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Cemal KAFADAR • Gönül A. TEKİN

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Guest Editors
Selim S. KURU Baki TEZCAN

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WAR-WINNING WEAPONS? ON THE DECISIVENESS OF OTTOMAN FIREARMS FROM THE SIEGE OF CONSTANTINOPLE (1453) TO THE BATTLE OF MOHÁCS (1526)

Gábor ÁGOSTON*

Introduction

The Ottoman cannon conquest of Byzantine Constantinople (1453) and Ottoman victories at Çaldıran (1514), Marj Dabiq (1516), Raydiniyya (1517) and Mohács (1526) against the Safavids, Mamluks and Hungarians respectively, are often cited in the generalist literature – alongside the better-known European examples of the French re-conquest of English Normandy in the 1450s, the Spanish re-conquest of Granada in 1492, the French invasion of Italy in 1494-95, and the battles of Ravenna (1512) and Marignano (1515)— as examples of field battles and sieges where firearms played a decisive role.

Yet unlike Ravenna and Marignano, which altered European geopolitics only modestly, Ottoman victories against the Byzantines, Safavids, Mamluks and Hungarians led to major geopolitical shifts. The Ottoman conquest of Constantinople marked the end of the thousand-year-old Byzantine Empire. The battle of Çaldıran secured Ottoman rule over most of eastern and southeastern Asia Minor, the homeland of pro-Safavid and anti-Ottoman Kızılbaş tribes. This in turn pushed the Safavid Empire, originally a Turcoman confederation, to assume a Persian and Shia character and position itself as the main counterweight to Sunni Ottoman power in the region for the next two hundred years. Marj Dabiq and Raydaniyya marked the end of Mamluk rule in Greater Syria and Egypt, and the introduction of Ottoman rule in the Arab heartlands of Islam, including Mecca and Medina, with major consequences for the development of both the region and the Ottoman Empire itself. Mohács was the graveyard of the medieval kingdom of Hungary, and led to the direct confrontation of the two superpowers of the time, the Ottomans and Habsburgs, in central Europe. How important a role did gunpowder weapons play in these Ottoman victories? The following re-examination of selected sieges and battles attempts to answer this question.

Lessons from sieges: the value and limits of siege artillery

Although historians claim that from the mid-fifteenth century onward cannons played increasingly important role in sieges, the limited capacity of most states to manufacture large bombards capable of demolishing castle walls, the difficulties of hauling such heavy pieces over large distances and rough terrains, and chronic shortages of gunners, shots and powder, often rendered bombardments ineffective. Castles habitually surrendered not to the efficacy of barrages but for other, more prosaic, reasons: shortage of defenders, ammunition and food, demoralized defense, lack of relief force, and so on. This was the case even at the

* Georgetown University.

French bombardment of Castelnouvo in 1494, often cited as an example for the dramatic effectiveness of siege ordnance, where the French ran short of their famous iron cannon balls.[1]

Constantinople (1453)

The Ottomans' capability of deploying large cannons in significant numbers is usually cited as a crucial factor in their conquest of Byzantine Constantinople in 1453. Indeed, the besiegers deployed the largest cannons and siege train ever mobilized to that date.[2] Before the siege, Sultan Mehmed II's gun founders (both Muslim and Christian) cast some 60 cannons of various calibers in Edirne, the Ottoman imperial seat. Some of these cannons threw shots of 240, 300, and 360 kilograms. The chief Turkish artillery gunner, a man named Sarıca, cast a large piece weighing approximately 16,200 kg. This must have been similar to the large cast bronze piece on display in the Military Museum of Istanbul, which is 424 cm long, weighs fifteen metric tons, has a bore diameter of 63 cm, and fired shots about 195-285 kg in weight.[3] Other similar Ottoman guns are on display in front of the walls of Rumeli Hisarı on the European shore of the Bosporus Strait. According to recent measurements and estimates, these are 427 and 423 cm long, have bore diameters of 68 and 64 cm, and could have fired cut stone balls of 375 and 310 kg in weight respectively.[4] Even these, however, were surpassed by the sultan's largest bombard, cast by the Hungarian master Orban, which according to the somewhat contradictory testimonies of contemporaries, fired stone balls weighing between 400 to 600 kilograms.[5]

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1 Simon Pepper, "Castles and Cannon in the Naples Campaign of 1494–95" in David Abulafia, *The French Descent into Renaissance Italy, 1494-95: Antecedents and Effects*. Aldershot, Hampshire: Variorum, 1995, pp. 263–293.

2 Most of the contemporary sources used by historians to reconstruct the siege have been available in various editions and translations. See, for example, Kritovoulos, *History of Mehmed the Conqueror*. Transl. Charles T. Riggs. Princeton: Princeton University Press, 1954; Doukas, *Decline and Fall of Byzantium to the Ottoman Turks*. Transl. Harry J. Magoulias Detroit: Wayne State University Press, 1975; John R. Melville-Jones, *The Siege of Constantinople 1453: Seven Contemporary Accounts*. Amsterdam: Hakkert, 1973; Georgius Phrantzes, *The Fall of the Byzantine Empire: A Chronicle by George Sphrantzes, 1401-1477*. Transl. Marios Philippides. Amherst: The University of Massachusetts Press, 1980; Marios Philippides, *Mehmed II the Conqueror and the Fall of the Franco-Byzantine Levant to the Ottoman Turks: Some Western Views and Testimonies*. Tempe, Ariz: ACMRS/Arizona Center for Medieval and Renaissance Studies, 2007. From the literature see Steven Runciman, *The Fall of Constantinople, 1453*. Cambridge: Cambridge University Press, 1965; Kelly DeVries, "Gunpowder Weapons at the Siege of Constantinople, 1453" in Yaacov Lev ed., *War and society in the Eastern Mediterranean, 7th-15th centuries*. Leiden: Brill, 1997, pp. 343-362; Marios Philippides and Walter K. Hanak, *The Siege and the Fall of Constantinople in 1453: Historiography, Topography, and Military Studies*. Farnham, Surrey, England: Ashgate Pub. Co, 2011; Feridun Emecen, *Fetih ve Kıyamet, 1453: Istanbul'un Fethi ve Kıyamet Senaryoları*. Istanbul: Timaş, 2012.

3 Gábor Ágoston, *Guns for the Sultan: Military Power and the Weapons Industry in the Ottoman Empire*. New York: Cambridge University Press, 2005, p. 66.

4 Robert Douglas Smith and Kelly DeVries, *Rhodes Besieged: A New History*. Stroud: History, 2011, p. 50.

5 Philippides and Hanak, *The Siege*, pp. 413–25.

Byzantine Constantinople was protected by the Sea of Marmara from the south and east, whereas the Golden Horn guarded the city from the north. The Byzantines stretched a boom across the entrance to the harbor to deny the Ottoman fleet access to the Golden Horn. Sultan Mehmed II, who laid siege to the city on April 5, concentrated his forces along the city's western land walls. The Ottomans arranged their cannons in four batteries along the wall, each battery consisting of at least one large and two to three smaller pieces. The smaller pieces were used to test the proper range of fire for the bigger cannons. The Ottomans fired at the wall with multiple cannons so that the aims would form a triangle. The application of this effective firing technique demonstrates the prowess of the sultan's artillery gunners, among whose ranks were both Muslims and Europeans.[6]

In order to destroy Byzantine and allied ships sheltering in the harbor and guarded from the walls of Galata, the Ottomans, reportedly on the sultan's instructions, experimented with a "different sort of gun with a slightly changed design that could fire the stone to a great height, so that when it came down it would hit the ships amidships and sink them."[7] Although not unknown to contemporaries, historians of technology and military historians credit the Ottomans with developing the mortar –a shorter cannon that fired projectiles with parabolic trajectories, usually against targets protected by walls.[8] Whatever the damage of Ottoman mortars was, their constant operation at the port area further stretched the Byzantine defense, already diminishing in numbers, and thus played an important role in the Ottomans' ultimate success.[9] From the mid-fifteenth century onward, Ottoman gunners used mortars regularly, as the sieges of Belgrade (1456), Jajca (1464) and Rhodes (1480) demonstrated.

Despite all the bombardment – and mining, in which the Ottomans also excelled – the Byzantines were able to repair the damaged walls. It seems that Mehmed II's large bombards were unable to breach the massive Theodosian land walls, but constant bombardment required large numbers of defenders to protect and repair the walls. In the end it took a brilliant and unexpected maneuver on the part of the Ottoman sultan to bring the siege to a successful close. In the days leading up to April 23, 1453, the Ottomans portaged some 70 to 80 smaller ships overland into the Golden Horn from the Bosporus.[10] This was a serious blow for the Byzantines, who now had to allocate men and resources to defend the sea walls on

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6 Emecen, *Fetih*, pp. 246–7.

7 Kritovoulos, *History*, p. 51.

8 Ágoston, *Guns for the Sultan*, p. 68.

9 DeVries "Gunpowder Weapons," p. 360.

10 Using sheep and ox tallow as lubricants, the Ottomans portaged their ships on rollers possibly along the longer (12-13 km) land route that run from the Double Columns (Beşiktaş-Kabataş) to where today the third bridge over the Golden Horne is located (opposite Eyüb), and not along the usually accepted shorter (2-3 km) Tophane-Taksım-Kasımpaşa route, which the Byzantines certainly would have detected. Also, the Ottomans had started the construction of some thirty bigger ships well before the siege in a creek near Beşiktaş. On the possible routes and the relevant sources see Feridun M. Emecen, *İstanbul'un Fethi Olayı ve Meseleleri*. İstanbul: Kitabevi, 2003, pp. 38–43.

the Golden Horn. The maneuver further stretched the already overwhelmed defense, which succumbed to the final assault on May 29.

While Sultan Mehmed II's artillery gunners, miners and sappers all played important roles in breaching Constantinople's walls, traditional siege engines (trebuchets, siege towers, etc.) remained important. Weapons alone were not sufficient to carry the Ottomans to victory; careful planning, resourceful leadership, numerical superiority (70,000 Ottomans versus 10,000 defenders), better logistics (abundant supplies in weaponry and food), cutting edge military technology, prowess in siege warfare, and lack of Byzantine relief forces all proved crucial in the eventual Ottoman victory.

Similarly, one should be careful not to overstate the importance of European renegade gunners. Mehmed II had several Turkish artillery gunners, including one named Sarıca who was a seasoned and experienced master gunner. Already in 1444, he had been the chief Ottoman gunner and proved instrumental in providing artillery cover for the Ottoman Asian troops during their crossing to Europe in order to meet a crusading army that threatened the very existence of the nascent Ottoman state. According to a contemporaneous Turkish anonymous chronicler, Sarıca's cannons managed to sink a crusader ship that tried to block the Ottomans' crossing at the narrowest point of the Bosporus. This demonstrates that by that time Ottoman artillery gunners were capable of using their cannon successfully against moving targets, still a rare skill in those days. More importantly, the operation was a carefully coordinated maneuver of Ottoman artillery deployed on both the Asian and European shores of the Bosporus, and as such may be the very first example in history for the use of coordinated fire of coastal artillery from both shores of the straits to disable an enemy fleet.[11]

Belgrade (1456) and Jajca (1464)

Firepower, even in combination with several of the above-named advantages, was still insufficient if a relatively strong relief army with superior leadership arrived in time and other factors worked against the besiegers. A case in point is Mehmed II's siege of Belgrade

[11] On Sarıca see Halil İnalcık and Mevlûd Oğuz eds., *Gazavât-ı Sultân Murâd b. Mehemmed Hân: İzladi ve Varna savaşları (1443-1444) üzerinde anonim Gazavâtnâme*. Ankara: Türk Tarih Kurumu, 1978, pp. 47–8. On the operation see also Zaifi, *Gazavat-i Sultan Murad Ibni Muhammad Han*. Afyon İl Halk Kütüphanesi Gedik Ahmet Paşa Bölümü no.18349, 51/a, as summarized in Gürol Pehlivan, "Varna Savaşı ve bir tarih kaynağı olarak Gazavatnameler," *Turkish Studies. International Periodical for the Languages, Literature and History of Turkish and Turkic* vol. 3. no. 4 (2008), p. 607, and Jehan de Wavrin's chronicle, which is based on the memoirs of his nephew, commander of the Burgundian ships in the Bosporus Straits in 1444. The latter claims that the cannons that the Ottomans deployed were delivered to them by the Genoese of Pera. The relevant section of Jehan de Wavrin's chronicle is available (in English translation) in Colin Imber, *The Crusade of Varna, 1443-45*. Aldershot: Ashgate, 2006, p. 128. See also John Jefferson, *The Holy Wars of King Wladislas and Sultan Murad: The Ottoman-Christian Conflict from 1438-1444*. Leiden: Brill, 2012, pp. 339–40.

in 1456.[12] The key stronghold of the Hungarian southern defense system since 1427, Belgrade lay at the confluence of the Danube and Sava Rivers on a hill, and was protected by the two rivers from the north/northeast and the west, respectively. A double wall and a deep moat guarded the castle's southern landward side, adjacent to which lay the fortified town. The Ottomans deployed their troops against this most vulnerable side of the fortress. Mehmed II again deployed one of the most powerful artillery trains of his time, consisting of large bombards, siege engines and field pieces, commanded by Turkish, German, Italian, Bosnian and Dalmatian artillery gunners and engineers. The sultan's ships blocked the Danube northwest of Belgrade, in order to prevent the approaching relief force of János Hunyadi, captain general of Hungary, from reaching Belgrade via the river. Hunyadi's 10,000 troops were joined by some 18,000 crusaders, recruited from Hungary on the authorization of Pope Callixtus III (1455–1458), and led by the Franciscan friar Giovanni da Capistrano. However, these were mainly poorly armed peasants, inexperienced in war.

The 50,000-strong besieging army –including, according to Capistrano's secretary Giovanni da Tagliacozzo, some 5,000 elite Janissaries— greatly outnumbered the defenders: 6,000 soldiers and 2,500 crusaders. The Ottomans were superior to the defenders in terms of their artillery, too. The sultan's troops deployed seven mortars and 22 large bombards. The largest bombards are said to have been 32 palms (224 to 288 cm) in length and 7 palms (49 to 63 cm) in width. Although shorter, these pieces were similar in caliber to the largest bombards that the sultan had used in 1453 against Constantinople. In addition, Mehmed II also had between 140 and 200 smaller pieces. Western sources called these weapons *huffnitzbugschen* and *pixides*.[13] Both terms denoted smaller field guns in the mid-fifteenth century, but the former specifically referred to the guns (*haufnice*), which the Hussites of Jan Žižka and later the Czech mercenaries of Hunyadi used on their wagons and wagon fortress (*Wagenburg*), another example for Ottoman-European military acculturation.

In 1456, the cannons were deployed in three batteries protected by earth-filled gabions. The heavy bombardment that started on July 4, quickly broke most walls down to the ground, destroyed several bastions, and allowed the besiegers to capture the outer watchtowers. There was shortage of food in the city and an outbreak of plague claimed lives

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[12] The following draws on Gábor Ágoston, "La strada che conduceva a Nándorfehérvár (Belgrade): L'Ungheria, l'espansione ottomana nei Balcani e la vittoria di Nándorfehérvár" in Zsolt Visy ed., *La campana di mezzogiorno: saggi per il Quinto Centenario della bolla papale.* Budapest: Edizioni Universitarie Mundus, 2000, pp. 203–50. For a short English version see Gábor Ágoston, "The Road Leading to Nándorfehérvár," Zsolt Visy ed., *A déli harangszó Magyarországon és a nagyvilágban/The Noon Bell in Hungary and the World.* Budapest: Zrínyi Média, 2011, pp. 15–26. See also, Ödön Bölcskey, *Capistranói Szent János élete és kora.* 3 vols. Székesfehérvár: Debreczenyi István Könyvnyomdája, 1924, vol. 2, pp. 282–345, and Lajos Elekes, *Hunyadi.* Budapest: Akadémiai Kiadó, 1952, pp. 438–79. Both used all the then available western sources.

[13] On August 3, 1456, one anonymous source reported from Vienna that the Turks lost "bombardas 22, maximas 32 palmas in longum et in latum 7, et huffnitzbugschen 200 et ultra." Similar information is reported from Vienna by Georgius de Welche: "Lucrati etiam sunt Bombardas magnas, quorum longitudo 32 palmarum, latitodo...7 palmarum, parvas autem pixides 140." See Bölcskey, *Capistranói Szent János élete és kora*, vol., 2, p. 342.

in the hundreds. However, on July 14 Hunyadi managed to break through the blockade of the Ottoman ships in a fierce five-hour fight, and entered Belgrade with part of his army to reinforce the garrison, which now numbered around 12,000 men. Hunyadi deployed the crusaders on the island across the River Sava, opposite Belgrade, which Mehmed II had failed to occupy despite the recommendation of his commanders.

After their failure to prevent the reinforcement of the garrison, the Ottomans bombarded Belgrade with even greater force. On July 21, the sultan ordered a general assault. Before it could begin, Hunyadi managed to bring some additional 4,000 crusaders into the castle, yet the overwhelming force of the besiegers soon broke the defenders' resistance, and the Ottomans entered the outer bailey. Hunyadi carried out two counterattacks from the inner bailey with his heavy cavalry and repelled the attackers. Around midnight, the sultan ordered his soldiers to assault the castle once again, but by morning of July 22, the defenders, reinforced by fresh crusaders from the island, had prevailed. Thrilled with their victory, around noon the crusaders sallied forth from the outer bailey and attacked the troops on the Ottoman left flank. Encouraged by this development, the crusaders waiting on the far bank of the River Sava crossed the river and joined them. The sultan sent reinforcements to his left flank, but at the cost of weakening the guard of his cannons. Hunyadi seized the opportunity and captured the Ottoman cannons left unguarded, and turned them against the besiegers. The defenders of Belgrade also fired their cannons, killing the Ottoman attackers in large numbers and destroying their tents. In light of heavy losses suffered in the assaults and the final battle, as well as to the plague, Mehmed II lifted the siege.

The importance of a sizeable relief force was once again demonstrated in 1464, during Sultan Mehmed II's unsuccessful siege of the Hungarian-held castle of Jajca in Bosnia. It seems that the Ottomans had less powerful artillery train, too. Sources mention six cannons, cast *in situ* before the siege from material brought there by the army. Apart from insufficient artillery and strong defense, it was the approaching relief army of some 10,000 to 15,000 men, led by the King Matthias Hunyadi of Hungary (r. 1458–90), which forced the sultan to lift his siege after 39 days.[14]

Lessons from the battlefield: the importance of the *tabur* and other factors

Çaldıran (1514)

At Çaldıran, the Ottomans might have significantly outnumbered the Safavids, though modern estimates of about 100,000 Ottoman troops versus 40,000 Safavid ones seem exaggerated on both sides.[15] While contemporaries put the number of Janissaries between

[14] Péter E. Kovács, "Jajca 1464. évi ostroma." in Gábor Hausner ed., *Az értelem bátorsága. Tanulmányok Perjés Géza emlékére*. Budapest: Argumentum, 2005, pp. 403–18.

[15] M. Moukbil Bey, *La Campagne de Perse (1514)*. Nancy-Paris-Strasbourg: Berger-Levrault, 1928, pp. 27–8, 48–55; Adel Allouche, *The Origins and Development of the Ottoman-Safavid Conflict (906-962/1500-1555)*. Berlin: K. Schwarz Verlag, 1983, p. 120; Roger Savory, *Iran Under the Safavids*. Cambridge: Cambridge University

12,000 and 20,000 men,[16] a recently discovered roll call listed only 10,065 Janissaries before the battle, and gave the total number of the sultan's household (*kapukulu*) troops as 16,332 men.[17]

The provincial cavalry that Sultan Süleyman mobilized for his campaign against the Hungarians twelve years later in 1526 numbered about 45,000 men (see below), and it is unlikely that Sultan Selim's *timariot* cavalry troops outnumbered them, given the smaller territory and population of the empire at the time of Çaldıran. With irregular *azab* infantry, *akıncı* cavalry as well as Kurdish and Türkmen horsemen from eastern Anatolia, Selim's army could have reached about 60,000 to 70,000 men.

On the other hand, a detailed Ottoman report from July 1516, based on information provided by one of Shah Ismail's former commanders who sided with the Ottomans in 1516, estimated the effective military strength of Shah Ismail at about 18,350 men, noting that at Çaldıran the shah had 2,000 additional guards.[18] The troops of the Safavid governors of Balkh, Herat and Qayin said to have been absent in 1514 due to the fact that they had to guard the northeast frontier against the Sunni Shaybanid Uzbeks.[19] This suggests that the strength of the Safavid army at Çaldıran was probably closer to 20,000 men than 40,000 men.

As to Ottoman firepower superiority: Safavid accounts put the number of gun-bearing Ottoman infantry at 12,000 men, of which 5,000 to 6,000 fired volleys at a time, and those of

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Press, 1980 (reprint 2007), p. 41. Safavid sources reflect a much greater disparity: 12,000 to 20,000 Safavid troops versus 120,000 to 212,000 Ottomans. See Allouche, ibid., and Ghulam Sarwar, *History of Shah Ismail Safawi*. Aligarh: Muslim University, 1939, pp. 78–80. Modern Iranian historians also repeat these numbers. See, e.g., Nasrullah Falsafi's 1953 lengthy article, which, as noted by Allouche (p. 116), is based in large part on Moukbil Bey. I am using Falsafi's Turkish translation in Vural Genç, *İranlı Tarihçilerin Kaleminden Çaldıran (1514)*. İstanbul: Bengi Yayınları, 2011, pp. 63–164. Modern Turkish historians, on the other hand, give much closer numbers: 40,000 Safavid troops versus 60,000 Ottoman troops. See Feridun M. Emecen, *Zamanın İskenderi Şarkın Fatihi Yavuz Sultan Selim*. İstanbul: Yitik Hazine Yayınları, 2010, p. 120.

16 Sarwar, *History*, p. 80. Ghiyas al-Din Khvandamir's *Habibu's-Siyar* (HS), which narrates the history of the Safavids through 1524 and Hasan Beg Rumlu's *Ahsenü't-tevarih* (AT) that chronicles Safavid history through 1577, mentioned 12,000 matchlockmen and put the number of the Ottoman cavalry at 212,000 and 200,000 men, respectively. See Khvānd Mīr, Ghiyās al-Dīn ibn Humām al-Dīn, *Habibu's-Siyar*. Translated and edited by W. M. Thackston. Tome Three. The Reign of the Mongol and the Turk. Part Two: Shahrukh Mirza-Shah Ismail. Cambridge, Mass.: Department of Near Eastern Languages and Civilizations, Harvard University, 1994, p. 605, and Genç, *Çaldıran*, pp. 29-31, 48–9.

17 İstanbul, Başbakanlık Osmanlı Arşivi (BOA), Maliyeden Müdevver Defterleri (MAD) 23. The distribution of the household troops was as follows: 10,065 Janissaries, 1,640 *sipahi*, 1,758 *silahdar* 1,864 men of the four cavalry regiments, 378 armorers (*cebeci*), 293 artillery gunners (*topçu*), and 334 gun carriage drivers (*top arabacı*). For the detailed data see Gábor Ágoston, *Osmanlı'da Strateji ve Askeri Güç*. Transl. M. Fatih Çalışır. İstanbul: Timaş, 2012, pp. 177–8.

18 İstanbul, Topkapı Sarayı Müzesi Arşivi (TSMA) E. 11996, published in transcription, facsimile and translation in Jean-Louis Bacqué-Grammont, *Les Ottomans, les Safavides et leurs voisins: contribution à l'histoire des relations internationales dans l'Orient islamique de 1514 à 1524*. Istanbul: Nederlands Historisch-Archaeologisch Instituut, 1987, pp. 178–86. On the informant, a certain Mehmed Başı Büyük, see İstanbul, TSMA E. 11839, published in Bacqué-Grammont, *Les Ottomans*, pp. 176–8.

19 Sarwar, *History*, p. 79.

cannons between 300 and 500.[20] These are exaggerated figures. Based on sources regarding the number of deployed hand firearms in the Ottoman army in near contemporary campaigns, it is reasonable to suppose that at Çaldıran only 2,000 to 4,000 Janissaries carried *tüfek*, which then denoted the arquebus.[21] The 293 artillery gunners present in the battle could have served some 100 smaller field pieces with the help of the Janissaries and the 334 gun carriage drivers.[22] Despite the oft-perpetuated "Sherly myth," which claims that the Safavids owed the widespread adoption of firearms to two English adventurers, the Sherley brothers, it has long been established that the Safavid use of firearms predates the reign of Shah Ismail. However, the sources do not mention firearms in the Safavid camp in 1514.[23]

Safavid chroniclers also emphasized the importance of the Ottoman wagon laager, consisting of shields and gun carriages chained together, and strengthened by a line of camels and mules, also tied together. In all likelihood, the Ottomans acquainted themselves with the Hussite *Wagenburg* tactic in the early 1440s, during their wars against the Hungarians under János Hunyadi. The *Wagenburg* or "wagon fortress," perfected by the Hussites in Bohemia during the Hussite wars (1419-36), was a defensive arrangement of "war wagons," chained together, protected by heavy wooden shielding, and manned with crossbowmen and gunners. Hunyadi had learned the *Wagenburg* tactic in Bohemia, fighting against the Hussites in the service of King Sigismund of Luxemburg. When preparing against the Ottomans in March 1443, he ordered the artisans of the Saxon town of Kronstadt (Braşov in modern Rumania) to send him "war wagons furnished with guns, arquebuses and other war-machines," made according to the instructions of a certain Bohemian artisan. In the end, Hunyadi deployed some six-hundred taborite war wagons in his winter campaign of 1443-44. In the 1444 Varna campaign, sources put the number of wagons in the crusaders' camp at 2,000, most of which the Ottomans captured in the battle, along with the aforementioned *huffnitzbugschen* or small guns, used on these wagons by the Hungarians in 1444 and by Mehmed II during his siege of Belgrade in 1456. The Ottomans named their

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20 Khvānd Mīr, *Habibu's-Siyar*, pp. 605-606, and Sarwar, *History*, p. 80.

21 For the 1522 Rhodes campaign the Ottomans transported 4,500 small guns and 1,000 trench guns. See Nicolas Vatin, *L'Ordre de Saint-Jean-de Jérusalem, l'Empire ottoman et la Méditerranée orientale entre les deux sièges de Rhodes, 1480-1522*. Paris: Peeters, 1994, pp. 484, 488. In the 1526 Mohács campaign the army had 4,000 small guns and 60 trench guns (see below). The number of Janissaries closest to the above years was as follows: in 1522-23 the imperial treasury paid 7,010 Janissaries, whereas their number was 9,390 in 1524-25. See Ágoston, *Osmanlı'da Strateji*, pp. 178–9. These data indicate that about half of the Janissaries could have carried firearms in 1522 and 1526.

22 The most commonly used Ottoman field pieces (*darbzen*) required three gunners and two carriage drivers. Feridun Emecen (*Yavuz*, p. 123) estimated the number of cannons at 150, and that of the Janissaries at 2,000. The latter figure is based on a captions of a late sixteenth-century fresco of the battle of Çaldıran, found in Palermo, which put the number of Ottoman troops at 70,000, and that of the gun-bearing soldiers at 2,000. However, this source does not mention the gun carriages, which played an important role in the battle. See Mirella Galletti, "La bataille de Čālderān dans un tableau du XVI[e] siècle," *Studia Iranica*, XXXVI, 2007, p. 74.

23 See, for instance, Roger Savory, "The Sherley Myth," *Iran* 5 (1967), pp. 73-81, and Rudi Mathhee, "Firearms in Persia," in Ehsan Yarshater ed., *Encyclopaedia Iranica*, vol. 9. New York: Bibliotheca Persica Press, 1999, pp. 619–28.

defensive wagon fortress *tabur*, after the term *szekér tábor*, the Hungarian name of Wagenburg.[24]

Safavid sources of the battle of Çaldıran described the Ottoman *tabur* as an old and known Ottoman tactic, and likened it to an impenetrable "strong fortress," which protected the sultan and his elite Janissaries. When the Safavid cavalry charges pushed the Ottomans back, it was to this "fortress" that the Ottomans retired, and soldiers beyond the *tabur* successfully "maintained the integrity of their stronghold." Passages in one of the Safavid chronicles stating that the Ottomans brought "their matchlockmen to the fore," and "they took the offensive" might suggest the first reported offensive use of the *tabur*, though this claim needs further examination.[25]

While the presence of cannon and matchlockmen in the Ottoman army played crucial role in stopping renewed Safavid cavalry charges and decimated the enemy, the Safavids' defeat was equally attributable to their own tactical miscalculations. Safavid commanders familiar with the Ottoman *tabur* tactic suggested that they attack before the Ottomans manage to arrange their wagon laager, and avoid any frontal attack against the fortified Ottoman camp. However, Shah Ismail rejected this proposition, adding that he was not "a caravan-thief, and whatever is directed by God," would occur.[26] In short, in addition to Ottoman firearms and *tabur*, Ottoman numerical superiority, the Safavids' tactical errors and warrior ethos were also factors in determining the outcome of the battle.

Marj Dabiq (1516) and Raydaniyya (1517)

Unlike the Safavids at Çaldıran, the Mamluks employed dozens of field pieces and troops trained in the use of arquebus at Marj Dabiq (August 23, 1516), but they could not match the firepower of Selim's army. The Ottoman sultan deployed some 100 to 150 field artillery, possibly *darbzens*, and about 2,000 matchlockmen.[27] The Venetian consul in Alexandria

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[24] Gábor Ágoston, "15. Yüzyılda Batı Barut Teknolojisi ve Osmanlılar," *Toplumsal Tarih* 18. (Haziran 1995), pp. 12–3; Ágoston, *Guns*, p. 18. See also Constantin Emanuel Antoche, "Du tabor de Jan Žižka et de Jean Hunyadi au *tabur cengi* des armées ottomanes. L'art militaire hussite en Europe orientale, au Proche et au Moyen Orient (XVe-XVIIe siècles), *Turcica* 36 (2004), pp. 91–124.

[25] Khvānd Mīr, *Habibu's-Siyar*, pp. 605-606; also *Zayl-i Habibu's Siyar* (ZHS, also known as *Tarikh-i Shah Ismail wa Shah Tahmasp*), which is a continuation of HS by Amir Mahmud ibn Khvandamir, son of the author of HS, and narrates the events up to 1550. Genç, *Çaldıran*, p. 37.

[26] The story is told in the ZHS and AT (Genç, *Çaldıran*, pp. 37, and 48–9.), and Iskandar Munshī, *The History of Shah 'Abbas the Great (Tarik-e 'Alamara-ye 'Abbasi)* 2 vols. Translated by Roger Savory. Boulder, Colo: Westview Press, 1978, vol., 1, p. 68. It is also cited in most modern works, see, e.g., Savory, *Iran Under the Safavids*, p. 41, and Sarwar, *History*, p. 80. Shah Ismail's ancestor, Uzun Hasan, made the same tactical mistake against the Ottomans in the battle of Bashkent (1473), despite the fact that he, too, was familiar with the *tabur* tactics.

[27] David Ayalon, *Gunpowder and Firearms in the Mamluk Kingdom: A Challenge to a Mediaeval Society*. 2nd edition. London: Frank Cass, 1978, pp. 125–6, note 206, cited the Damascene chronicler Ibn Tulun, who mentioned that the cannons on the Ottoman carts fired led projectiles of the size of a fist. This also points to smaller field pieces. Emecen, *Yavuz*, 217, estimated 150 cannon and 2,000 matchlockmen. He also mentioned (p.

reported that the Mamluk Sultan al-Ghawri left Cairo for Syria with 25 to 30 cannons and 15,000 Mamluks and *awlad al-nas*. The latter, descendants of manumitted Mamluks and members of the Muslim military elite, were known to have been trained in the use of firearms.[28] Even with added cannons acquired from Syria and arquebusiers under Mamluk commanders, Mamluk firepower lagged behind that of the Ottomans. Moreover, the Ottoman wagon laager, which the Damascene chronicler Ibn Tulun described as a fortified wall, enhanced the effectiveness of Ottoman firepower. The Mamluk cavalry proved unable to penetrate the *tabur*.[29]

Yet in addition to firearms and *tabur* tactics, other factors also worked for the Ottomans and against the Mamluks. These included the multi-front threats from the Portuguese, Safavids and Ottomans that strained Mamluk resources, financial and social tensions and the resulting rivalry between the various Mamluk troops, and the insubordination of some forces. Among the more immediate factors one can mention Ottoman numerical superiority,[30] sultan al-Ghawri's death (possibly of a stroke) half way through the battle, the looting of the Ottoman camp by some Mamluks and the disorder it caused, and the desertion of Kha'ir Bey, the last Mamluk governor of Aleppo, who changed sides with his troops during the battle.[31]

The role of Ottoman firearms and Wagenburg in the battle of Raydaniyya (January 22, 1517) seems less decisive, though still important. Al-Ghawri's successor Sultan Tumanbay learned the lessons of Marj Dabiq and decided to use defensive tactics against the approaching enemy, based on entrenched positions, firearms, and the adaptation of the Ottoman *tabur*. Through their spies the Mamluks had information about the size and nature of Selim's forces, which numbered only about 20,000 men and must have been exhausted after a more than four-month-long march across the Sinai desert and continuous harassment by the Bedouins.[32] With their entrenched positions and cannons the Mamluks,

245) that when in late December Sultan Selim visited Jerusalem he was guarded by 1,000 *tüfekçi* Janissaries and 500 household cavalry.

28 Robert Irwin, "Gunpowder and Firearms in the Mamluk Sultanate Reconsidered," in Michael Winter and Amalia Levanoni eds., *The Mamluks in Egyptian and Syrian Politics and Society*. Leiden: Brill, 2004, p. 133.

29 Adai-i Şirazi' *Selimname* also likened it to fortress walls (Emecen, *Yavuz* 218.) Referring to İdrîs Bitlîsî's *Selim Şah-nâme* (Ed. by Hicabi Kırlangıç. Ankara: Kültür Bakanlığı, 2001), Feridun Emecen claimed that the Ottomans used their laager offensively (*Yavuz*, p. 225). However, I could not find proof for this in the referred section of the source (pp. 314–5).

30 Although Emecen thought that the forces were about equal (50,000 to 60,000 men on both sides), Mamluk sources and modern studies mention much smaller numbers for the Mamluks (30,000 or even as few as 5,000 to 7,000 men). See Irwin, "Gunpowder," p. 134.

31 Irwin, "Gunpowder," p. 136.

32 The Ottomans captured one of the Mamluk spies after the battle of Raydaniyya. During his interrogation, the spy confessed that he visited the Ottoman camp on two separate occasions as seller of dates and cheese, respectively. He later passed the information he gathered about the Ottoman army to Tumanbay. See Emecen, *Yavuz*, p. 254, based on an unpublished report (İstanbul, TSMA E. 4800).

whose troops could have numbered about 20,000 men,[33] hoped to surprise Selim. Thus, Tumanbay had prepared trenches and gun emplacements at Raydaniyya. He gathered cannons from the citadel of Cairo and Alexandria, although an Ottoman inventory from March 1517 still listed 105 guns in each of the fortresses of Rashid and Alexandria, which suggest that Tumanbay was unable to transport all available cannon to Raydaniyya.[34] According to Mamluk sources, Tumanbay sent a hundred carriages to Raydaniyya, each armed with a small copper cannon and drawn by a pair of oxen. He also had two hundred matchlockmen at his disposal, mainly Turkomans and Maghrebis.[35] The small number of handguns found in Rashid by the Ottomans after the battle also indicates that Tumanbay must have collected most of them during his preparation for the fight with Sultan Selim. Ottoman sources mentioned some 200 guns in the Mamluk army, and claimed that most of Tumanbay's artillerists and arquebusiers came from Europe.[36] The term *prangı* that the Ottoman chroniclers used for the Mamluk artillery pieces refers to small-caliber guns (firing projectiles of 150 g in weight or smaller), and it is also possible that most of these were larger handguns, rather than cannon proper.[37]

From their spies and from Mamluk soldiers captured during reconnaissance raids, the Ottomans learned about Tumanbay's plans, and altered their tactics accordingly.[38] On the day of the battle the Ottoman army marched in good order against the Mamluks. However, before they reached the range of fire of the enemy cannons, the Ottomans turned to the side in order to outflank the Mamluk gun emplacement. Surprised, the Mamluks were unable to adjust their ranks to the new situation quickly enough. In their effort to do so they had to come out of their trenches, and thus were vulnerable to Ottoman matchlockmen and artillery, some of which had previously been moved to the Ottoman left flank. Now, all these cannon fired simultaneously at the exposed Mamluks and their trenches. The Janissaries, too, fired at the enemy, while advancing toward them. Although the Mamluks were successful in sending reinforcements to their right flank, most of their cannons were dispersed by the cavalry charge of the Rumelian *sipahis*, and did little damage in the Ottoman ranks. While on the flanks mutual cavalry charges continued for some time with severe losses on both sides, it seems that the Mamluk right wing and center eventually

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33 Contemporary Ottoman chroniclers estimated the size of the Mamluk forces between 20,000 and 30,000 men. The heavy Ottoman losses in the battle also suggest substantial military strength on the Mamluk side.

34 İstanbul, TSMA D. 5641, pp. 1–4, published by Feridun Emecen, "Ortadoğuda askeri gelişme: Osmanlı-Memlük rekabətinde ateşli silahlar," in Feridun M Emecen, *Osmanlı Klâsik Çağında Savaş*. İstanbul: Timaş, 2010, pp. 82–6. In Rashid, in addition to 29 handguns (*tüfek*) there were 28 cannon (*top*), 57 *darbzens*, 13 *şaykas*, and 7 *prangıs*. In Alexandria they registered 5 big copper cannon, 39 big iron cannon, 18 iron *darbzens*, 5 iron *şaykas*, and 38 old, disabled iron *darbzens*. On the Ottoman *şayka* and *darbzen* guns see Ágoston, *Guns*, pp. 74–7, 83–5, and Salim Aydüz, *XV. ve XVI. yüzyılda Tophâne-i Âmire ve top döküm teknolojisi*. Ankara: Türk Tarih Kurumu, 2006, pp. 344–50, 373–82.

35 Ayalon, *Gunpowder*, pp. 52, 84–5.

36 Emecen, *Yavuz*, p. 256.

37 Ágoston, *Guns*, p. 87; Aydüz, *Tophâne-i Âmire*, p. 394.

38 Mamluk sources credit this to the treachery of Janbardi Ghazali, former Mamluk governor of Damascus.

collapsed under the coordinated attack of the Ottoman artillery, arquebusiers and cavalry.[39] In short, in addition to Ottoman firepower, it was the Ottomans' successful tactics of outflanking, which in turn was based on good intelligence about Mamluk battle plans, which won the day for the Ottomans.

Mohács (1526)

Contrary to received wisdom, the Ottoman victory at Mohács was not a story about the victory of a more modern Ottoman military over an obsolete Hungarian army made up of feudal heavy cavalry. A recently (re-)discovered report suggests that the troops that reached Mohács under the command of King Louis II of Hungary (1516–26) had many of the traits of a "modern" army. It was a mixed army of cavalry (circa 16,000 men) and infantry (circa 10,000 men) armed with handguns (*scopietieri*), pikes (*armati con picha*) and large shields of the Bohemian type. The artillery consisted of 85 cannon (*tormenta maiora bellica*) and 600 smaller Praguer hook-guns (*barbatos Pragenses*), and was accompanied by 5,000 wagons that could be used as *Wagenburg*.[40] While the Ottoman chronicles describing the battle gave the impression, popularized later in the secondary literature, that the bulk of the Hungarian army consisted of obsolete heavy cavalry, it is obvious from the sources that part of it was light cavalry, perfectly suited to fight the Ottoman *sipahi* horsemen.

However, the Ottomans greatly outnumbered the Hungarians. The bulk of the Ottoman army consisted of provincial cavalry forces, the timariot sipahis and their *cebelü* retainers, who in 1526 could have numbered some 70,000.[41] Of these, about 45,000 sipahis

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[39] Emecen, *Yavuz*, pp. 258-261.

[40] Although first published by František Palacký in 1838, the reports of the Papal legate, Antonio Burgio, have been forgotten and were re-published recently by Antonín Kalous, "Elfeledett források a mohácsi csatáról. Antonio Burgio papi nuncius jelentései és azok hadtörténeti jelentősége," *Hadtörténelmi Közlemények* (henceforth, *HK*) 120 (2007), 603–22. All the other important sources (Latin, Italian, German, and Ottoman) are available in Hungarian translation. See Tamás Katona ed., *Mohács emlékezete: a mohácsi csatára vonatkozó legfontosabb magyar, nyugati és török források; a csatahely régészeti feltárásának eredményei*. 3rd edition. Budapest: Magyar Helikon, 1987, and János B. Szabó ed., *Mohács*. Budapest: Osiris, 2006.

[41] My calculations are based on the 1527-1528 balance sheet of the Ottoman imperial treasury, which unlike most known balance sheets also listed the timariot *sipahis*. See Ömer Lütfi Barkan, "H. 933-934 (M. 1527-1528) Malı yılına ait bir bütçe örneği," *İstanbul Üniversitesi İktisat Fakültesi Mecmuası* cilt 15. sayı 1-4. (1953–1954), pp. 251–329. Here I am using Barkan's collected essay volumes: Ömer Lütfi Barkan, *Osmanlı Devletinin Sosyal ve Ekonomik Tarihi: Tetkikler-Makaleler*. Ed. by Hüseyin Özdeğer. 2 vols. İstanbul: İstanbul Üniversitesi İktisat Fakültesi, 2000, vol. 1, pp. 649–702. The balance sheet gives the number of timariot *sipahis* as 27,888. Barkan put the possible number of *cebelü* retainers between 60,000 and 80,000 in his publications, which is close to Rhoads Murphey's 61,520 estimated *cebelüs*. See Rhoads Murphey, *Ottoman Warfare, 1500-1700*. New Brunswick, N.J.: Rutgers University Press, 1999, p. 38, where Murphey uses multipliers of 2.5 for Rumeli and 2.0 for other parts of the empire, despite the fact that he himself finds these multipliers "over-generous." Indeed, a near contemporary source from 1533 shows that in Rumeli almost 70 percent of the timariot *sipahis* had revenues less than 6,000 *akçe* per annum, and thus had to provide only one *cebelü*. See Defter-i zuama ve sipahiyan-i vilayet-i Rumeli El-vaki fi yigirmi üç Rebi'ulevvel sene 940 (October 12, 1533) in Barkan, *Osmanlı Devletinin Sosyal ve Ekonomik Tarihi*, vol. 1, p.

and *cebelüs* were mobilized for the 1526 campaign.[42] In 1524-25 the imperial treasury paid 17,063 salaried household (*kapukulu*) troops, of which 9,390 were Janissaries. The number of Janissaries was higher than in 1523-24 (8,641 men), which might indicate that the government increased the number of Janissaries before the Mohács campaign.[43] Unfortunately, we do not know the exact number of *kapukulu* troops mobilized in 1526. However, it is likely that Sultan Süleyman took most of his salaried troops with him, as he did in 1521. With infantry *azabs*, the Ottoman army could have numbered 60,000 to 70,000 troops. These numbers are very close to the estimates of Pál Tomori, commander-in-chief of the Hungarian army, who before the battle put the strength of Süleyman's professional combat forces at about 60,000.[44]

Ottoman firepower superiority was pronounced more with regard to the artillery than hand firearms. The Ottomans had 150 to 200 Ottoman field pieces and some larger cannons (*darbzen* and *top*), 4,060 handguns, and 3,000,000 projectiles. The number of handguns brought to the campaign indicates that only about half of the Janissaries carried firearms. The rest of the Janissaries and the household cavalrymen used the 5,200 bows and 1,400,000 arrows, listed in the campaign inventory.[45]

This is corroborated by the Ottoman chronicler Celalzade Mustafa (d. 1567), who claimed that "four thousand Janissaries [under the command of the *beylerbeyi* of Rumeli] were deployed in nine consecutive rows according to the rules of imperial battles [led by the sultan]," behind the chained field pieces known as *darbzen* or *darbuzan*, and that these "gunners (*tüfekendaz*) were firing their guns (*tüfek*) row by row." A miniature of the battle from 1558 shows the Janissaries firing in two rows: soldiers in the first row are in a kneeling position reloading their weapons, while those standing behind them in the second row firing their guns. The Janissaries are depicted as being behind light field pieces, chained together, a well-known arrangement from earlier and later battles. The question whether these accounts refer to volleys known from west European examples from the latter part of the sixteenth century and presented by historians as one of the hallmarks of the "European military revolution" needs further examination.[46]

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674. Consequently, I have calculated with 1.5 *cebelü* per sipahi. This would give some 42,000 *cebelüs* and a provincial cavalry force of about 70,000 strong.

42 My estimates are based on a list of *sancaks* mobilized in 1526 and the assumption that they could furnish the same number of timariot horsemen as in 1533. The *sancak* list of 1526 was published in Feridun Emecen, "Mohaç (1526): Osmanlılara Orta Avrupahın Kapılarını Açan Savaş," in Emecen, *Savaş*, pp. 209–12. From Rumeli almost all the *sancaks* were mobilized. However, from the province of Anadolu several *sancaks* were missing. More importantly, absent were the timariot forces of some 44 *sancaks* from the provinces of Karaman, Rum, Diyarbekir and Damascus.

43 İstanbul, BOA, MAD 23 and Ágoston, *Osmanlı'da Strateji*, p. 179.

44 Katona ed., *Mohács emlékezete*, p. 22.

45 The inventory (İstanbul, TSMA D 9633) in published in Emecen, "Mohaç, pp. 213–16.

46 Mustafa Çelebi Celâlzade, *Geschichte Sultan Süleymān Ḳānūnīs von 1520 bis 1557, oder, Tabakāt ül-Memālik ve Derecāt ül-Mesālik*. Ed., Petra Kappert. Wiesbaden: Steiner, 1981, fols. 146b–47a; Ágoston, *Guns*, p. 24, and Günhan Börekçi "A Contribution to the Military Revolution Debate: The Janissaries' Use of Volley Fire

The Hungarian command planned to charge against the much larger Ottoman army in increments as it was to descend from a steep, 30-meter high plateau (which was also slippery due to heavy rains in the previous days) and before all the sultan's troops could arrive. The king's artillery opened fire at the Rumelian army on the Ottoman left wing, though it did little damage, for the enemy was out of range of the weapons. It was followed by the charge of the Hungarian light cavalry forces on the right flank that broke the resistance of the Rumelian cavalry, which fled (or retreated) behind the *darbzens*, chained together. In their pursuit, the Hungarian light cavalry set out to loot. At this point the Hungarian heavy cavalry and infantry also charged. However, they, too, were unable to penetrate the chained cannons. Behind the cannons stood the Janissaries who inflicted major destruction on the Hungarians with their volleys. Although the Hungarian infantry of some 10,000 men in the middle and the left wing fought bravely, they, too, were unable to break the obstacles erected in front of the cannons and Janissaries and were slaughtered by Janissary volleys.[47]

The battle is a reminder that even a relatively "modern" army was vulnerable to an opponent with numerical and firepower superiority. As for firepower: the Ottoman cannon did little damage, for their shots landed beyond the attacking Hungarians (likely due to the uneven terrain and the resulting elevation of the gun barrels). Rather, it was the discipline, insurmountable wall and volleys of the Janissaries that figured decisively in the Ottoman victory. The fact that the Ottomans had much larger cavalry and reserves also played an important role in their victory, as did the discipline of the Ottomans and the looting of the Hungarians.

Conclusion

The examination of the above sieges revealed that Ottoman bombardment and mining often breached the strongest castles, after which the numerically superior besiegers overwhelmed the defenders. However, as the cases of Belgrade and Jajca demonstrated, the timely arrival of a relief force and Ottoman tactical mistakes led to the Ottomans' defeat, despite their superior firepower. In battles, firearms proved useful in combination with the *tabur* and cavalry on the wings, both of which provided protection to the infantry Janissaries. Enemy cavalry charges were unable to penetrate the Janissary encampments and *tabur*, and were decimated by the coordinated volleys of Janissary arquebusiers and artillery gunners. However, firearms and the Ottoman *tabur* seldom decided the outcome of military engagements. It was a combination of many factors, including the Ottomans' ability to

during the Long Ottoman-Habsburg War of 1593-1606 and the Problem of Origins," *AOH*, 59, 4 (2006), pp. 430–1.

47 János B. Szabó, "A mohácsi csata és a 'hadügyi forradalom'. II rész: A magyar hadsereg a mohácsi csatában, *HK* 118 . 3. (2005) pp, 573–632. From the literature in western languages see Géza Perjés, *The Fall of the Medieval Kingdom of Hungary: Mohács 1526 - Buda 1541*. Boulder, Colo, Social Science Monographs, 1989 and János B. Szabó and Ferenc Tóth, *Mohács (1526) Soliman le Magnifique prend pied en Europe centrale* Paris: Economica, 2009, their presentation of the Ottoman army, however, should be handled with caution.

consistently outnumber their enemies in terms of deployed troops and firearms. This, in turn, reflected the strength of the Ottoman administrative-fiscal and logistical systems, which maintained, paid, and supplied one of the largest armies in central and southeastern Europe, Asia Minor, and the Middle East. The professional Janissary core of this army typically comprised less than fifteen percent of the mobilized military, yet it was one of the most disciplined organizations of the time. At critical moments, the Janissaries' discipline and endurance was as important as their arquebuses, and stood in sharp contrast to the looting of the Mamluk and Hungarian cavalry. While field pieces and hand firearms were important, so were the bows of the Janissaries and other troops, whose rain of arrows, often with poisoned arrow heads, is frequently mentioned by the sources of the defeated enemy as an effective weapon. The Ottoman army's largest arm was its cavalry, whose charges usually finished the enemy. In addition, efficient intelligence and reconnaissance helped the Ottomans to be well informed about the strengths, weaknesses, battle plans, and tactics of the enemy, and to adjust their own battle tactics accordingly. The Ottomans also exploited the tactical mistakes of their adversaries – as in the case of the Safavids' decision to delay their attack until the Ottomans formed their defensive wagon laager, or the Hungarians' choice not to use their Wagenburg.