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Trebuchets Were Not Siege Guns, So Why Use Them?

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Counterweight trebuchets were the most powerful ballistic weapons of their day, but their association with later siege guns has led to misunderstandings of their destructive capabilities. This article is an attempt to correct some misguided ideas by providing a short overview of the power and value of mechanical artillery and contextualizing its use in the Levant during the twelfth and thirteenth centuries. After addressing the origin of certain theories that these engines were far more destructive than seems to have been the reality, a brief assessment of their actual power is conducted by looking at the ways sources exaggerate the destructive capabilities of these weapons and exploring their capacity as energy systems. The notion that counterweight trebuchets were responsible for a 'revolution' in fortification design from the late twelfth century is then addressed. Building on the notion that these machines were less powerful than some have supposed, an assessment of their value is offered by exploring their relative strength, the psychological impact associated with the dangers they posed, and the prestige attached to employing such great engines.

Keywords: Artillery, trebuchet, siege warfare, crusades, castles

Introduction

In 1997, Kelly DeVries published "Catapults Are Not Atomic Bombs," a critique of theories that rely on 'decisive' weapons to explain the course of pre-modern military history. DeVries chose to focus on ancient chariots, medieval longbows and Europe's early modern 'military revolution'; despite the title, he did not investigate mechanical artillery, unintentionally providing me with an opportunity to do so here, a quarter of a century later. Such an addition seems necessary as the power, and associated influence, of the medieval trebuchet is often misunderstood, misjudged, or simply exaggerated. It has become reasonably common to find comparisons between these engines, and the damage they were supposedly capable of inflicting, and later siege guns, the implication being that the former were used primarily

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for the purpose of smashing down fortified walls, much as later guns were used to pulverize some early modern fortifications. What follows is an attempt to explain the origins and influence of a recent scholarly trend that presents the counterweight trebuchet as particularly powerful, and then what I believe to be a more realistic assessment of such siege machines. Finally, if the impact of these engines was much less dramatic than that of later siege guns, I will offer an explanation of why they were used at all. Taking into consideration the scope of this journal, focus will be placed on events in and around the Latin East.

For a long time, the prevailing opinion among military historians appears to have been that the power of medieval mechanical artillery was fairly limited. In the words of Eugène Emmanuel Viollet-le-Duc (1860, 1:344), such engines "could only destroy battlements and prevent the besieged from remaining on their walls, or remove their machines." Sir Charles Oman (1885:57) similarly remarked that "the feeble siege-artillery of the day" could only "beat without perceptible effect" against stout walls, noting that sapping was instead the most effective way to damage fortifications.

In the late twentieth century, a new interpretation was put forward by Paul Chevedden. Beginning with his Ph.D. dissertation (1986), Chevedden has argued that the appearance of the counterweight trebuchet had a sudden and dramatic impact on medieval siege warfare. This theory reached a considerable audience thanks to its endorsement in Hugh Kennedy's popular *Crusader Castles* (1994: esp. 182), and these ideas have since been developed further in a series of articles (e.g., Chevedden 1999; 2000). According to Chevedden (2000:76):

> The counterweight trebuchet was so far superior to any piece of artillery yet invented that its introduction brought about a revolution in siegecraft that rendered existing systems of defense obsolete. [...] The introduction of the counterweight trebuchet led to an increase in the scale of warfare and produced revolutionary changes in military architecture in order to counter the greater destructive power of this new artillery.[2]

Such statements have had a profound impact on subsequent theories of fortified architecture. Ronnie Ellenblum (2007:237–238, 285–286) remarked that a critical factor behind the development of Frankish 'concentric castles' in the late twelfth century was advances in Muslim heavy artillery, without exploring this any further. Adrian Boas (2017:107–108), citing Chevedden, has similarly identified improving Muslim artillery as a potential reason why the Franks stopped building small, exposed castles in the twelfth century and began constructing large, more topographically isolated strongholds in the thirteenth century. This idea that medieval artillery was capable of smashing down fortified walls, much to the satisfaction of Hollywood, is now regularly found as an explanation for the construction of larger castles by the Franks in the thirteenth century. I have dealt at length elsewhere with what I believe to be the flaws of this theory (Fulton 2018: esp.

[2] Cf. Chevedden 1999:36. For somewhat different assessments, in the context of the ongoing dialogue between the forces of attack and defense, see France 1999:119–126; Fulton 2019b:156–167.

322–355), so I shall only reiterate a few points here before moving on to why besiegers bothered to employ such engines, if indeed they were weaker than others have suggested.

Exaggerated Descriptions

The earliest indisputable evidence to support the existence of counterweight trebuchet technology is a description and accompanying illustration provided by al-Tarsusi in a manuscript that dates to the 1180s (ff. 134v–135r). Earlier in the twelfth century, however, artillery is described as inflicting considerable damage. It was supposedly used to shatter the walls and towers of Tyre in 1124 and smash down walls at Shayzar in 1138, to offer only a couple of examples.[3] The stone-throwing engines employed at Tyre and Shayzar, like those used at numerous sieges before and after, were presumably traction trebuchets. Whereas counterweight engines would use the force of gravity acting on a large load to propel the short end of the throwing beam downward, smaller traction engines made use of teams of pullers to accomplish the same result.[4] Contrary to suggestions otherwise (e.g., Chevedden et al. 2000), there were fundamental limits to the scale and power of traction trebuchets that ensured they never threw stones anywhere near the size of those later hurled by counterweight engines in the thirteenth century (Fulton 2017a).[5] Accordingly, artillery remained fairly light and reasonably easy to build on site during the early generations of the Frankish presence in the Levant. Not until the second half of the twelfth century do figures in the Near East appear to begin transporting prefabricated trebuchets with their baggage, though the practice of building new engines, either to complement prefabricated ones or instead of using such, seems to have continued throughout the thirteenth century (Fulton 2015).

Al-Tarsusi's counterweight engine displays a quite primitive design (Fulton 2018:433–436). Unsurprisingly then, when looking past certain exaggerated descriptions, artillery had little effect smashing down walls during sieges of the 1170s and 1180s (Fulton 2017b). Although it is widely held that counterweight trebuchets were employed against Acre during the Third Crusade (1189–1192), the rather sober remarks of certain participants of the Fifth Crusade (1217–1221) help check assumptions that early examples of this technology were wall-smashing proto-bombards.[6] During the initial phase of the siege of Damietta in 1218,

[3] For Tyre, see Fulcher of Chartres 3.32, pp. 728–730; William of Tyre, *Chronicon* 13.6–14, pp. 593–604. Cf. Matthew of Edessa 3:99, pp. 233–234; Ibn al-Qalanisi, pp. 170–172. For Shayzar, see William of Tyre, *Chronicon* 15.1, p. 674. Cf. Usama ibn Munqidh, pp. 125–126; Niketas Choniates, pp. 17–18. See also Fulton 2018:97–102, 107–112.

[4] For an introduction to the differences between these two engine types and how they might be represented as energy systems, see Fulton 2018:39–58. For more detailed mathematical modeling of a counterweight trebuchet, see Denny 2005. For trials with a reconstructed traction trebuchet, which is harder to model, see Tarver 1995.

[5] These same limitations extend to the proposed 'hybrid' trebuchet, cf. Chevedden 1998.

[6] For the use of artillery at Acre in 1189–1191 and Damietta in 1218–1219, see Fulton 2018:183–198, 207–216.

which concentrated on the Tower of the Chain, the crusaders' artillery is described by figures close to the action as having no effect against the tower, though the besiegers were almost certainly employing counterweight engines, which they called *trabuculi* (Oliver of Paderborn 12, p. 181; James of Vitry No. 4, p. 105). Even at Acre in 1291, the final siege of the era of the crusades in the Levant, where numerous large trebuchets were brought to bear against the city's defenses, it was mining, as it had been in 1191, that compromised the city's fortifications, leading to its fall.[7]

Many twelfth- and thirteenth-century descriptions of artillery damage contain obvious exaggerations, all the more apparent when considering the real effects of later gunpowder weapons.[8] Some authors embellished things to elicit a visceral reaction in their readers, while others celebrated the majesty of their patron or leader by associating their greatness with that of the siege engines they commissioned. Obvious issues arise when modern scholars put forward theories–some of which defy basic physics–to explain how such descriptions might be read literally. The interpretation of the siege of Saone in 1188 put forward by Gabriel Saadé (1968), which was widely accepted for five decades, is one such example.[9]

To a certain degree, exaggerations are perhaps more excusable when found in the works of Frankish authors, most of whom were churchmen who had little, if any, exposure to siege warfare. Fulcher of Chartres and Walter the Chancellor were probably more familiar with the realities and nuances of campaigning in the Levant than most; others, including William of Tyre, upon whom our understanding of events in the twelfth century relies so heavily, seem to have avoided opportunities to gain firsthand experience. Although some authors witnessed siege activities directly, and many had access to firsthand testimony, most seem to have tried to convey the emotional experience of an artillery bombardment, rather than an accurate assessment of damage, as will be noted again below.

Muslim authors, by comparison, were more likely to have a deeper familiarity with the practice of war. Whereas Ibn al-Qalanisi appears to have shared William of Tyre's aversion to campaigning, Usama ibn Munqidh took part in a number of twelfth-century sieges. 'Imad al-Din al-Isfahani and Baha' al-Din ibn Shaddad witnessed several sieges in the late twelfth century in the service of Saladin, and Ibn 'Abd al-Zahir did so in the late thirteenth century accompanying Baybars. Far from just passive witnesses, Baybars al-Mansuri and Abu'l-Fida' both commanded troops at later Mamluk sieges. All, however, had motives to exaggerate at times. At Saladin's siege of Shughr-Bakas in 1188, 'Imad al-Din, Baha' al-Din ibn Shaddad, and Ibn al-Athir, all of whom appear to have been accompanying Saladin's army, provide conflicting assessments of the besiegers' artillery (Fulton 2017b:48).

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[7] For the use of artillery at Acre in 1291, see Fulton 2018:293–302.

[8] For the debate over the impact that the refinement of siege guns had around the year 1400, see Rogers 2011. A methodology for measuring the effects of seventeenth-century guns, archaeologically, is proposed in Leese 2020.

[9] Cf. Fulton 2017b.

Despite the general lack of clarity, it seems significant that very rarely is the damage supposedly inflicted by artillery, in both Muslim and Frankish accounts, linked to a breach that is subsequently stormed by attacking forces.[10] Likewise, artillery is found playing against the defenses of some strongholds for months, yet these walls, unless they were undermined, seem to have remained a formidable obstacle and quite defensible in most instances.[11]

Assessment of Power

Although certain exaggerated accounts may suggest that medieval mechanical artillery was exceptionally powerful, a much less sensational process of development becomes apparent when all the available literary evidence is considered (Fulton 2018:59–302). Such a tempered assessment is also supported by the surviving physical evidence. Few identifiable components of medieval trebuchets have survived; the wooden beams, cordage and metal fittings have been lost, destroyed, disintegrated or repurposed long ago.[12] Fortunately, however, a number of projectiles have been discovered, some in a sealed archaeological context (Fulton 2020; Kotán 2019:117–121, 124–125; Raphael and Tepper 2005:87–88). Although such recorded finds remain limited, they confirm two key things. First, small traction trebuchets remained in use during the thirteenth century, complementing larger counterweight trebuchets following the introduction of the latter. Second, quite large projectiles were employed from about the mid-thirteenth century—some stones greater than 70 kg appear to have been thrown to distances around 200 m by the final third of the century. While this might sound impressive, these stones carried far less energy than the shot of later gunpowder weapons (Fulton 2019a:707–712). For a visual representation of the power harnessed by the largest trebuchets of the late thirteenth century, one might view the south face of the great tower at Margat. Here, Qalawun's most powerful engines were capable of inflicting only minor cosmetic damage, small pockmarks dwarfed by the large cracks opened by subsequent earthquakes.[13]

It is often considered a matter of fact that large stone projectiles were used to smash holes in fortified walls. Such assumptions, however, are influenced by the power of later weapons. Even when throwing huge projectiles, a counterweight trebuchet could not harness anywhere near the amount of energy as could later siege guns. For example, a 100 kg (220

[10] By comparison, there are literally hundreds of instances in which strongholds are said to have been captured following successful sapping efforts or a general frontal assault launched without the assistance of artillery.

[11] For discussions of sieges in which artillery was used in the Levant during the twelfth and thirteenth centuries, see Fulton 2018.

[12] For a rare exception, see Nicolle 2004.

[13] See Kotán 2019:121–124. For the siege of Margat in 1285, see Ibn 'Abd al-Zahir, pp. 100–105; Baybars al-Mansuri, pp. 320–321; Abu'l-Fida', p. 12; Templar of Tyre 193 [429], pp. 166–167. See also Fulton 2018:284–289. For an analysis of earthquake damage at the castle, see Kázmér and Major 2010.

lb) projectile thrown at 45 m/s, which allows for a theoretical horizontal range of 200 m,[14] travels with 101,250 J of kinetic energy.[15] By comparison, a 24-pounder, loaded with only 12 pounds of powder, has a muzzle velocity of around 525 m/s, discharging a shot of just 10.9 kg with more than 750,000 J.[16] Muzzle velocity can be increased further if a larger charge is used or the barrel of the gun is lengthened. Likewise, if the caliber of the gun is enlarged, allowing for a heavier ball, accompanying adjustments can yield an even higher muzzle velocity and a shot that carries considerably more kinetic energy as both the mass and velocity of the projectile increase. Even if the muzzle velocity remains the same, the shot of a 68-pounder is dispatched with 4,250,730 J—the 100 kg stone thrown at 45 m/s, despite being more than three times heavier, carries less than 2.4% of this energy.

In addition to the quantity of energy carried by a projectile, there is also the efficiency with which this energy is transferred to consider. The high muzzle velocity of gunpowder weapons allowed them to shoot projectiles to great distances along a fairly flat trajectory. This resulted in a relatively efficient transfer of energy when these projectiles struck a wall or tower, the angle of impact being near perpendicular to the vertical face of the target. Trebuchets, which could generate only much lower release velocities, were forced to lob projectiles at a high angle to reach a target at any significant range—placing engines at a distance was often desirable to protect them from active defensive measures. Traveling along such a parabolic path, projectiles would fall at a reasonably steep angle, transferring only a small fraction of their kinetic energy if they struck a vertical plane, yielding limited damage.

The motives for constructing increasingly large and powerful trebuchets were a product of the same tradition that seeks to improve and enhance military technologies up to the present day. In much the same way that larger guns were usually capable of harnessing more energy than smaller guns, bigger counterweight trebuchets were capable of throwing larger stones at greater speeds than comparable smaller engines. The scale of the largest counterweight trebuchets was ultimately limited by the challenges associated with assembling their correspondingly large components. One engine brought to Acre from Crac des Chevaliers in 1291 was said to have been transported with the assistance of one hundred carts (Abu'l-Fida', p. 16). The engine was presumably moved in pieces and assembled in a suitable position outside Acre. Even allowing for a margin of exaggeration, this was probably one of the largest engines of this type ever employed in the Near East.[17]

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[14] $Rh_{max}=v^2/g$. If operating with a release angle (α) other than 45°, $h=(2v^2)(\sin\alpha)(\cos\alpha)/g$. Neither takes into consideration air resistance, the impacts of which vary due to environmental conditions.

[15] $Ek=1/2m\ v^2$.

[16] See Robins 1805:188–189. The method of calculating a gun's muzzle velocity was publicized in the eighteenth century by Benjamin Robins, engineer general to the East India Company. The example noted here is from a paper he delivered in 1747, one of a number collected and published by James Wilson, and subsequently reissued with further notes by Charles Hutton in 1805.

[17] For the possible positioning of this engine during the siege, see Fulton 2018:297.

Architectural Reaction

Contrary to suggestions otherwise, the introduction of the counterweight trebuchet did not lead to a radical change in the design of fortifications. As noted above, these seem not to have been particularly impressive engines at the end of the twelfth century. It was at this moment that a shift can indeed be seen toward the construction of larger and more expensive castles.

In the Kingdom of Jerusalem, Belvoir represents an early example of this trend. Work on the impressive stronghold began in about 1168 and was complete by the time Saladin attacked it in 1187.[18] Belvoir was one of a number of large castles in the Kingdom of Jerusalem by the late twelfth century, but it was perhaps the newest of these sizable fortresses. Whereas most other large castles were the product of gradual development and a series of successive construction programs,[19] Belvoir was instead the result of a single building effort, an enormous investment of resources on the part of the Hospitallers.

Most iconic 'Crusader castles' postdate Belvoir, and were constructed, at least in their present form, in the thirteenth century. These mighty castles include 'Atlit, Crac des Chevaliers, Margat, Beaufort, Montfort and numerous others. A shared aspect between these great strongholds, and most other impressive thirteenth-century castles, is that they were built, rebuilt, or otherwise developed into their current form (or latest Frankish phase) under the ownership of the wealthy military orders: the Templars, Hospitallers, and to a lesser degree, the Teutonic Knights. The considerable scale and strength of these new, stronger castles represent two critical elements: the considerable resources of their commissioners, and the political reality that emerged in the aftermath of Saladin's conquests between 1187 and 1189.

The military orders, with their vast networks of estates across Europe, had the resources to maintain and develop these great structures. Similarly, wealthy European crusaders, notably Holy Roman Emperor Frederick II and King Louis IX of France, were responsible for financing improvements to the defenses of certain coastal communities. By 1260, Julian of Sidon was a rare example of a baron who still possessed, and was thus responsible for the upkeep of a significant castle. That year, however, Julian sold both Beaufort and Sidon to the Templars (*Eracles* 34.3, 2:445).

Considerable investments in fortifications were required in the thirteenth century because the Kingdom of Jerusalem was significantly weaker, relative to the strength of its neighbors, than it had been earlier. Whereas the Franks had faced several smaller local powers in the first half of the twelfth century, regional authority was consolidated by Nur al-Din, who united Aleppo and Damascus in 1154 and gained nominal authority over Egypt from about

[18] For the Hospitallers' acquisition of the site, Delaville le Roulx 1894: No. 398, 1:271–272. For the siege of 1187–1189, with a focus on the use of artillery, see Fulton 2018:179–182.

[19] Two of the best examples of these are Montreal, founded in 1115, and Kerak, built from about 1142. Both had developed into significant castles by the time they fell to Saladin in the late 1180s.

the end of 1168. Saladin, who assumed power in Egypt on behalf of Nur al-Din in early 1169, later took control of Syria and much of northern Mesopotamia following Nur al-Din's death in 1174. Saladin's victory over the Franks at Hattin in 1187 led to the near collapse of the Kingdom of Jerusalem. The Third Crusade, large elements of which began arriving in 1189, helped ensure that the Franks retained control of a small strip along the Palestinian coast at the end of the twelfth century. Events in Syria over the next half-century were dominated by members of Saladin's family, the Ayyubids, and then the mighty Mamluks from late 1260, with the Franks a relatively weak neighbor. It was this imbalance of power that made it necessary for the Franks to build far stronger castles than they had before, while the wealth of the military orders and visiting crusaders made this possible. These strongholds had to be able to resist larger armies for longer periods of time, as the prospect of relief was far from what it had been in the days before Hattin (Fulton 2019b:235–242).

If this shift in defensive architecture was instead a response to the sudden appearance of extremely powerful artillery, we might expect to find obvious indications of this—none more so than a uniform thickening of walls. While some quite thick tower walls were indeed built in the thirteenth century, this was far from a universal trend and the thickness of curtain walls remained relatively constant (Fulton 2018:334–347; 2019b:242–249).[20] Many examples of very thick thirteenth-century walls are found supporting large towers, often with vast internal spaces, as is found in the very large inner towers of ʻAtlit (Johns 1947). This suggests that the thickness of such walls was due to structural considerations, including the potential effects of earthquakes, rather than the threat of artillery.[21] Other quite thick walls were the result of efforts to enlarge towers by encasing earlier ones, as was done by al-ʻAdil at the citadel of Cairo (Creswell 1952–1959:6–39), and the Mamluks later in the thirteenth century at both Subayba (Hartal 2001) and Montreal (Faucherre 2004). Elsewhere there are quite thick walls dating to the twelfth century and thin walls dating to the thirteenth.[22]

Similar trends are evident in Europe, where a number of great castles were built from about the end of the twelfth century. Like those constructed in the Near East, the most celebrated of these building projects were commissioned by those who possessed the most resources: Europe's great monarchs. Thanks to the efforts of Brown and Colvin (1963), we have a sense of such royal investments in the case of England. In the second half of the twelfth century, Henry II devoted between £6,000 and £7,000 to the development of Dover castle, far more than was spent on any other castle in England. These building efforts were continued by Richard I, who also dedicated enormous sums to the construction of Château Gaillard, on the right bank of the Seine between Paris and Rouen. Under Henry II and his sons, Richard I and John, more money was spent on castles than anything else in the

[20] Ronnie Ellenblum (2007:239–240) put forward an argument to the contrary; however, there are rather obvious issues with his selective choice of measurements. Building on Ellenblum's work, the arguments of Kate Raphael (2010) are no more convincing.

[21] For the region's seismic history, see Ambraseys 2009.

[22] For a survey of various Frankish fortified structures in the kingdom of Jerusalem, see Pringle 1997.

annual record of royal expenditure, accounting for an average of £780 per year at a time when the annual revenues of the Crown summed to less than £10,000. John's ineptitude, which among other things caused the loss of most English lands in France, precipitated quite real security threats. During his reign, the average annual expenditure on castles rose to £1000. Meanwhile, French royal authority and revenues rose significantly under Philip II of France, thanks in part to his conquest of considerable English territory in France. This facilitated a wave of French royal investment in fortifications.

As in the Levant, there are few indications that these building programs in Western Europe were inspired by the appearance of particularly powerful stone-throwing siege engines. European artillery seems to have developed in a very similar manner to that seen in the Near East during the twelfth century (Fulton 2016), while the thickness of fortified walls similarly continued to vary in England, France and elsewhere.[23] Likewise, conspicuously thick European walls dating to the twelfth and thirteenth centuries are most often associated with particularly grand towers; many of the most obvious twelfth-century examples are found at those castles that feature a keep.[24] At any site, fortifications were designed with a plethora of considerations in mind, many unique to the particular stronghold and the immediate circumstances that inspired its development.[25]

Value

If the above holds true, and the counterweight trebuchet was hardly comparable to later siege guns, and mechanical artillery was not responsible for the appearance of quite large castles from the end of the twelfth century, why, some might ask, were such engines used? I believe there are at least three reasons: (1) the counterweight trebuchet was still the most powerful ballistic siege engine of its day; (2) the relative power of these weapons gave them an added psychological value; (3) the prestige associated with the command of any great technology.

Relative Power

When assessing any description of artillery, a sense of context is imperative. Although the weapons that attackers had at their disposal improved, and the size of the stones and the force with which they were thrown grew, descriptions of artillery damage dating to the late thirteenth century often sound similar to many from the early twelfth century. Part of this is due to exaggerations, as authors attempted to communicate a sense of the experience to their

[23] For a survey of English castles built between the late eleventh and early seventeenth centuries, see Goodall 2011. For an introduction to French castles during the same period, see Mesqui 1991.

[24] For example, the walls of the great tower at Conisbrough, which date to the twelfth century, are much thicker than those of the later towers and curtain walls of the surrounding bailey, see Brindle 2012.

[25] For a discussion of various considerations, see Fulton 2019b:190–257.

readers. Regardless of whether an incoming stone was 10 or 100 kg, a quite imaginative report of its effects might follow if it was considered 'large'.

When looking beyond obvious exaggerations, authors' points of reference would have evolved as counterweight trebuchets grew larger. Consider that someone's idea of what a house 'destroyed' by artillery might look like today is inevitably different from that of someone who lived the better part of a millennium ago, and it will certainly differ from that of a person who lives in the distant future. Such relative perceptions of scale, danger and destruction also account for why descriptions of trebuchet damage often sound similar to accounts of the destruction wrought by later gunpowder weapons.[26]

Even if a counterweight trebuchet could not destroy the bulk of a fortified wall, such engines had an obvious value to besiegers. Throughout the twelfth and thirteenth centuries, the two areas most commonly linked to artillery damage are the battlements of walls and unfortified buildings within an enceinte (Fulton 2018). The traction trebuchet was foremost an antipersonnel weapon; hence, it makes sense that such engines, along with early counterweight models, would have targeted defenders along the parapet of a besieged stronghold. These weapons were capable of throwing larger stones to greater distances than could a person with a sling. While some projectiles would have struck the battlements, perhaps leaving an impression, others would have sailed high, threatening people and structures behind the town or castle wall. As the power of counterweight trebuchets developed, these weapons could be used to deliberately destroy battlements, exposing defenders and limiting their ability to mount an effective resistance.[27]

In addition to targeting defenders and the shelter provided by a crenelated parapet, it is possible that counterweight trebuchets were used to intentionally throw large projectiles over a stronghold's walls and into the enceinte. This could weaken the morale of defenders by eroding their sense of safety. Unfortified buildings were susceptible to damage, and there would be serious consequences if provisions were compromised. Indiscriminate destruction would also generate debris, which might disrupt the garrison's ability to move freely and coordinate defensive efforts.

Psychological Impact

Aside from inflicting physical damage, there is the psychological toll of raining stones to consider. If a 5 kg stone thrown by a traction trebuchet was scary to those manning defenses, or seeking shelter somewhere else, a 50 kg stone must have been that much more threatening. Many apparent exaggerations relating to artillery by contemporary authors seem to be attempts to communicate the drama and fear of these incoming projectiles.

[26] For a short selection of descriptions of the latter from the fifteenth century, see DeVries 1998.

[27] This function may have had even greater significance in Europe, where the use of wooden hoarding was relatively common.

Consider William of Tyre's account of Zanki's siege of Montferrand in 1137 (William of Tyre, History 14.28, 2:89):

> The very walls shook under the impulse of his mighty engines. Millstones and huge rocks hurled from the machines fell into the midst of the citadel, shattered the houses within, and caused intense fear to the refugees there. Great fragments of rock and all kinds of whirling missiles were hurled with such violence against them that there was no longer any place of security within the walls where the feeble and wounded might be hidden. Everywhere was danger, everywhere hazard; everywhere the specter of frightful death hovering before their eyes. Apprehension of sudden destruction and a sinister foreboding of disaster ever attended them.

Usama ibn Munqidh provides a few similarly illustrative anecdotes relating to the Byzantine-Frankish siege of Shayzar in 1138. Emphasizing a theme of fate, each episode details the unexpected death of a defender caused by an artillery projectile. In one, a man, who had just returned to the relative safety of the citadel from repelling a Byzantine assault, was killed when a stone hit him in the head as he answered the call of nature. Another was skewered when a highflying projectile broke a flagpole in two, causing the top half to fall on the unsuspecting victim as he crossed the citadel's main pathway. A third man, wounded in the leg by an initial projectile, was carried to a presumed place of shelter just outside the gates of the citadel, but was there killed when a second stone struck him in the head as he received care (Usama ibn Munqidh, pp. 125–126).

This general sense of danger due to incoming artillery projectiles contributes to the similarity between accounts across time. Those manning defenses or simply walking the streets were at risk of being hit by flying stones; others seeking shelter in buildings or trying to sleep must have questioned the strength of the walls around them and the roofs over their heads. So even if counterweight trebuchets posed only a limited threat to fortified walls, these engines were still quite useful; as they grew, so too did the impact and threat of their projectiles.

Prestige

A measure of prestige often accompanies the possession of something judged to be special, costly, or otherwise impressive. A skillfully forged sword might have conveyed a sense of martial prowess and wealth in the Early Middle Ages, much as a particularly fine suit of armor might have accomplished the same in the Late Middle Ages, while ownership of a castle projected a sense of power, authority and wealth on an entirely different scale. Siege engines were somewhere in between. Although closer to personal arms and armor in cost, these could be seen and appreciated by a wider audience, more like a castle. A great trebuchet communicated to onlookers that its commissioner was among a small group of individuals who had the resources and mastery of the technical ability required to build such an engine and was thus someone special.

The crusades provided a somewhat unique environment for a diverse assortment of European rulers to come together and besiege a common enemy in cooperative competition.

In such settings, which facilitated direct comparisons, demonstrations of grandeur and ability were uniquely powerful. Nowhere was this more evident than at Acre in 1191, where two of Europe's great monarchs, Philip II of France and Richard I of England, former allies and already emerging rivals, tried to demonstrate their greatness outside the city's walls. This practice, however, can be discerned even before the kings arrived in Palestine.

The great Frankish siege of Acre began in 1189, but the first push against the city with significant siege engines was made in the spring of 1190. This attack focused on the use of three siege towers; one was commissioned by Conrad of Montferrat, with the assistance of the Genoese, another by his political rival, Guy of Lusignan, and the third by Ludwig, landgrave of Thuringia, one of the first major figures of the Third Crusade to reach Acre (Ambroise, pp. 54–55; *Itinerarium* 1.36, pp. 84–85). The failure of this attack contributed to the besiegers' decision to shift to a strategy of employing artillery to support sapping efforts.

Siege activities intensified with the arrival of the kings of France and England in the spring of 1191. By this time, it seems to have become almost obligatory, or at least a marker of status, that the greatest figures have a noteworthy trebuchet. Philip II of France had a machine dubbed 'Bad Neighbor', which was repeatedly knocked out of action by one of the defenders' engines, which the crusaders called 'Bad Relation'. Hugh of Burgundy and Philip of Flanders each had a notable trebuchet, while the latter also had a smaller one. The Templars and the Hospitallers each had another. Most of the closest European sources to this siege were followers of Richard I, so it is perhaps unsurprising that the English king reportedly had two great stone-throwers, and another two *mangonels*, which are presented as lighter engines, probably smaller traction trebuchets. Following the death of the count of Flanders, his engines also passed to Richard, who used them to target one of the city's gates. Another trebuchet was funded communally by the broader army (Ambroise, pp. 76–77; *Itinerarium* 3.7, pp. 218–219).[28]

Almost three decades later, a similar scenario played out as members of the Fifth Crusade besieged Damietta. In the second phase of the siege, once the crusaders had crossed the Nile and began attacking the city's landward defenses, a number of impressive engines are identified, each with a variation of the term 'trebuchet'. Oliver of Paderborn (38, pp. 237–238) highlights a *trabuccus* commissioned by the Duke of Austria, while Roger of Wendover (2:250) mentions a noteworthy *trebuculus* belonging to the Templars. The *Eracles* account (32.8, 14, 2:337–238, 345) states that the *trabuchet* of the Hospitallers inflicted some damage, another of these engines was possessed by John of Brienne, and a third was funded communally, while a collection of *perrieres* and *mangoneaus* were also positioned around the city. The strange disagreement among the sources, which all highlight different figures in possession of noteworthy engines, may reflect differing biases, interests or influences. Whatever the case may be, there was again conspicuous prestige associated with the possession of a great trebuchet.[29]

[28] For the siege of Acre, with a focus on artillery, see n. 5 above. For the siege more generally, see Hosler 2018.
[29] For the siege of Damietta, with a focus on artillery, see n. 5 above.

Once more, we can find obvious European parallels. The best-known of all medieval trebuchets today is probably Edward I of England's 'War Wolf'. Before becoming king, Edward spent more than a year in the kingdom of Jerusalem in 1271–1272, though he engaged in no significant siege actions during his time in Palestine. As part of his later efforts to subjugate Scotland, Edward besieged Stirling Castle in April 1304, making use of several significant trebuchets, including the War Wolf. A letter sent with news of the siege relates that the garrison surrendered unconditionally a few months later, on 20 July. The king, however, refused to let his men take over the castle, or let the garrison leave, until the War Wolf had a chance to strike the stronghold (Bain 1884: No. 1560, 2:405).[30] This begs the question—one posed to me fairly regularly—why was Edward so intent on seeing this engine used before the siege ended? The answer seems simple: Edward wanted the chance to see this new engine in action, and he probably desired those accompanying him to witness this as well.

The War Wolf appears to have been a sizable weapon. According to financial records, payments were made on June 21 to five master carpenters, fifty carpenters and four pages who were engaged in its construction (Bain 1884: No. 1599, 2:420). The engine was evidently still not ready, or had at least not come into use, when the defenders declared their desire to surrender a month later. Many of the siege machines erected against Stirling castle had been brought from various places under the king's control; these engines were then disassembled and transported away after the siege.[31] This was thus Edward's opportunity to see how the War Wolf functioned before it was taken away to be stored somewhere.[32] There may also have been an element of performance in this. Rather than an effort to intimidate the garrison, and by extension the Scots—following their surrender, the defenders were imprisoned in English castles, giving them little immediate opportunity to share what they had seen—the demonstration seems to have been for the benefit of prominent figures accompanying the English army, including Edward's queen and her ladies. Forcing the defenders to remain in the castle may have provided an element of 'authenticity', though they appear not to have been in any danger.[33]

[30] For contemporary accounts of this siege, see Flores historiarum, 3:315–319; Peter of Langtoft, 2:354–359.

[31] For documentation relating to the movement of engines and components to and from Stirling, as well as the maintenance of these engines, see Bain 1884: Nos. 1491, 1498–1500, 1504, 1510, 1519, 1539, 1589, 1599, 1646, 1680, 1687, 2:387–90, 395, 400, 412, 420, 442, 452, 455. For the similar Mamluk practice of employing prefabricated trebuchets in the preceding decades, see Fulton 2015:65–72.

[32] Parts or fittings for a War Wolf were among a number of weapons to be turned over at Berwick in December 1306, Bain 1884: No. 1863, 2:497.

[33] This was a fairly minor punishment considering the garrison had held out against the king for at least three months. By surrendering unconditionally, they were at the mercy of the English king.

CONCLUSIONS

There is little evidence to suggest that medieval trebuchets were an effective means to bring down fortified walls. This was a task left to sappers—the figures who compromised the defenses of Nicaea in 1097, during the opening siege of the First Crusade, and those of Acre in 1291, the final siege of the crusading era in Palestine. Theories that instead present trebuchets as particularly destructive weapons tend to rely on literal readings of contemporary accounts, many of which, when evaluated alongside the mechanical physics and surviving material evidence, seem to contain clear exaggerations. Likewise, the discernable shift in defensive architecture from the end of the twelfth century was due to factors other than a sudden and significant rise in the power of mechanical artillery.

Although the destructive power of trebuchets was far from that of later siege guns, the relative power of such engines was still significant. This is why accounts of destruction dating to the late thirteenth century can sound very similar to others composed almost two hundred years earlier. Whether large or small, the stones thrown by these engines posed real dangers to those defending a besieged stronghold and others simply taking refuge within. For besiegers, a great trebuchet might help advance siege efforts, but there was also prestige and an opportunity to project a sense of power by commissioning such a grand engine. Although trebuchets were not siege guns, they were nonetheless quite useful siege weapons.

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