubitable. Let us add some further examples supporting the aesthetic interpretation of its function (Figs. 4, 5).

[24] Giovan Battista Belici [Belluzzi], *Nuova inventione di fabricar fortezze di varie forme*, Venetia 1598, see https://preserver.beic.it/delivery/DeliveryManagerServlet?dps_pid=IE1441154; Franco Borsi, ed., *Il disegno interrotto. Trattati medicei d'architettura*, 2 vols., Florence 1980, vol. 1, 410-412.

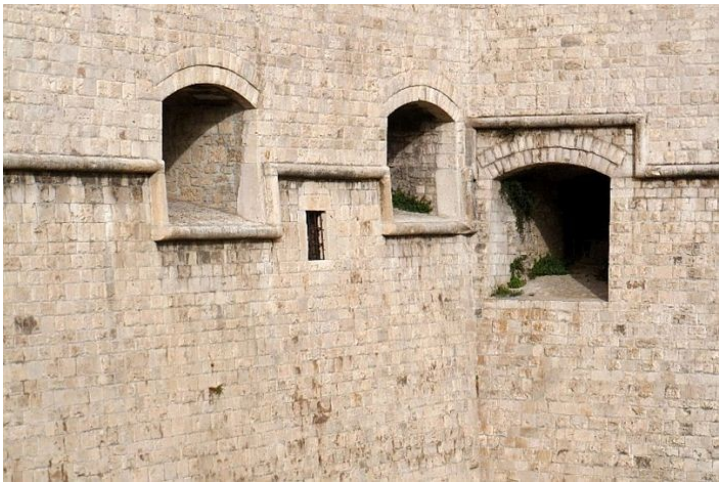
[25] "Le lascivie delli ornamenti"; "cosa superflua nelle fortificationi"; Belici (1598), 31.

[26] "Differente di colore di quella delle mura per bellezza"; Francesco De Marchi, *Della architettura militare*, Brescia 1599, 96; likewise 135.

[27] "Si potrà fare il cordone; perche fa bel vedere", in the margin "il cordone in fin della scarpa fa bel vedere"; Giacomo Lanteri, *Duo libri del modo di fare le fortificationi...*, Vinegia 1559, 59.

[28] "Facendosi il suo cordone più basso di quello de' balluardi, l'op[e]ra pareria brutta"; Girolamo Maggi and Iacomo Castriotto, *Della fortificatione delle città*, Venetia 1564, 27.

3 Victoria (Malta), Cittadella, 1599–1622 (photo: author)



4 Barletta, Castello, 16th century (photo: author)

5 Naples, Castel Sant'Elmo, 1538 (photo: author)

[15] Towards the end of the 16th century, authors from Northern Europe began to emerge. One of them was the Netherlandish mathematician and engineer Simon Stevin (1548–1620), whose treatise on fortification contains the wording "concerning the cordon commonly made to decorate the lower wall above the scarping",[29] thereby reiterating the aesthetic purpose of the cordon. The treatise by the insufficiently known Pietro Sardi (1559–1638), in which he notes that the cordon should be made of large and beautiful stones, already belongs to the 17th century.[30] Finally, it is important to mention the French engineer and theoretician Antoine de Ville (1596–1656), who published his treatise on fortification in 1628. He claimed that the cordon was more of a decorative feature than one of practical use.[31]

Discussion

[16] Even though references to the cordon are generally few, we have seen that several authors interpret it as an aesthetic element in the design of fortifications. Yet is there another aspect to consider – the cordon's possible role in the defence against ladder attacks, in line with Francesco di Giorgio's idea? The point is that the writers of the treatises associated this function with the scarp – a completely different element that is typically located beneath the cordon. In this regard too, Alberti should be mentioned first, since he was, as far as we know, the first to write about this function of the scarp: "The base of the citadel must be solidly constructed out of huge stones, and must have an inclined surface, so that any ladder propped against it will bend and be weakened."[32] The same reasoning about the scarp is found again in Francesco di Giorgio, who additionally proposed executing the scarp in a "semi-circular", that is, convex form. This would force the attacker to tilt the ladder at a greater angle in order to rest it against the wall at the top, which would cause the ladder to bend under a weight.[33] The association of the scarp with protection against ladders in these two early treatises was noticed by Hale as well.[34] In the 16th century, this argument for the scarp continued to appear, for example, in the writings of the architect and military engineer Galasso Alghisi (c. 1523–1573). He stated that the scarp is useful both for resisting the pressure of the earth embankment (*terrapieno*) and for making it more

[29] Simon Stevin, *De Sterctenbovwing*, Leyden 1594, 59; quoted according to the translation in: E. J. Dijksterhuis, ed., *The Principal Works of Simon Stevin*, vol. 4: *The Art of War*, Amsterdam 1964, 167.

[30] "Il cordone rotondo grosso un piede, e mezzo in circa fatto di grosse, e belle pietre"; Pietro Sardi, *Corona imperiale dell'architettura militare, divisa in due trattati*, Venetia 1618, Trattato secondo, 20.

[31] "On fera le cordon de pierre qui sert plustost d'ornement que de commodité"; Antoine de Ville, *Les fortifications du chevalier Antoine de Ville*, Lyon 1628, 90.

[32] Alberti (1988), 123; in the original text: "Arcis podium ponetur solidum, vastis lapidibus, linea extrinsecus obliqua, quo scalae admotae cunatu debilitentur"; Alberti (1966), 351.

[33] Martini (1967), vol. 2, 438: "Similmente per resistere alli scalamenti si può fare la scarpa del torrone volta a semicirculo, per la qual figura le scale non potendosi accostare alla sommità del torrone o mura senza molto discostarsi da quelle, bisogna che le scale infine per ogni piccolo peso si fiacchino."

[34] Hale (1965), 475, n. 1.

difficult to use ladders.[35] Finally, it is worth noting the argument presented by the engineer Buonaiuto Lorini (c. 1542–1611). He proposed constructing a sharply inclined lower scarp, followed by a cordon and a less inclined, more vertical upper scarp above it. As Lorini explains, this would force the ladder into an unfavourable position, causing it to fall apart under weight.[36]

[17] One example showing that ladder attacks remained a method of assault even in the 17th century can be found in the treatise by Francesco Tensini (1581–1630). In it, the author partially adopts the attacker's perspective, suggesting ways in which the use of ladders could be improved.[37] Finally, the aforementioned De Ville also referred to ladder attacks. At one point, he noted that ladders were no longer commonly used in his time,[38] yet he devoted two chapters of his treatise to this assault technique.[39] Moreover, he created a drawing showing various types of ladders leaning against a bastion, for which, incidentally, the cordon presents no obstacle (Fig. 6).

6 Antoine de Ville, A bastion and different types of ladders, signed "A.D.V.In&S", from his *Les fortifications du chevalier Antoine de Ville*, Lyon 1628, pl. XXXVIII

[35] Galasso Alghisi, *Delle fortificazioni*, Venetia 1570, 64: "perche meno gli darà carico, & fatica il terrapieno, & ancho sarà piu difficile da scalare".

[36] Buonaiuto Lorini, *Delle fortificationi di Buonaiuto Lorini nobile fiorentino [...]*, Venetia 1597, 69: "con queste due scarpe si viene à dar difficultà al nemico nell'appoggiarvi le scale, che caricate di genti, e non potendosi sostentare sopra la muraglia andarebbono in pezzi". The idea that the wall above the cordon is also inclined is not new and has been put forward by some earlier authors like Castriotto/Maggi (1564) and De Marchi (1599, but written before 1576) as well.

[37] Francesco Tensini, *La fortificatione guardia difesa et espugnatione delle fortezze [...]*, Venetia 1624, III, 13-29.

[38] De Ville (1628), 91: "Mais tout ainsi qu'on ne se sert plus d'eschelles pour prendre les villes fortifiées".

[39] De Ville (1628), 235-240 and 376-377.

[18] Based on this survey of what was written about the cordon in 16th-century and later treatises, the answer to the initial question appears clear: the cordon served a purely aesthetic, rather than utilitarian, purpose.[40] However, the matter is not quite so straightforward, as there is an exception, namely Gabriello Busca (c. 1540–1605). Besides being the chief engineer in the Duchy of Savoy during the last decades of the century, this experimenter and practitioner also published several works. His treatise *Della architettura militare* was conceived as three books, but he managed to publish only the first before his death. In it, he expressed the opinion – completely in line with other treatise writers – that the cordon beautifies the structure, while also attributing to it a protective function against ladders: "The cordon, or collar, besides embellishing the wall, is made for this purpose; so that with its projection it impedes the ladders, which we want to push upwards."[41] Busca's reasoning is not entirely simple, as he assigns the same task, i.e. making it more difficult to use ladders, to the moulding above the ground, which he calls *zoccolo* or *peduccio*;[42] however, it is clearly stated that the cordon also serves to protect against ladders. In interpreting Busca's position and his understanding, it is important to note that he was familiar with the work of Francesco di Giorgio. Moreover, in 1594 he copied several drawings from Francesco's treatise, i.e. its transcript in Turin known to us as Cod. Saluzziano 148.[43] This, admittedly, was not the later version by Francesco with drawings of peculiar cordons or *golas* (which is preserved as ex. Cod. Magliabechiano in Florence),[44] but it cannot be ruled out that Busca was familiar with other transcripts of Francesco's works, such as this one in Florence. In any case, it must be assumed that Renaissance experts were understandably better and more extensively informed about the works of their colleagues than the individual pieces of information available to us today suggest. But in Busca's case, it is crucial that there is solid historical evidence of his engagement with Francesco's work and his familiarity with that intellectual heritage.

[19] It is not easy to explain why Busca considered the cordon a protection, especially since he was not only a theorist but also a practitioner. It is conceivable that he adopted Francesco's concept either directly from his works or through other authors, merely repeating it out of inertia as an inherited formula without real practical justification. Busca's reasoning about the cordon in

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[40] The cordon retained its aesthetic function in the following centuries, not only on fortifications but also in civil architecture, particularly on buildings evoking historical styles, well into the modern era.

[41] Gabriello Busca, *Della architettura militare primo libro*, Milano 1601, 118-119: "Il cordone, o collarino, oltre che abellisce la muraglia, si fa a questo fine; accioche col risaltamento suo impedisca le scale, le quali si volessimo spignere in sù"; very similar also on p. 186: "E utele il collarino, o cordone per impedire l'apoggio delle scale, & il pontarle all'insù, & adorna non poco la muraglia."

[42] Busca (1601), 173: "Da ancora ornamento, & giova non poco. Perche impedisce l'apoggiare le scale alla muraglia, che per tale risalto stanno più lontane dal piede, & restano più deboli"; see the drawing on p. 177 as well. This kind of moulding is also described by other treatise writers, such as Belluzzi: Daniela Lamberini, *Il Sanmarino. Giovan Battista Belluzzi architetto militare e trattatista del Cinquecento*, Florence 2007, vol. 2, 340.

[43] Carlo Promis, *Vita di Francesco di Giorgio Martini, architetto senese del secolo XV*, Turin 1841, 106.

[44] Francesco di Giorgio Martini, *Trattato di architettura*, Biblioteca nazionale centrale di Firenze, Florence, Fondo Nazionale, II.I.141.

this context is the exception that proves the rule, because the other treatise authors mentioned so far write about the cordon only as an ornament.

[20] This discussion of the cordon becomes even more complex in view of a completely opposite argument put forward by Giovanni Francesco Fiammelli (1565–1614), likewise a practical military engineer. Contrary to Busca, he argued that the cordon actually facilitates the use of ladders:

> *Not serving for anything other than decoration, it indeed facilitates the use of ladders, because it projects outwards, and the ladders, which lean against it, do not require as much incline as they would need if there were no cordon*.[45]

[21] The issue of protection from ladders could possibly be clarified by examining the dimensions of the cordon as given by the treatise writers. Francesco di Giorgio does not specify the dimensions for his protective cordon, but provides them for the additional moulding he calls *gola*: it should project by a foot and a half. Among the treatises mentioned so far, dimensions for the cordon are given by De Marchi (height 1.5 feet, projection 1 foot),[46] Belluzzi (height 1 foot),[47] Maggi/Castriotto (height 1 foot),[48] Busca (height 1 foot)[49] and Sardi (height 1.5 feet).[50] The treatise writers generally do not specify the projection, but if the cordon in cross-section is imagined as an ideal semicircle, with a height of one foot, then the projection corresponds to the radius, i.e. half a foot. This clearly contrasts with the projection of a foot and a half given by Francesco, which moreover refers only to the belt course he calls *gola*. It should be noted, however, that, judging by his drawings, his cordon projected even further than that.[51]

Conclusion

[22] For some of the fortifications that still exist today, it is conceivable that their architects deliberately designed certain features to make the use of ladders more difficult. Even in the absence of a projecting crowning structure, such fortresses sometimes display a distinctly reinforced upper zone, in various forms. Examples can be found in some of Giuliano da Sangallo's fortresses, such as those in Sansepolcro, Poggio Imperiale, and the Cittadella Nuova in Pisa.[52] In

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[45] "Non servendo per altro, che per ornamento, anzi da commodo alle scale, perche esce in fuori, e le scale, le quali vi si appoggiano non hanno bisogno di tanta pendenza, quanta bisognerebbe loro se non vi fosse il cordone"; Giovanni Francesco Fiammelli, *Il principe difeso*, Roma 1604, 30.

[46] De Marchi (1599), 135.

[47] Lamberini (2007), vol. 2, 438.

[48] Maggi and Castriotto (1564), 29.

[49] Busca (1601), 186.

[50] Sardi (1618), 20.

[51] Alternatively, one should consider the possibility that Francesco exaggerated the scale of the cordons in his drawings in order to render their profiles more distinct.

[52] Giancarlo Severini commented on these details, specifically assuming the protection of the Medici fortress in Sansepolcro from ladder attacks: Giancarlo Severini, "Giuliano e Antonio da Sangallo e le origini della fortificazione bastionata", in: *Castellum* 18 (1973), 113-117.

these cases, we are always referring to the upper termination, which Alberti, in his time, described as the *corona*.

[23] But the subject of this discussion is the cordon at a lower level, at the upper end of the scarp. Considering all of the above, it seems that the modern interpretation of the cordon as a protection against ladders rests on an obvious misunderstanding: Francesco di Giorgio intended this function for his special cordon, though it was never truly put into practice in that form. The misunderstanding was due to the fact that much later, in modern scholarship, this idea of Francesco began to be associated with the standard cordon that separates the escarpment from the vertically rising wall above. It is therefore not appropriate to define the cordon as a defensive measure against ladders without referring to Francesco. All the later treatise writers quoted here state that the cordon serves to embellish the fortress, most of them mentioning no other purpose. While it may be argued that their treatises are (merely) architectural theory, they nonetheless represent the most authentic sources available regarding the purpose of the cordon.

About the Author

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