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DISJOINTED HISTORIOGRAPHY AND ISLAMIC MILITARY TECHNOLOGY: THE EUROPEAN MILITARY REVOLUTION DEBATE AND THE OTTOMANS

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The military revolution debate

The history of gunpowder, the circumstances of its "discovery," its use in warfare, and the associated moral questions inspired European scholarly thought and gave rise to an unusually rich literature. This was so from the very arrival of gunpowder in Europe as a by-product of Chinese alchemy. In western literature it is often declared that "gunpowder blasted the feudal strongholds and the ideas of their owners," a notion that was shared by such authorities like David Hume (1711-76) or Adam Smith (1723-90). Thomas Macaulay (1800-59) stated that the invention of gunpowder was, with that of printing, one of the two greatest events in the Middle Ages. Johan Huizinga went even further when he wrote that "the rebirth of the human spirit dates from the discovery of firearms."[1] Even if one finds it difficult to accept such claims and considers them exaggerations, one should accept the far-reaching consequences that the proliferation of firearms brought about. States which possessed artillery at an early date had an advantage over armies which yet had none.

Gunpowder weaponry gained prominence in the generalist literature as a consequence of the European Military Revolution thesis, which by the 1980s and 1990s had become the new orthodoxy among early modern historians: "*l'histoire totale de nos jours.*"[2] In its most ambitious forms, it seeks to explain almost every fundamental development in early modern European history including the rise of nation states, Absolutism, and the fate of empires and continents. The theory has generated a great debate that can only be sketched here. In Michael Roberts' original conception of the European Military Revolution, first put forward in 1956, weapons technology was but one

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1 For these statements cf. J.R. Hale, "Gunpowder and the Renaissance: An Essay in the History of Ideas" in idem, *Renaissance War Studies* (London, 1983), 389-420.

2 R.A. Stradling, "'A Military Revolution': The Fall-Out from the Fall-In," *European History Quarterly* 24 (1994), 271-278.

element. As summarized by Geoffrey Parker (first a skeptical rediscoverer of the thesis, later its main proponent), Roberts detected four major developments that he thought deserved to be treated as revolutionary: (1) revolution in tactics, that is, "the replacement of the lance and pike by the arrow and musket," which resulted in the defeat of the feudal knights "by the firepower of massed archers or gunners;" (2) the marked growth in army size; (3) "the adoption of more ambitious and complex strategies designed to bring these larger armies into action;" and finally (4) larger armies and continuous wars "accentuated the impact of war on society" with greater financial and human cost, with the net results that wars became "far more of a burden and far more of a problem than ever previously, both for the civilian population and for their rulers."[3]

In his 1976 essay, Parker accepted several of the conclusions of the original thesis, and was of the opinion that the consequences of the revolution (the impact of wars upon society and economy; increased authority of the state; accentuated social mobility), and most importantly "the 'prodigious increase in the scale of warfare' merit the title of 'military revolution' which Roberts bestowed upon it."[4] In his 1988 prize-winning book on the subject, Parker further broadened the scope of the original thesis, expanding it both chronologically and geographically. In Parker's version of the European Military Revolution thesis, gunpowder weaponry and military technology occupy the central stage. In fact, cannon and cannon-proof fortifications, the *trace italienne*, became the most important factors of the thesis, responsible for the fundamental changes in military affairs the era of the military revolution witnessed. Since only monarchs possessed the necessary financial and organizational means to establish and maintain large enough artillery corps to successfully besiege the new style artillery fortifications and to invest in the defense lines consisting of these new fortresses, cannon and the *trace italienne* eventually led to the strengthening of state power vis-à-vis the feudal lords, and facilitated the emergence of absolutist states. Similarly, argues Parker, superior firepower and ocean-going naval technology conclusively shifted the

3 Geoffrey Parker, *The Military Revolution: Military Innovation and the Rise of the West, 1500-1800* (Cambridge, 1988; revised edition., 1999), pp, 1-2; Jeremy Black, *A Military Revolution? Military Change and European Society, 1550-1800* (London, 1991), 2.

4 Geoffrey Parker, "The 'Military revolution, 1560-1660'– A Myth?" *Journal of Modern History* (1976), reprinted in Rogers, Clifford J., ed., *The Military Revolution Debate: Readings on the Military Transformation of early Modern Europe* (Boulder, Co., 1995), 37-54, quotation from p. 48.

military balance towards Europe, and were responsible for establishing Europe's hegemony over non-European civilizations, a process that many historians proudly label the rise of the West.[5]

Naturally, such a comprehensive and wide-ranging thesis invited both admiration and criticism. While the European Military Revolution theory found wide acceptance,[6] several authors criticized and qualified many elements of both Robert's and Parker's ideas, and the debate exploded in the mid-1980s.[7] With regard to army growth, David Parrot questioned the importance of tactical and technological factors, while John Lynn argued that it can be explained with the growing population and wealth of Europe rather than with the *trace italienne*, as Parker suggested.[8] Jeremy Black emphasized the evolutionary rather than the revolutionary nature of the transformation of armies and warfare and argued that changes that occurred before and after the proposed period of the revolution were in fact more important. Black also found that the battles of the Thirty Years' War "were not generally determined by different tactics and weaponry," as argued by Roberts, rather by other factors such as numerical superiority, "terrain, the availability of reserves and the results of the cavalry encounters on the flanks," outmaneuvering the opponents and so forth. "Victory commonly went to the larger army and the more experienced force rather than to that which had adapted Dutch-style tactics," which according to Roberts and Parker were the decisive factors.[9]

In Parker's works military technology (re-)emerged as a major catalyst of Europe's military, as well as, economic and social transformations in the early modern era. While some historians rejected

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5 Parker, *The Military Revolution*; idem, "In Defense of The Military Revolution," in Rogers, ed., *The Military Revolution Debate*, 337-365. Parker's 1988 book won both the Best Book Award of the American Military Institute (1989) and the Dexter Prize for the best book on the history of technology (1990).

6 See, for example, Michael Duffy ed., *The Military Revolution and the State, 1500-1800* (Exeter, 1980); William H. McNeill, *The Pursuit of Power. Technology, Armed Force, and Society since A.D. 1000* (Chicago, 1982)

7 See Clifford J. Rogers, "The Military Revolution in History and Historiography," in idem ed., *The Military Revolution Debate*, 1-10.

8 David Parrot, "Strategy and Tactics in the Thirty Years' War: 'The Military Revolution'," *Ibid.*, 227-251; John A. Lynn, "The *trace italienne* and the Growth of Armies: The French Case," *Ibid.*, 169-199.

9 Black, *A Military Revolution*, passim, quotations are from 10, 12.

his ideas, accusing him of technological determinism,[10] others incorporated them into their sweeping treatments of war and society. Students of warfare and military technology continue to examine the development of gunpowder and its role in the history of military conflicts and that of humankind. Military and economic historians have tried to determine the significance of European arms and ammunition production as well as the role of arms transfer and technological diffusion in the rise and fall of states, empires and civilizations.[11] Others are more cautious with regard to the importance of military technology. In his recent works, Jeremy Black questioned the importance of technology for "the fate of the continents." Although Black underrates the importance of firearms and the *trace italienne* compared to Parker or McNeill, he does not ignore military technology. Following Parker, to whom his *War and the World* is dedicated, Black devotes much attention to Europe's global expansion, broadening the scope of investigation even further geographically. Likewise, the emphasis on Europe's "aggregate firepower" and naval capability figure prominently in Black's works, though he offers important qualifications with regard to Europe's global expansion, emphasizing the unique relationship and interactions between European technology, economy and state formation.[12] In short, despite criticisms of it, the European Military Revolution thesis continues to exert great impact far beyond the works of historians and figures prominently in the appealing surveys on state formation and geopolitics.[13] Even those authors who disagree with the

[10] See, for instance, Bert S. Hall and Kelly DeVries, "The Military Revolution Revisited," *Technology and Culture* 31 (1990), 500-507. Several critical studies were reprinted or published for the first time in Rogers, ed., *The Military Revolution Debate.*

[11] Carlo M. Cipolla, *Guns, Sails and Empires: Technological Innovation and the Early Phases of European Expansion 1400-1700.* (London, 1965. Reprint New York, 1996); David Ayalon, *Gunpowder and Firearms in the Mamluk Kingdom: A Challenge to a Mediaeval Society,* (London, 1956, 2nd edition, London, 1978); John Francis Guilmartin, *Gunpowder and Galleys: Changing Technology and Mediterranean Warfare at Sea in the Sixteenth Century* (Cambridge, 1974); McNeill, *The Pursuit of Power*; Trevor N. Dupuy, *The Evolution of Weapons and Warfare* (New York, 1985); Kelly DeVries, *Medieval Military Technology* (Peterborough, Ontario, 1992); Bert S. Hall, *Weapons and Warfare in Renaissance Europe* (Baltimore, 1997); Alfred W. Crosby, *Throwing Fire: Projectile Technology Through History* (Cambridge, 2002)

[12] Jeremy Black, *War and the World. Military Power and the Fate of the Continents, 1450-2000* (New Haven, 1998); idem, *Europe and the World, 1650-1830* (London, 2002); idem, *European Warfare, 1494-1660* (London, 2002)

[13] See, for example, Paul Kennedy, *The Rise and Fall of the Great Powers: Economic Change and Military Conflict from 1500 to 2000* (New York, 1989); Charles Tilly, *Coercion, Capital, and European States, AD 990-1990* (Oxford, 1990); Brian M. Downing, *The Military Revolution and Political Change: Origins of Democracy and Autocracy in Early Modern Europe* (Princeton, N.J., 1992); Keith Krause, *Arms and the State: Patterns of Military Production and Trade* (Cambridge, 1992)

thesis feel it necessary to reflect on it.[14]

While an increasing number of works consider non-European military developments and present a much more balanced and multi-causal, evolutionary (rather than revolutionary) explanation of European military changes, students of non-European history are lagging behind their Europeanists colleagues. The historiography of the Ottoman Empire, militarily the most sophisticated non-European adversary of early modern Europe, is a case in point. Given the significance of warfare in the history of the Ottoman Empire and that of the whole region once ruled by the Sultans, it is hard to understand that the Ottomans have until recently been sidelined by the flourishing literature of the New Military History.[15] The result is a disjointed historiography, and the persistence of many appealing but often questionable theories in western-language historiography regarding the evolution and capability of the Ottoman military.

Eurocentric and Orientalist views on Ottoman military technology and their criticism: a brief overview

Despite the rich material available in the Turkish archives with regard to Ottoman gun casting, saltpeter and gunpowder manufacturing, as well as shipbuilding, to name but the most important sectors of early modern weapons industry, the history of Ottoman military technology and armaments industry is still a *terra incognita* for the students of European history, technology and warfare. Some pioneering studies by Turkish and European scholars have been available for several decades,[16]

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[14] Hendrik Spruyt, *The Sovereign State and Its Competitors: An Analysis of Systems Change* (Princeton, N.J., 1994), 85-86.

[15] It was not until 1999 that the first general text on Ottoman warfare appeared. See Rhoads Murphey, *Ottoman Warfare, 1500-1700* (New Brunswick, 1999) However, in many respects, the book should be considered as a specialized scholarly monograph, rather than a general text, with all the advantages and limitations of that genre. See my review in the *Journal of the Economic and Social History of the Orient* 45,3 (2002), 403-406.

[16] See, for instance İsmail Hakkı Uzunçarşılı, *Osmanlı Devleti Teşkilatından Kapukulu Ocakları. vol. 2 II. Cebeci, Topçu, Top Arabacıları, Humbaracı, Lağımcı Ocakları ve Kapukulu Suvarileri* (Ankara, 1944, 2nd edn 1984); Halil İnalcık, "Osmanlılar'da Ateşli Silahlar," *Belleten* XXI. 83. (1957), 501-508; idem, "The Socio-Political Effects of the Diffusion of Fire-arms in the Middle East," in V. J. Parry and M.E. Yapp eds., *War, Technology and Society in the Middle East* (London, 1975), 195-217; Djurdjica Petrović, "Fire-arms in the Balkans on the Eve of and After the Ottoman Conquest of the Fourteenth and Fifteenth Centuries," in Parry and Yapp eds., *War, Technology and Society*, 175-178; Vernon J. Parry, "Barud" *Encyclopaedia of Islam*, vol., 1, 1061-1066; Colin Heywood, "The Activity of the State Cannon-foundry (*Tophane-i amire*) at Istanbul in the Early Sixteenth Century According to an Unpublished Turkish Source" *Prilozi za orijentalnu filologiju*, 30 (1980), 209-216, reprinted in his *Writing Ottoman History:*

and thanks, partly, to the works and efforts of Professor Ekmeleddin İhsanoğlu,[17] there is a new interest in the subject in Turkey in recent years.[18] However, monographic study of Ottoman weapons technology and war industries exists in any language.

Given the lack of relevant studies on Ottoman military technology and arms production, it is hardly surprising that the old fallacies with regard to Ottoman and Islamic military technology are often repeated in the generalist literature. Of these misconceptions the most persistent ones proved to have been (1) "Islamic conservatism;" (2) the East-West technological divergence; (3) Ottoman technological inferiority and backwardness; (4) insufficient production capacity and Ottoman dependence on European know-how and imports.

Based on unpublished production output accounts of the Ottoman saltpeter and gunpowder works in Asia Minor, the Middle East and the Balkans, as well as on the account books of the Imperial Cannon Foundry in Istanbul, my forthcoming book on the Ottoman weapons industry refutes Eurocentric claims regarding the Ottomans' supposed "insufficient production capacity." The book demonstrates that the Ottomans created the necessary organizational and financial frameworks to ensure a prompt and efficient production and supply of ammunition

Documents and Interpretation (Aldershot, 2002); idem, "Notes on the Production of Fifteenth-Century Ottoman Cannon," in *Proceedings of the International Symposium on Islam and Science, Islamabad, 1-3 Muharrem, 1401 A.H. (10-12 November, 1980.)* (Islamabad, 1981), 58-61, reprinted in his *Writing Ottoman History*; Mücteba İlgürel, "Osmanlı İmparatorluğunda Ateşli Silahların Yayılışı" TD 32 (1979); idem, "Osmanlı Topçulugun İlk Devri " *Hakkı Dursun Yıldız Armağanı* (Ankara, 1995), 285-293; Rhoads Murphey, "The Ottoman Attitude towards the Adoption of Western Technology: The Role of the Efrenci Technicians in Civil and Military Applications" in Jean-Louis Bacqué-Grammont and Paul Dumont, eds., *Contributions à l'histoire économique et sociale de l'Empire ottoman* (Leuven, 1983); Gábor Ágoston, Ottoman Artillery and European Military Technology in the Fifteenth and Seventeenth Centuries," *Acta Orientalia Academiae Scientiarum Hungaricae* 47 (1994), 15-48.

[17] See, e.g., Ekmeleddin İhsanoğlu, ed., *Transfer of Modern Science and Technology to he Muslim World.* (Istanbul, 1992); idem, ed., *Osmanlılar ve Batı Teknolojısı.* (İstanbul. 1992); idem, *Büyük Cihaddan Frenk Fodulluğuna.* Istanbul, 1996

[18] Two recent Ph.D. dissertations are devoted to the history of Ottoman gunpowder industry and that of the Imperial Cannon Foundry, respectively. See Birol Çetin, *Osmanlı İmparatorluğu'nda Barut Sanayi, 1700-1900.* (Ankara, 2001) and Salim Aydüz *Osmanlı Devletinde Tophane-i Amire ve Top Döküm Teknolojisi (XV-XVI. Yüzyıllar)* Istanbul, 1998 (University of Istanbul Institute of Social Sciences, manuscript.) However, it should be noted, that while both works contain valuable new information regarding their respective topics they lack the comparative approach, hardly use the relevant literature in foreign languages, and surprisingly from Turkish scholars who have easy access to the Ottoman archives, both works are poorly researched. Aydüz's study is much better in all respects. Çetin's book contains original material only for the nineteenth century.

and weaponry early in their history; that the ability of the Ottoman central and local authorities to adjust them according to the changing socio-economic conditions enabled the Ottomans to achieve self-sufficiency in armament production and to maintain it for centuries – indeed, in certain sectors of the arms industry well into the eighteenth century.[19] Therefore, the present essay will only discuss the first three points of Eurocentric and Orientalist historians regarding Islamic/Ottoman weapons technology.

Islamic conservatism?

Despite the growing evidence to the contrary, scholars of European history have traditionally held the opinion that non-European empires were reluctant to use firearms or they were slow to adopt European technological improvements. With regard to Islamic empires they often mention that European weapons were regarded as innovations (*bid`a*) that were incompatible with Islam, for these forms of weaponry had not been attested to in the time of the Prophet Mohammed. Following superficially understood Islamic doctrines, authors such as Kenneth M. Setton, Eric L. Jones or Paul Kennedy fault the "extreme conservatism of Islam;"[20] the "military despotism," which "militated against the borrowing of western techniques and against native inventiveness;"[21] or the "cultural and technological conservatism," for the failure of Islamic civilizations to keep pace with western military technology.[22] While these quotes are taken out of context, they not only

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[19] See Gábor Ágoston, *Guns for the Sultan: Military Power and the Weapons Industry in the Ottoman Empire* (forthcoming) Cf. also my "Behind the Turkish War Machine: Gunpowder, Technology and Munitions Industry in the Ottoman Empire, 1450-1700." in Brett Steele and Tamera Dorland eds., *The Heirs of Archimedes: Science and the Art of War through the Age of Enlightenment.* (Cambridge, MA: MIT, 2002) in print. A Turkish translation of an abridged version of the above article was published in 2000. See, "Osmanlı İmparatorluğu'nda Harp Enüstrisi ve Barut Teknolojisi (1450-1700)" in Güler Eren, Kemal Çiçek, Cem Oğuz eds., *Osmanlı* Cilt 6 Teşkilat (Ankara, 2000), 613-621. Unfortunately, there are several mistakes and misunderstandings remained in the Turkish translation for I had no chance to review it before it was published. Readers, therefore, should consult the longer English-language version of the article.

[20] Kenneth Meyer Setton, *Venice, Austria, and the Turks in the Seventeenth Century* (Philadelphia, PA, 1991), 6, 100, and 450. For its critique see Rhoads Murphey's review in *Archivum Ottomanicum* XIII (1993-1994), 371-383. Setton places too much emphasis on the impact of religion. He argues that "the Spanish were caught in an era of religious bigotry, the Turks in a renewal of Islamic fanaticism, and neither people could keep abreast of the technological innovations which had been altering European society from at least the mid-sixteenth century." (*Ibid.*, 6.)

[21] E. L. Jones, *The European Miracle: Environments, Economies, and Geopolitics in the History of Europe and Asia* (Cambridge, 1987), 181.

[22] Kennedy, *The Rise and Fall of the Great Powers*, 12.

convey the general approach of Eurocentric and Orientalist historians but also exhibit a remarkable ignorance of historical evidence.

It is well established in the related literature that Islamic societies were instrumental in the transmission of knowledge of gunpowder from China to Europe.[23] Scholarly literature in recent decades has demonstrated that the Mamluks, Timurids, Akkoyunlus, Ottomans, Safavids, and Mughals had used gunpowder and firearms.[24] Furthermore, Islamic theoretical literature regarding *bid`a* differentiated between good and bad or praiseworthy and objectionable *bid`a* as early as the second century of Islam,[25] and later scholars of Islamic law could and did find the way to justify military reforms if they wanted to do so.[26] More importantly, it has also been demonstrated that the reluctance of the light-armed Muslim horseman to adopt firearms has very little to do with Islam. Rather, it can be explained with the mentality, social status and military tradition of these Muslim horsemen, the nature of war they had to fight, as well as with the inadequacy of early firearms for the mounted warrior. It is also important to remember that the feudal knights in Italy, France, Spain or England demonstrated similar stance against firearms, and often for similar reasons (mentality, knightly ethos, social status, deficiencies of early gunpowder weapons, etc.).

The reasons for the dominance of traditional, non-gunpowder weapons in Muslim armies are manifold, but religion usually played a

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[23] "The entire line of development, from the first mixing of sulphur, saltpetre and a source of carbon, took place in China first and passed to Islam and Christianity only afterwards." Joseph Needham, "The Guns of Khaifeng-fu," *Times Literary Supplement* January 11, 1980, 41; also quoted by Iqtar Alam Khan, "Coming of Gunpowder to the Islamic World and North India: Spotlight on the Role of the Mongols" *Journal of Asian History* 30, 1 (1996), 29. See also, Joseph Needham, Ho Ping-Yü, Lu Gwei-Djen, and Wang Ling, *Science and Civilization in China, Vol. 5, Pt. 7, Military Technology: The Gunpowder Epic* (Cambridge, 1986); Ahmad Y. al-Hassan and Donald R. Hill, *Islamic Technology: An Illustrated History* (Cambridge, 1986), 113-120; Cf. Weston F. Cook, *The Hundred Years War for Morocco* (Boulder, CO., 1994)

[24] Ayalon, *Gunpowder and Firearms*; A.M. Belinickii, "O poiavlenii i rasprostaneii ognestrel'nogo oruzhia v srednei Azii i Irane v XIV-XVI. vekah," *Izvestiia Tadzhiskogo Filiala Akademii Nauk SSSR* 15 (1949), 21-35; Roger Savory, "The Sherley Myth," *Iran. Journal of the British Institute of Persian Studies* 5 (1967), 73-81; Vladimir Minorsky, "La Perse au XVe siècle entre la Turquie et Venise" in his *The Turks, Iran, and the Caucasus in the Middle Ages* (London, 1978), 12-13; Gábor Ágoston "A tűzfegyverek elterjedése a muszlim világban" in Péter Tusor ed., *R. Várkonyi Ágnes Emlékkönyv* (Budapest, 1998), 176-184.

[25] Ignác Goldziher, *Muslim Studies* 2 vols. (London, 1967), vol. 2, 36. cf. also Vardit Rispler, "Towards a New Understanding of the Term *bid`a*," *Der Islam*, 68, 2 (1991), 320-328.

[26] See, for instance, Uriel Heyd, "The Ottoman Ulema and Westernization in the time of Selim III and Mahmud II," in: Uriel Heyd ed., *Islamic History and Civilization (Scripta Hierosolymitana IX.)* (Jerusalem, 1961), 74.

very modest role, if any at all, in delaying the introduction of firearms. The Safavid experience with firearms is illustrative in this respect. In the Safavid Empire, perceptions of honor, the physical environment of Persia, the lack of raw materials needed for the manufacturing of firearms and ammunition, as well as the absence of wheeled transportation and of navigable rivers to move large artillery trains were of much greater importance than religion in delaying the integration of gunpowder weaponry. Due to the fact that there were no fortified towns in Persia where those who challenged the power of the center could have found refuge, artillery was not essential for monopolizing the means of organized violence either. [27]

Historical evidence suggests that Muslim armies and states adjusted their weaponry and tactics to that of their enemies with relative ease, and did not hesitate to introduce gunpowder weaponry when faced rivals equipped with firearms. The Ottomans who had to besiege Byzantine, Serbian, Bulgarian, Greek and Hungarian castles and faced enemies already in the possession of firearms very early in their conquests in the Balkans, were quick in integrating firearms technology into their armed forces and navy. They established centralized and permanent troops specialized in the manufacturing and handling of firearms well before such permanent units appeared in the armies of their European and Middle Eastern opponents.[28]

The battle of Bashkent (Otluk-beli) in 1473, where the Ottomans proved the advantages of firearms in their victory over the Akkoyunlus, also served as a stimulus for the latter to introduce more firearms into their army. The Akkoyunlus used gunpowder weapons in 1478 and in 1485 they deployed heavy battering cannon to lay siege to the Georgian fort of Akhiska/Akhatsike.[29] The Safavids used arquebuses (*tofak*) and cannon (*tup*) before the foundation of their Empire under Ismail I (1501-24). However, it was only after the battle of Çaldıran (1514)–where the Safavids faced, for the very first time in their history, the devastating firepower of an enemy, that of their Ottoman neighbors–that the Safavid leadership decided to arm its troops with cannons and arquebuses in a more systematic manner and on a much larger scale than had previously

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[27] Ayalon, *Gunpowder and Firearms*; Rudi Matthee, "Unwalled Cities and Restless Nomads: Firearms and Artillery in Safavid Iran," in Charles Melville ed., *Safavid Persia: The History and Politics of an Islamic Society* (London, 1996), 389-416.

[28] For a detailed treatment see chapter two of my forthcoming book: *Guns for the Sultan*

[29] Savory, "The Sherley Myth," 78-79; Minorsky, "La Perse au XVe siècle entre la Turquie et Venise," 12-13.

been the case. Thus, in the Safavid case the main stimulus was, as had been for the Ottomans and for the Akkoyunlus in the fifteenth century, the need to adjust to an enemy already well-armed with gunpowder weapons.

East-West divergence and Ottoman technological inferiority?

The notion of divergence of Ottoman and European military technology was introduced by Carlo Maria Cipolla half-a-century ago. As many European historians before and after him, Cipolla acknowledged the Muslims' (and particularly the Ottomans') quick adoption of firearms. However, along with other Eurocentric historians, Cipolla was of the opinion that the Ottomans "never succeeded in going beyond the stage of 'follower country'. The West kept moving ahead, and especially after the middle of the fifteenth century it moved progressively faster."[30]

It is known that in the fifteenth century, in the search for super-weapons both European and Ottoman gun-founders cast giant cannons. However, assumes Cipolla, "at the very moment when Mohammed II was firing [his monstrous cannon, called the] Mahometta, the technicians in the West reversed the prevailing trend and devoted great efforts to the production of light field artillery." The Ottomans on the other hand, continues Cipolla, "failed to recognize the importance of the innovations and did not keep up with the new developments...they continued to devote their main efforts to the production of siege ordnance and lagged behind the West both in the production and the use of field artillery."[31]

In the late 1980s, Cipolla's thesis was questioned by Stephen Christensen, who aptly called it "the gigantism theory of Ottoman guns."[32] Christensen suggested that in his book Cipolla "implied that the Turks never really overcame" what Christensen called "an ethno-psychological trauma" originating from the Turks' "early experience with urban Christians and their fabulous war machine." Christensen was of the opinion that both David Ayalon who, in the mid-1950s, examined the Mamluks' experience with firearms, and Cipolla who, in the mid-1960s, studied the Ottomans' use of gunpowder weapons, "saw Muslims using

30 Cipolla, *Guns, Sails and Empires*, 95.
31 Cipolla, *Ibid.*, 98.
32 Stephen Christensen, "European-Ottoman Military Acculturation in the Late Middle Ages," in Brian Patric McGuire ed., *War and Peace in the Middle Ages* (Copenhagen, 1987), 236.

Western firearms as some sort of a paradox. Their attention was on the internal anti-imitational boundaries... In both instances the problem was to detect a dysfunctional mechanism within a specific Muslim society, which had caused the stagnation or unsuccessful evolution of the firearms in question."[33]

Despite Christensen's apt criticism, Cipolla's thesis was (and is) repeated in the generalist literature. While Geoffrey Parker's influential book on the European Military Revolution offers a more complex picture of non-European military technology, in the first and second editions of his book he, too, shared Cipolla's theory. Although Parker acknowledged that the Ottomans "adopted and mastered Western military technology with remarkable speed and thoroughness" during the fifteenth and even the sixteenth centuries, he argued that western techniques and the military revolution was only "imperfectly practiced" by even this most developed of the Islamic empires. "First, and best-known, was the Ottomans decision to build their artillery big, whereas the western powers concentrated on increasing the mobility and numbers of their guns."[34]

Eurocentric claims regarding Islamic conservatism and the divergence of early modern Western and Islamic military technologies proved to be so influential that they are often repeated by the specialists of Islamic societies. In several of his publications, Charles Issawi, the doyen of Middle Eastern economic studies, attributed the general economic backwardness of the Middle East and the economic stagnation this region of the world experienced between 1100-1800, among other factors, to the lack of inventiveness and slowness with which Islamic countries adapted European technology, and was rightly criticized for such generalizations.[35] Arthur Goldschmidt, whose *Concise History of the Middle East* is a widely used textbook in undergraduate courses in the US, also accepted the Ottomans' technological inferiority and claimed that "by the end of the sixteenth century, the Ottomans lagged

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33 Christensen, "European-Ottoman Military Acculturation," 237. It is interesting to note that although Christensen recalled the fact the Ottomans cast all types of cannon, not being familiar with the Ottoman archival sources, and thus with the overall composition of the Ottoman artillery, he also suggested that "a tradition of founding giant guns may have existed among the Ottoman gun founders." (*Ibid*, 238.)

34 Parker, *The Military Revolution*, 126. See also his "Europe and the wider world, 1500-1750: the military balance," in James D. Tracy, *The Political Economy of Merchant Empires* (Cambridge, 1991), 173.

35 On this see Murphey, "The Ottoman Attitude towards the Adoption of Western Technology," 289.

behind the West in weaponry and fighting techniques."[36] So did Bernard Lewis, whose influence on the general public and on policy makers regarding Islam and the Middle East is apparent by the popularity of his works and by the frequent references to his thoughts one finds in opinion pieces of major newspapers in the US. In several of his works, including his most recent *What Went Wrong*, Bernard Lewis repeats his ideas concerning the Muslims' supposed inability to adopt and perfect western technologies, as well as the Muslims' reliance on foreign technology and know-how. Talking about Ottoman gunpowder technology and cannon, he echoed one of the favorite claims of both Eurocentrists and Orientalists suggesting that "the majority of their [i.e., the Ottomans'] gun-founders and gunners were European renegades or adventurers." He also maintained that "while the Ottomans were able to deploy this new weapon, they continued to rely on outsiders for the science and even the technology needed to produce it. Much the same is true of the related corps of bombardiers and sappers. The inevitable result was that, with the passage of time, the Ottoman artillery fell steadily behind that of their European rivals."[37]

One of the most recent proponents of western military superiority is Victor Davis Hanson. Writing about the Battle of Lepanto, he suggested that "what most nullified Ottoman courage and numbers was the presence of so many topflight European ships, equipped with superior firepower and better armed soldiers–a testament to the western manner of designing, producing, and distributing armaments that operated only within the confines of capitalist economies." Later, he suggested that "the Ottomans increasingly looked westward, not merely for additional slaves and plunder but also for European weaponry and manufactured goods."[38] Talking about the Istanbul Arsenal, Hanson claimed that it was merely a copy of the Venetian Arsenal, "where shipwrights from Naples and Venice were hired to duplicate the Venetian success," though, so he claims, only with mixed results, for the artillery pieces of the Sultans were "for the most part stolen and plundered from Christian forces rather than fabricated on the premises."[39]

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[36] Arthur Goldschmidt, *A Concise History of the Middle East* (Boulder, Co., 1999), 127.
[37] Bernard Lewis, *Muslim Discovery of Europe* (London, 1982. Reprint 1994), 223.
[38] Victor Davis Hanson, *Carnage and Culture: Landmark Battles in the Rise of Western Power* (New York, 2001), 254-255.
[39] *Ibid.*, 260.

Based on Ottoman archival sources I have repeatedly challenged the above notions during the past decade. A comparative look at the history of technology diffusion demonstrates the contribution of European technicians to the Ottoman arms industry and weapons technology should not be exaggerated, for inviting and employing foreign technicians was the prime means throughout Europe to acquire new technology. The assistance of craftsmen from countries that were considered to be on the cutting edge of technology at a certain point in time was inevitable for countries not yet familiar with the techniques, if they were to establish their indigenous arms industries. The Ottomans were no exception, rather, they were very much part of this transfer of early modern weapons technology.

What made the Ottoman case somewhat unique, though, was its ideal place for technological diffusion. While miners from the mining centers of medieval Serbia, Bosnia, Greece and Asia Minor brought their knowledge of metallurgy into Istanbul, Muslim blacksmiths added their knowledge of metalworking techniques of the Islamic East that produced the world-renowned Damascus blades. Istanbul, with its Turkish and Persian artisans and blacksmiths; Armenian and Greek miners and sappers; Bosnian, Serbian, Turkish, Italian, German, and later French, English and Dutch gun-founders and engineers; as well as with its Venetian, Dalmatian and Greek shipwrights and sailors, proved to be an ideal environment for "technological dialogue."[40]

During my research it became obvious that understanding the bewildering terminology of Ottoman guns was essential if we were to appreciate the composition of Ottoman artillery. A preliminary classification of Ottoman artillery pieces that used the main characteristics of the guns (the weight and length of the barrel and the weight of the projectiles fired) made it clear that Ottoman guns were often of European origin and that the Ottomans used all sorts of guns from the largest *şaykas* and *balyemezes* to the smallest *şahi* guns that often fired projectiles of merely a few grams.[41] Eyewitness accounts regarding sixteenth-century Ottoman campaigns show that the Ottomans deployed hundreds of smaller guns during their campaigns.[42] Similarly, in sieges the majority of the Ottoman ordnance consisted of

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[40] The phrase is taken from Arnold Pacey, *Technology in World Civilization: A Thousand-Year History* (Oxford, 1990)

[41] Ágoston, "Ottoman Artillery and European Military Technology"

[42] See, or instance, the well-known Ottoman and European narratives of Süleyman's campaigns.

smaller pieces, and large siege artillery, though in certain cases considerable in number by contemporary standards, comprised no more than 10 percent of the Ottoman siege train. This was the case in the sieges of Constantinople (1453) and Belgrade (1456) in the mid-fifteenth century, an era that is portrayed in historiography as the age of giant bombards. In sixteenth- and seventeenth-century sieges, too, medium- and small-caliber guns rather than large siege cannons were the most important tools.[43]

A more thorough examination of Ottoman data gathered from the official account books of the Imperial Cannon Foundry (*Tophane-i Amire*) in Istanbul and from weapons inventories of major Ottoman castles from such diverse regions of the Empire as Iraq, Hungary, the Balkans or Crete shows that Ottoman guns were similar to the cannons the Sultan's European enemies used. Based on the weight of the shot they fired, Ottoman siege guns, referred to in the sources as battering guns or *kale-kob*s (from the Persian *qal`a-kob*=fort-smasher), can be compared to the large European culverins and siege cannons. Large-caliber *kale-kob*s firing shots of 16-, 15- and 14-*okka* in weight would be close to the 40-pounder Spanish *culebrina*s and the 41-pounder English *bastard cannons*, but they were larger than the 36-pounder Austrian *Dreiviertel Karthaun*. On the other hand, they fired lighter shots than the Spanish double cannons (*doble canon*, 48 lbs), battering cannons (*canon de batarία*, 60 lbs) or the English *cannon* and *serpentine cannon* (60 and 53 lbs). The 12-*okka kale-kob*s can be compared to the 30-pounder Spanish *culebrinas* and *culebrina relas*, the 32-pounder siege cannon (*canon de abatir*), and to the 24-pounder Austrian *Halbe Karthaune*.

The most commonly used Ottoman "battering guns" (*darbzen*) fired shots of only 150 gram through 2.5 kg in weight. While the Ottomans –similarly to other Mediterranean nations–preserved some of their large stone-throwing pieces as center-line bow guns on their flagships, the majority of guns deployed aboard their galleons were

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43 For Constantinople see 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, 1997, 343-362. and Feridun Emecen, *İstanbulun Fethi Olayı ve Meseleleri* (İstanbul, 2003), 37-38; on Belgrade see, 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, 2000), 244-246; on sixteenth- and seventeenth-century sieges in general cf., Murphey, *Ottoman Warfare*, 110 ff.

small-caliber bronze pieces whose projectiles weighed between 3.7 kg and 8.6 kg. Most of the guns aboard the boats of the Ottoman river flotillas consisted of even smaller cast-iron guns that weighed only 20 to 40 kg and fired projectiles of usually less than 500 grams.

The situation was somewhat different with regard to fortress guns. It seems that the Ottomans deployed the majority of their large pieces on the ramparts of their fortresses. Large pieces figured prominently, especially in their key forts that had particular strategic importance, such as Belgrade, Buda, Baghdad, or the forts of the Dardanelles that protected the capital city. Some of these guns were obsolete, giant pieces. Lying as abandoned pieces on the walls of Ottoman fortresses in Hungary or on the Dardanelles defenses, these giant and obsolete cannon were described and popularized by such eminent European experts of the Ottoman military as Luiggi Ferdinando Marsigli in the 1690s and Baron de Tott in the 1770s. As their descriptions captured the imagination of the European mind and found their way into European military and history books, the myth of the Ottoman giant guns was born. And the myth has survived to this day. However, Ottoman archival data suggest that even in these fortresses medium- and small-caliber pieces predominated.[44]

Since the art of casting rested on accumulated experience transmitted from caster to caster rather than on scientific knowledge, even limited numbers of foreign founders who had brought something new with themselves to the Ottoman capital, could have introduced it to the Istanbul foundry. Indeed, archival records show that the composition of Ottoman bronze cannons was very similar to those cast in Europe and that the proportions of copper and tin were very close to those suggested by Vanoccio Biringuccio, the most respected expert on the subject in sixteenth-century Europe. While chemical analyses might provide more precise figures in the future, it is worth remembering that that there had been very modest technical advances in weapons design and effectiveness during the period of this investigation, and thus guns in 1800 were very similar to those made in 1500. Thus it would be a mistake to place too much emphasis on the composition of alloy when comparing sixteenth- and seventeenth-century Ottoman and European ordnance.

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[44] See chapter three of my forthcoming *Guns for the Sultan*.

Recent scholarship on the Ottomans seems to concur with this more balanced treatment of Ottoman military technology.[45] It is also encouraging that that the results of Ottomanists have found their way into the more general historiography of Europeanists and military historians. Jeremy Black present a very nuanced picture of Ottoman-European confrontation and Geoffrey Parker has also, at least partly, revised his former views regarding Ottoman military technology and no longer shares Cipolla's views regarding the divergence of Ottoman and European military technologies. Instead, he focuses on other factors of Ottoman military weakness, and rightly so.[46] Ottomanists may considerably further a better understanding of Ottoman history if they take up some of Parker's points and devote more attention to the socio-economic conditions in the seventeenth- and eighteenth-century Ottoman Empire rather than focusing on technology when studying Ottoman military weakness.[47]

[45] Murphey, *Ottoman Warfare*; Colin Imber, The *Ottoman Empire, 1300-1650* (New York, 2002).

[46] See, e.g., Black, *War and the World*; idem, *European Warfare, 1494-1660*; Parker, *The Military Revolution* (1999 edition), 126, where the passage I cited from the first edition is missing.

[47] A pioneering study in this regard is Halil İnalcık, "Military and Fiscal Transformation in the Ottoman Empire," *Archivum Ottomanicum* VI. (1980), 283-337.