THE THEORY OF A MILITARY REVOLUTION: GLOBAL, NUMEROUS, ENDLESS?[1]

LA TEORÍA DE UNA REVOLUCIÓN MILITAR: ¿GLOBAL, NUMEROSA E INTERMINABLE?

Frank Jacob and Gilmar Visoni-Alonzo. City University of New York, QCC. USA

E-mail: jacob.m.a84@googlemail.com

Abstract: The present article is trying to counter the discussion about a Military Revolution in Europe as a unique European event. It also tries to outline possible difficulties that might emerge by using the term itself. Therefore the authors ask, if the Military Revolution per se is global, unique, or even endless. Due to this several case studies are analyzed to finally present a more multi-causal theoretical approach for the term and its use.
Keywords: Military Revolution, Military History, Global History, Comparative History, Gunpowder Revolution

Resumen: El presente artículo trata de presentar una alternativa al debate sobre la Revolución Militar y cuestionar su caracter exclusivamente europeo. El artículo también intenta delinear las posibles dificultades que emergen a consecuencia del uso de tal término. Por lo tanto, los autores se preguntan si la Revolución Militar es global, única y perpetua. En el presente artículo son analizados algunos casos ejemplares con el propósito de enmarcar el concepto de Revolución Militar en un contexto de causas multiples.
Palabras Clave: Revolución militar, historia militar, historia global, historia comparada, revolución de la pólvora.

[1] Recibido: 29/10/2014 Aceptado: 26/12/2014 Publicado: 20/01/2015

INTRODUCTION

Martin van Creveld already explained it: the history of war is not possible if one does not take political, economic, social, and technological aspects into consideration.[2] War is determined by all of these aspects, and a history of warfare cannot be just a history of events. He was not the first who recognized this fact. Werner Sombart (1863-1941) wrote about the interrelationship of war and capitalism already in 1913,[3] and many other scholars have discussed the single factors and their influence on warfare per se. The interrelationship between technology and warfare (as well as science and warfare) is as old as war itself because human beings have always tried to kill each other and overcome their antagonists. However, with regard to the method of killing, why would too close a focus on the age of high industrialization not be sufficient anymore,[4] even though we can trace a more visible interconnection among science, technology, and war in the decades between 1914 and 1945.

Since most inventions are not spontaneous, but usually mark the end of a long-term process of research and development,[5] they rarely seemed to be revolutionary in ancient times. However, a process of development is traceable through all ages[6] because human developers have always been in search of a more efficient way of killing. Technology has been used simultaneously to create a higher grade of firepower and mobility.[7] As a consequence of the increase of these two factors, killing has become a more and more distant act[8] in which machine guns, artillery and tanks have played a decisive role since the two World Wars. The German historian Karl Heinz Metz finally linked all the factors responsible for an effective warfare in a simple formula: "If the modern violence of war receives its impact from revolutionary ideologies, her material impact is provided by a network of industrial mass production, industrial transport systems, and purposeful innovation by applied science."[9] Therefore industrialization also started to industrialize the act of killing, a fact that is underlined by the increased demand of fire power and bullets in the course of the Great War.

In 1914, the German army needed the same number of bullets they had used during the whole war against the French in 1870/71, and the amount continued to climb year by year to exorbitant numbers by 1918. Consequently, the events in Europe at the beginning of the 20th century clearly revealed the impact of science and technology on modern warfare.[10] Even though the First World War had a tremendous effect on the social, political, economic, and technological environments of the participating powers, it is not the event that is discussed when historians talk about the Military Revolution. What Geoffrey Parker lately defined again as a Military Revolution was the reason for a

[2] CREVELD, Martin van, (2009), *Die Gesichter des Krieges. Der Wandel bewaffneter Konflikte von 1900 bis heute*, Munich, Siedler Verlag, p.8.
[3] SOMBART, Werner (1913), *Krieg und Kapitalismus*, Munich, Duncker & Humblot.
[4] DOERING-MANTEUFFEL, Anselm: "Kriegserfahrungen, Wissenschaft und Technik". In: G. Schild; A. Schindling (Eds.), *Kriegserfahrungen – Krieg und Gesellschaft in der Neuzeit. Neue Horizonte der Forschung*, Paderborn, Ferdinand Schöningh, 2009, pp.197-211, here p.197.
[5] MÖSER, Kurt, (2009), *Fahren und Fliegen in Krieg und Frieden. Kulturen individueller Mobilitätsmaschinen 1880-1930*, Heidelberg, Verlag Regionalkultur, p.12.
[6] For a detailed analysis of the interrelationship of war and technology see the forthcoming JACOB, Frank, (2015) (Ed.), *Helix of Death? On the Interrelationship of War and Technology*, Jefferson, NC, McFarland (in print).
[7] MÖSER, (2009), p.481.
[8] METZ, Karl Heinz, (2010), *Geschichte der Gewalt*, Darmstadt, Wissenschaftliche Buchgesellschaft, p.116.
[9] Ibid. p.118.
[10] Ibid. p.123.

Western supremacy since the early modern period of European history, which was mainly determined by exploration, expansion, and the beginning of colonialism. Following Parker, this supremacy was based on a superior Western military power expressed by modern siege cannons, new forts that followed the design of the so-called *trace italienne,* larger infantries, a more expanded administration and a rather complex tax system, and, finally, cannons on ships that could establish, as well as support, oversea forts.[11] Following his theory, the military development in Europe during the late middle ages and the early modern era was unique, which also explained the continuous Western supremacy in the age of colonialism and imperialism.[12]

According to Parker, the *trace italienne* is the architectural answer to the development of heavy and concentrated artillery fire over the course of the 15th century.[13] Clifford Rogers details the transformation of artillery over the course of the Hundred Years War from inaccurate bombards designed to wreak random destruction inside cities and castles to accurate and powerful guns built to demolish outer walls.[14] By the time French king Charles VIII invaded Italy in 1494, he engaged the enemy with an arsenal of forty heavy guns that forced the Italians to look at warfare in a completely different manner.[15] Francesco Guicciardini relates in his *Storia d'Italia* how during this invasion the French used a new type of artillery called *cannoni*, cast only in bronze and using iron balls as ammunition.[16] These cannons were transported on carriages and pulled by horses (rather than oxen, as it was customary in Italy). The Florentine historian contrasts the fast, accurate and devastating power of the French cannons with the lentitude and inefficacy of the bombards used by Italian armies only a decade earlier.[17] According to Parker, it was this display of devastating firepower during the Italian Wars that became the impetus for the construction of ever more complex fortifications built in a new style. The foundational module of this new style of fortifications was the bastion, an angular salient that offered defensive artillery the ability to cover a field of fire with no "dead zones" (areas outside the view and range of the defenders). The addition of bastions to medieval walls of cities eventually led to the design and construction of more formidable and intricate fortifications. The angular bastion became the emblematic element in a re-conceptualization of the stronghold that included polygonal layouts, low-laying structures, thick walls, sloped profiles, earthworks, moats, scarps, counterscarps, and ravelins and crownworks (free-standing artillery platforms that covered the approaches to the main structure). The Italian style of building fortresses had the main tactical purpose to resist the firepower of the new heavier and more accurate artillery and to avoid the "enfilade" (a flanking attack) by creating interlocking fields of fire with no blind spots or "dead zones."

[11] PARKER, Geoffrey, (1996), *The Military Revolution: Military Innovation and the Rise of the West,* Cambridge, Cambridge University Press. On the importance of forts see PARKER, Geoffrey, "The Artillery Fortress as an Engine of European Overseas Expansion 1480-1750". In: J. Tracy, (Ed.), *City Walls: The Urban Enceinte in Global Perspective,* Cambridge, Cambridge University Press, 2000, pp.386-416.

[12] ANDRADE Tonio; KANG, Hyeok Hweon; COOPER, Kirsten, "A Korean Military Revolution? Parallel Military Innovations in East Asia and Europe", in: *Journal of World History* 25,1 (2014), pp.51-84, here p.52.

[13] PARKER (1996), p. 8.

[14] ROGERS, Clifford (1995), "Military Revolutions of the Hundred Years War," in *The Military Revolution Debate,* C. Rogers, ed., Boulder, CO, Westview Press, pp. 64-73.

[15] PARKER (1996), pp. 9-10.

[16] GUICCIARDINI, Francesco, *Storia d'Italia*, Libro Primo, XI.

[17] Guicciardini is particularly impressed by the French artillery's rate of fire. Ibid.

Like all inventions, the bastion and the *trace italienne* were the product of a gradual development. However, we can identify key figures and influences in the evolution of the concept. We should see the *trace italienne* within the context of Renaissance artists' fascination with symmetry and geometric forms as well as their desire to revive Roman architectural paradigms. The works of Brunnelleschi and Piero della Francesca come to mind. But closer to the present topic, one can think of Leon Batista Alberti who, around 1440, wrote *De Res Aedificatoria*, a treatise on architecture where it is suggested for the first time that fortifications should be built with angular points resembling "the teeth of a saw."[18] In the 1460's, influenced by Alberti, the architect Filarete produced a design for the city of Sforzinda, a utopian urban vision whose purpose was to glorify the newly established dynasty of the Sforza in Milan. Sforzinda (which was never built) was planned as a walled city with a layout in the shape of a star with eight points (with towers at each of the external vertices and gates at the internal vertices).[19]

Theory and practice come together in the figure of Francesco di Giorgio Martini. Di Giorgio produced his *Trattato di architettura civile e militare* between 1475 and 1495.[20] It is in this work (which according to Elizabeth Merrill was produced as an instructional manual for the dukes of Urbino) that we see for the first time the concept of the bastion explicitly delineated and discussed. Martini finished the first version of his treaty 13 years before Charles VIII's invasion of Italy, and, therefore, the conceptual birth of *trace italliene* precedes the event that Parker establishes as the point of departure of his military revolution. In fact, as early as 1487, Giuliano Sangallo and his brother Antonio Sangallo the Elder had built a fortress and encircling wall that incorporated angular bastions at Poggio Imperiale in Tuscany.[21] It seems then that the French invasion of the 1490's was not the cause but rather the catalyst of a vision of military architecture that had been incubated for at least half a century.

By the 1490's Pope Alexander VI commissioned Giuliano Sangallo with the task of re-enforcing the defense works around Castel Sant'Angelo in Rome. Sangallo (who may have met di Giorgio while living in Naples)[22] produced a structure with prominent pentagonal bastions. By the dawn of the 16th century, Giuliano and his brother had produced several bastioned fortresses that show their evolving notions of military architecture.[23] In the 1530's, across Italy, there were approximately fifty fortresses or defensive structures that incorporated bastions and polygonal elements.[24] By then, the basic architectural language of the *trace italienne* had been firmly established.

This does not mean, however, that the *trace italienne* had been universally adopted and understood. In *Dell'arte della Guerra,* written in 1520, Niccolo Machiavelli dedicates a section to the discussion of fortifications.[25] He is well aware of the importance of artillery, and his advice on how to build forts includes some modern elements such as integrated defenses, deep embankments, flanking recesses, and casemates at the bottom of the moat. Nonetheless, his overall conception of military

[18] PARKER (1996), pp.8-9.
[19] LANG, S. "Sforzinda, Filarete and Filelfo", in: *Journal of the Warburg and Courtauld Institutes* 35, (1972), pp.391-397
[20] MERRILL, E. M., "The Trattato as Textbook: Francesco di Giorgio's Vision for the Renaissance Architect", *Architectural Histories* 1, 1 (2013), p.20, DOI: http://dx.doi.org/10.5334/ah.at
[21] HALE, J. R., (1983) *Renaissance War Studies,* London, The Hambledon Press, p.17.
[22] Ibid., p.8.
[23] Ibid., p.23.
[24] Ibid., p.28.
[25] MACHIAVELLI, Niccolo, *Dell'arte della Guerra,* in *Machiavelli, The Chief Works and Others, Vol. II,* trans. By A. Gilbert (1989), Durham and London, Duke University Press, pp.703-708.

structures shows a lack of familiarity with the *trace italienne*. He speaks of two concentric enclosures separated by a ditch (with a tall external wall and a lower internal wall), towers built along the curtain walls at intervals of 400 feet, entrances protected by *portcullises* (gliding latticed gates) and thick merlons along the walls. Surprisingly, there is no mention of bastions or polygonal designs. Machiavelli insists on the superiority of French methods, oblivious to the innovations generated by Italian architects since the 1490's.[26] By the year 1526, however, Machiavelli writes a letter where he recounts an official inspection of Florence where general Pietro Navarro offers his advice on how to efficiently fortify the city.[27] Navarro's recommendations delineate a plan that fully embraces the concept of the *trace italienne* with low-lying structures built on an angular layout, artillery providing crossfire, and bastions located at strategic points. Unfortunately for the Florentines, Navarro's recommendations where not implemented with sufficient alacrity. A fresco painted by Giorgio Vasari in the Palazzo Vecchio depicts the 1529/1530 siege of Florence by Spanish and Imperial troops. The panoramic view of the city and the besieging army clearly shows the city "protected" by thin, crenellated walls with quadrangular towers. Along the vast perimeter of defenses one can see only three locations where modest polygonal structures were added to the medieval walls. The city inevitably fell to the besieging forces.

The Papal States had pioneered the constructions of bastions in the late 15th century, and as we saw in Machiavelli's report, Pope Clement VII (a member of the Medici family) was interested in providing Florence with *trace italienne* defenses in 1526. However, as late as 1540 the city of Rome lacked a comprehensive system of modern defenses. The sack of the city by the imperial forces of Charles V in 1527 and the menace of a Turkish raiding fleet in 1534 (along with the failure of Florence to withstand a siege) prompted the Papal authorities to commission the construction of vast defense works that would encircle the whole city.[28] The project was awarded to Antonio Sangallo the Younger who produced an ambitious design that after contentious debate never came to fruition, mainly because of excessive costs.

But it was obvious that the former style of warfare had totally changed as a consequence of the use of artillery and early modern guns, a fact that was also described by Georg Agricola (1494-1555): "a missile or an arrow fired by a bow or a scorpion is able to pierce a body; in contrast the iron bullet of a gun can be shot through the bodies of many people. And no marble or rock (…) is solid enough that the bullet cannot break through it with its blow and force"[29].

Consequently the cities and their rulers had to react on this threat. By the mid-16th century the wealthy republic of Siena also still lacked modern fortifications. It was only under the imminent threat of a Florentine and Imperial invasion that the Sienese decided to engage in a vast process to fortify Siena and its surrounding towns according to the current standards of military architecture.[30] The project bankrupted the republic, and by 1555 Siena had been conquered and annexed by Florence.[31] This shows that even after a universal consensus about the value and effectiveness of the *trace italienne* had been

[26] Ibid.
[27] MICHIAVELLI, Niccolo, *An Account of a Visit Made to Fortify Florence: A Letter to the Ambassador of the Republic in Rome*, in *Machiavelli, The Chief Works and Others, Vol. II*, trans. By A. Gilbert (1989), Durham and London, Duke University Press, pp. 727-734.
[28] PEPPER, Simon, "Planning versus Fortification: Sangallo's project for the defense of Rome", in: *Fort* 2 (1976), pp. 33-49.
[29] AGRICOLA, Georg, (1928), *Zwölf Bücher vom Berg- und Hüttenwesen*, Berlin, VDI-Verlag, p.8.
[30] PARROT, David, "The Utility of Fortifications in Early Modern Europe: Italian Princes and their Citadels, 1540-1640", in: *War in History* 7, 2 (2000), pp.127-153, here p.132.
[31] Ibid.

achieved, economic considerations remained an impediment to its full implementation. In the Netherlands, where the idea of the *trace italienne* was enthusiastically embraced early on, the majority of its 200 walled cities had fortifications that were mostly medieval in design as late as the 1590's.[32] According to Mahinder Kingra, the limited implementation of the Italian style of defensive works was not only the exorbitant cost of construction but also the fact that both Spanish and Dutch commanders had adopted tactics and strategies to cope with the lack of modern fortifications.[33]

While the development of the *trace italienne* is undeniably a pivotal element in the transformation of warfare in the early modern period, its slow and uneven adoption forces us to question its role as a causal element of the military revolution. And that is not the only reason to counter Parker's theory of a Military Revolution.

Even though Parker's theory was criticized for a teleological approach[34], which should explain the whole history of the following centuries, the debate is about the nature of the revolution[35] as well as about its chronology.[36] Despite the heat of the discussion itself, it mainly neglected the non-Western world,[37] even though Europe did not always dominate the military scene in Africa[38], Asia[39], or the Americas. The discussion seemed to be rather one-sided even though some historians, who are rather familiar with the non-European spheres, started to criticize the Eurocentric concept. Therefore, it seems to be useful to scrutinize the theory of *a* Military Revolution in general. Consequently, we will ask three questions that will also raise some critical arguments against the so far used concept of revolution in military history in general. We ask: Was the Military Revolution global? Were there numerous revolutions? And finally, is the revolutionary process in military history endless at all, or should we start to think of a better concept to describe the military changes that occurred during the ages?

1. GLOBAL?

When "the range of his technology is the range of his need"[40] the human's need is to kill other people to survive, expand, or rule. This need determined the use of political, economic, social, and technological reservoirs to achieve this aim since humanity came into existence. Due to this process, technology was always able to provide a concept of a future as well. So-called hard technology of tools and soft technology of its use[41]

[32] KINGRA, Mahinder, "The *Trace Italienne* and the Military Revolution during the Eighty Years' War, 1567-1648", *The Journal of Military History*, Vol. 57 (July, 1993), pp.431-446, here p.438.
[33] Ibid., p.439.
[34] BLACK, Jeremy, (2011), *Beyond the Military Revolution: War in the Seventeenth-Century World*, New York, Palgrave Macmillan.
[35] ROGERS, Clifford J. (1995), (Ed.), *The Military Revolution Debate: Readings on the Military Transformation of Early Modern Europe*, Boulder, Westview Press.
[36] AYTON, Andrew; PRICE J. L., (1995), *The Medieval Military Revolution: State, Society and Military Change in Medieval and Early Modern Europe*, London, I. B. Tauris; ETLIS, David (1995), *The Military Revolution in Sixteenth-Century Europe*, London, I.B. Tauris.
[37] ANDRADE (2014), p.52.
[38] One example would be the Battle of Adwa in 1896. For a detailed study of this battle see: JONAS, Raymond, (2011), The Battle of Adwa: African Victory in the Age of Empire, Cambridge, MA, Belknap Press.
[39] ANDRADE, Tonio (2011), *Lost Colony: The Untold Story of China's First Great Victory over the West*, Princeton, Princeton University Press.
[40] METZ, Karl Heinz, (2006), *Ursprünge der Zukunft. Die Geschichte der Technik in der westlichen Zivilisation*, Paderborn, Ferdinand Schöningh, p.12.
[41] Ibid. p.16.

could become an essential part of the history of mankind in any age, no matter which region or part of the globe. Some examples of the non-Western world will show that this process was a very natural one; therefore, the adoption of modern technologies was nothing that could be described as uniquely European anymore.

With the invention and development of guns and rifles, the visible expression of the so-called gunpowder age of Europe was seen to be tremendously important for Western supremacy in the following decades and centuries. Recent studies have shown that India, in particular, was already using canons before the Portuguese ships arrived in 1498 for the first time.[42] Consequently, especially in this sphere, which would become some kind of epitome for colonial rule, technological backwardness was definitely not a reason for Western rule in later days. However, the Scottish historian Morse Stephens (1857-1919) explained the successful rule of Alfonso de Albuquerque (1453-1515) with these arguments:

The special causes of the success of the Portuguese are to be found in the superiority of their ships, their artillery, and their soldiers. The Portuguese ships at the beginning of the sixteenth century, though much smaller than the great galleons which they afterwards built for the Indian trade, were much more efficient than the Arab vessels. They had to be both well built and well fitted to accomplish the long and perilous voyage round the Cape of Good Hope, whereas the Arab ships were only intended to sail across the Indian Ocean with the favourable monsoon and then up the quiet waters of the Red Sea or Persian Gulf. But the Portuguese did not depend on sailing vessels alone in their maritime battles; they built galleys in imitation of the native craft, and secured good sailors for them by offering increased pay.

The excellence of the Portuguese artillery and the skill of the gunners was another main cause of their victories. The natives, indeed, understood the use of powder and of cannon; as many as 300 pieces of ordnance were captured at Malacca; but the Portuguese guns were always better served than those of their opponents. It was noticed at the siege of Benastarim that one of Rasúl Khán's guns did more damage than the rest, and it was soon discovered that it was being served by a Portuguese renegade. The arquebuses or clumsy muskets of the Portuguese also did them good service, though they cannot be compared to the more efficient arms of precision which came into use in the next century. Bows and arrows were the chief weapons on both sides, and the superiority of the Portuguese crossbowmen is constantly described in different engagements.[43]Albuquerque himself provided a different picture, when he described the fact that the Indian rulers already possessed powerful and well produced cannons and firearms. His report of the attack on Goa shows that the Portuguese were not fighting an easy battle against a backward enemy:

> Alfonso Dalboquerque got into a boat, and proceeded to the station where the small vessels were at anchor, with all the rest of the fleet which followed him, and there he settles himself, and sent Duarte de Lemos, Gaspar de Paiva, and Diogo Fernandez de Béja, to man their skiffs and reconnoitre the condition of the fortress. These three got up in front of it, and examined it very closely, and reported to Alfonso Dalboquerque that it was very strong,

[42] EATON Richard M.; WAGONER, Philip B., "Warfare on the Deccan Plateau, 1450-1600: A Military Revolution in Early Modern India?", in: *Journal of World History* 25,1 (2014), pp.5-50, here p.9. For warfare in India in general see KHAN, Iqtidar Slam, (2004), *Gunpowder and Firearms: Warfare in Medieval India*, New Delhi: Oxford University Press.

[43] STEPHENS, H. Morse, (1892), *Albuquerque*, Oxford, Clarendon Press, http://www.gutenberg.org/files/31226/31226-h/31226-h.htm

> fortified with many trenches and bulwarks, and embrasured flush with the water, with much artillery therein, and a very large ditch. So Alfonso Dalboquerque, on receipt of this intelligence which the captains reported, and on consideration of the number of the forces within the city, came to the conclusion that it was a very perilous undertaking to attack it.[44]

The Indian enemies were everything but weak and unprepared. At the beginning 16th century, the fire arms industry of Goa was one of the best in the world; its gunsmiths were also influenced by Genoese, Venetian, Mamluk, and Ottoman knowledge about the new technology. The Portuguese viceroy Albuquerque even sent some matchlocks to Portugal, which should underline the quality of the Indian gunsmiths who stood no inch behind their Bohemian counterparts at that time.[45] The muskets produced on the Indian Peninsula finally made their way around the Portuguese trade colonies, arriving in Japan some years later.

However, the example of Goa in India not only provides a good case against the Eurocentric perspective of a Military Revolution but also helps to understand how military progress works. Following a trade dispute about the import of war-horses between Vijayanagara and Bijapur, the Battle of Raichur in 1520 showed that the possession of firearms was not responsible for a military victory. When Krishna Raya, the ruler of Vijayanagara, accompanied by more than 25,000 cavalry faced the well-armed army of Bijapuri, the adaption of the modern technology was not yet completed. As a consequence, the Bijapuri artillery fired all shots at once, while the cavalry of Vijayanagara was able to gain victory in the following assault against its enemies.[46] Despite this victory, the following events also show that military supremacy can easily lead to technological backwardness.

In 1565, the two powers were getting ready for another battle at Talikota. The former losers showed that they had prepared better and learned from their mistakes. The rulers of Vijayanagara had missed the opportunity to strengthen their army.[47] With regard to such developments, India also resembled Europe. However, the Indian rulers were even more successful in combining forts and artillery technology in their ruled territories, and the defeat of Bijapur in 1520 had lead to a "crash program of experimentation and adaption."[48] The fact that India was finally and successfully integrated into the British Empire was not a result of military supremacy in general but of internal rivalries among the maharajas whose disunity provided the British colonizers with a suitable divide-and-rule option. However, India is not the only example that is able to provide a rather global perspective on the case of a Military Revolution.

The Sengoku era (1467-1603) in Japan was marked by rivalries among the several feudatory rulers. Until the 1570s, when Oda Nobunaga (1534-1582) started to unify the country again, a process that was finally concluded by Toyotomi Hideyoshi (1537-1598) and Tokugawa Ieyasu (1543-1616), warring states were fighting against each other.[49] The feudal lords (*daimyō*) were trying to overcome their neighboring rivals also

[44] BIRCH, Walter de Gray, ed., (1880), The Commentaries of the Great Afonso Dalboquerque Second Viceroy of India, Vol.3, London, Hakluyt Society, p.13.
[45] EATON, (2014), p.16.
[46] Ibid. pp.18-19.
[47] Ibid p.41.
[48] Ibid p.50.
[49] For a survey of the unification process of Japan see: JACOB, Frank (2013), "Tokugawa Ieyasu: Reichseiniger, Shôgun oder Japans Diktator?". In: F. Jacob (Ed.), *Diktaturen ohne Gewalt? – Wie Diktatoren ihre Macht behaupten/ Dictatorships without Violence? – How Dictators Assert their Power*,

by using Western technologies, like muskets, which arrived with the Portuguese traders –as has been shown also from India, not only from Europe. More and more rulers adopted the new technology and copied it. Consequently, by the end of the 16th century Japan produced more rifles than all countries in Europe together. In the Battle of Sekigahara (1600), Tokugawa Ieyasu was able to end the internal fights with a glorious victory. Nonetheless, he knew that it was just a single victory, and the further use of firearms would again destroy his monopoly of power and violence. When he was proclaimed as the highest military leader of the country (*shōgun*) in 1603, he started to secure the new power for himself and his heirs.

He initiated a real Military Revolution when he announced that because the lack of honor in the use of guns in combat, firearms should be abolished. He also prohibited foreign trade in general; thus, the country became almost totally secluded from the outside world. Indeed, numerous samurai had died a dishonorable death as a consequence of the use of muskets in the last decades, but Ieyasu was mainly interested in securing power. Honor was just a very suitable excuse. The abolition of gunpowder in Japan secured the Tokugawa rule for many years, namely until 1853 when the American Commodore Matthew C. Perry (1794-1858) arrived in the Bay of Edo and forced the *shōgun* to open his country for trade. It seems ironic that Perry also used guns to achieve this aim, but the Japanese, who had decided to stay away from gun-related technology in the early 17th century, were forced to surrender facing a further development of the same technology two and a half centuries later.

A more parallel development to the European case can be seen in another Asian country that received its initial firearm impact from Japan. When Toyotomi Hideyoshi had tried to conquer Korea and China in the 1590s, he already used musketeers as an important part of his army. The Korean enemies recognized the importance of this innovation and tried to imitate the Japanese tactics.

They were also eager to get possession of muskets and Japanese prisoners.[50] The Korean military staff furthermore identified the military manuals of the Chinese Qi Jiguang (1528-1588) as valuable because on their bases the troops of the Chinese Ming Empire were able to stop the Japanese assault. Consequently, the Korean army used Japanese technology and Chinese tactics to further develop its own strength.[51] King Seonjo (1552-1608) was especially interested in the firearms and promoted enthusiastically this new form of a distance-oriented weapon.

Finally musketeers, archers, and swordsmen built some kind of complementary killing unit of the Korean army.[52] To keep these units as effective as possible, the Korean leaders also developed drill training programs, that resembled advances that were used in Europe at the same time.[53] Like their counterparts in Europe, the Korean soldiers went through a musket revolution that also changed the social environment of the country. The archers tended to be a higher social class before the focus switched to the new musketeers, who were eagerly promoted by the royal leader as well. Next to drill training, the Korean government also used foreign specialists –Chinese, Dutch, and Japanese– to improve and refine the new tactics in specially established military

Globalhistorische Komparativstudien Bd.2, Comparative Studies from a Global Perspective Vol. 2, Würzburg, Königshausen & Neumann,, pp. 79-102.

[50] ANDRADE, (2014), p.61.

[51] Ibid. pp.62-65.

[52] Ibid. p.66.

[53] Ibid. p.53.

schools, whose alumni were able to successfully encounter the Russian territorial ambitions in later years.[54]

To answer the first question, we can state that there was definitely not just a European Military Revolution. Historians working on subjects of Asian history have shown the diversity with regard to military developments in several of these countries, which resemble the European developments. One could easily broaden this perspective with regard to the Ottoman Empire, where Eurocentric theories are also no longer able to explain the specific military-based processes of advance.[55] While the Military Revolution was not uniquely European, was it at least unique from a chronological perspective, or do we have to talk of numerous revolutions in the future?

2. NUMEROUS?

The basis for the theory of a Military Revolution is the "mass adoption of firearms as a tool of warfare,"[56] but is the adaption of a single technology sufficient to explain something that should be determined to be a revolution? When we assume that an event of a revolutionary impact has to have consequences for political, social, economic, and technological perspectives, it is definitely not enough to just focus on firearms, but in combination with increasing numbers of infantry, the adaption of a higher level of state control and other aspects combined, create and justify the use of the term. However, if that is what we call a military revolution, we definitely also have to ask if there were numerous military revolutions. Due to the fact that the history of war cannot be just the history of events[57] but also has to take different factors into consideration, the term revolution might be useful or needed for other developments of the long military history of humanity.

Following Carl von Clausewitz, the reason for warfare was always to wear down the enemy[58] and to win a battle or a whole war. To achieve this, generations of armies tried to get in possession of the best available technology and the most possible economic and political support as well as the most social prestige for their actions.[59] So if we use the term Military Revolution in the sense of that specific scenario, there is more than one revolution of warfare through the ages. When the Athenians started to recruit thetes (τὸ θητικόν) for the triremes during the Persian Wars (499 BC-449 BC), they not only increased their manpower, which was needed to keep the ships sailing, they also initiated a political and social change leading to an increasing democratic system in Athens itself. However, this would be just one example from antiquity. When Alexander the Great (356 BC-323 BC) conquered the Persian Empire, he heavily relied on his cavalry, a part of his army that was already developed under Philip II (382 BC - 336 BC), who started to focus his military tactics on this special part of his army. The established Hetairoi became the heart of the army and tactical dagger in Alexander's hand, which he could use to destroy the Persian military order with a so-called "hammer

[54] Ibid. pp.78-79 and pp.82-83.
[55] ÁGOSTON, Gábor, "Firearms and Military Adaption: The Ottomans and the European Military Revolution, 1450-1800", in: *Journal of World History* 25,1 (2014), pp.85-124, here pp.99-100.
[56] Ibid. p.85.
[57] SCHMIDTCHEN, Volker, (1990), *Kriegswesen im späten Mittelalter*, Weinheim, VCH Verlagsgesellschaft, p.8.
[58] CLAUSEWITZ, Carl von (2010) *Vom Kriege*, Neuenkirchen, RaBaKa Publishing, p.179.
[59] MÜNKLER, Herfried, (2002), *Über den Krieg. Stationen der Kriegsgeschichte im Spiegel ihrer theoretischen Reflexion*, Weilerswist, Velbrück Wissenschaft, p.200.

and anvil tactic."[60] Philip had not only created a fast, very mobile and highly destructive group of soldiers, but military elite as well. Due to this social impact, which was supplemented by the political expansion to the parts of Greece where the best horses were bred, Philip in a way revolutionized the warfare of antiquity. The Hoplites of Southern Greece were no longer the standard, a fact that was underlined in the Battle of Chaeronea (338BC) when Alexander's cavalry slaughtered the Sacred Band of Thebes.[61]

> That not only the ancient ages were full of military adaptions, which caused tremendous social, political, and economic consequences has already been shown by several historians who focused on different time periods.[62] Despite this interrelationship, it was the introduction of gunpowder that finally changed the whole military system, leading to new mass armies, firstly tested during the Thirty Years' War (1618-1648). At the beginning, the state was not capable of waging such a new large-scale war, a fact that paved the way for people like Albrecht von Wallenstein (1583-1634), who could be seen as the first military entrepreneur of Europe. Additionally, like Kaempffert stated already in 1941, it was the discovery and the military use of gunpowder that gave science and technology their impetus –a discovery which did quite as much as the invention of movable types and the steam engine to change the structure of society, to give it new purpose and direction, and to lay the foundations of engineering and mass production.[63]

He continues by drawing a comparative line between the Military Revolution, which was just a consequence of its industrial predecessor:

> Military history merely parallels industrial history. Both in industry and in war men are regimented. Everywhere there is system –system in reconnoitering from the air, firing shells from a battery, building an airplane, preparing and packaging a breakfast food. Innovations can be introduced in the midst of war only on a small and experimental scale, as in the case of gas, the tank, and armored vessels.[64]

While his perspective was highly influenced by the events of the Second World War (1939-1945), he also recognized the impact of the Industrial Revolution on the scope of warfare itself because "the musket, the cannon, the machine gun are labor-saving devices in precisely the same sense that a steam shovel is a labor-saving

[60] DELBRÜCK, Hans, (1920-1923), *Geschichte der Kriegskunst im Rahmen der politischen Geschichte*, 4 Vols., Berlin, Stilke; JÄHNS, Max, (1878-1880), *Handbuch einer Geschichte des Kriegswesens. Von der Uhrzeit bis zur Renaissance*, 2 Vols., Leipzig, Verlag von Fr.Wilh. Grunow; OMAN, Charles, (1898), *A History of the Art of War. The Middle Ages from the Fourth to the Fourteenth Century*, London, Methuen & Co.

[61] For a detailed analysis of the importance of horses for Alexander's strategies see: JACOB, Frank (2015), "Der Aufstieg Makedoniens: Eine Erfolgsgeschichte antiker Kavallerie". In: F. Jacob (ed.): Pferde in der Geschichte, Darmstadt, Büchner.

[62] See the report on a recent conference on the interrelationship of technology and warfare at the University of Würzburg (Germany), which is available at the following URL: http://hsozkult.geschichte.hu-berlin.de/tagungsberichte/id=5466 (Last access, 31 October 2014).

[63] KAEMPFFERT, Waldemar, "War and Technology", in: *American Journal of Sociology* 46, 4 (1941), pp.431-444, here p.432.

[64] Ibid. p.442.

device."[65] That killing should become a dishonored work mainly determined by modern technologies was already visible during the last wars of the 19th century. Even Carl von Clausewitz, writing in the early 19th century, had known that a combination of power and technology would lead to a more complex situation. He described the interrelationship therefore already in his famous work *On War* in the following way:

> The choice between these terms seems to be still unsettled, and no one seems to know rightly on what grounds it should be decided, and yet the thing is simple. We have already said elsewhere that "knowing" is something different from "doing." The two are so different that they should not easily be mistaken the one for the other. The "doing" cannot properly stand in any book, and therefore also Art should never be the title of a book. But because we have once accustomed ourselves to combine in conception, under the name of theory of Art, or simply Art, the branches of knowledge (which may be separately pure sciences) necessary for the practice of an Art, therefore it is consistent to continue this ground of distinction, and to call everything Art when the object is to carry out the "doing" (being able), as for example, Art of building; Science, when merely knowledge is the object; as Science of mathematics, of astronomy. That in every Art certain complete sciences may be included is intelligible of itself, and should not perplex us. But still it is worth observing that there is also no science without a mixture of Art. In mathematics, for instance, the use of figures and of algebra is an Art, but that is only one amongst many instances. The reason is, that however plain and palpable the difference is between knowledge and power in the composite results of human knowledge, yet it is difficult to trace out their line of separation in man himself.[66]

Finally, it was the First World War created a sphere for new dimensions of technologically driven mass killings. In this sense, the events of 1914 until 1918 really created a Military Revolution. Already during the Russo-Japanese War (1904/05), observers and soldiers alike could experience the new level of industrialized warfare to its total ends. Sakurai Tadayoshi (1879-1965) described the modern battlefield in very vivid terms:

> The sublimity of battle can only be seen in the midst of showers of bullet and shell, but the dismal horror of it can best be observed when the actual struggle is over. The shadow of impartial Death visits friend and foe alike. When the shocking massacre is over, countless corpses covered with blood lie long and flat in the grass and between stones. What a deep philosophy their cold faces tell! When we saw the dead at Nanshan, we could not help covering our eyes in horror and disgust. But the scene here, though equally shocking, did not make us shudder half so much. Some were crushed in head and face, their brains mixing with dust and earth. The intestines of others were torn out and blood was trickling from them. The sight of these things, however, did not horrify us very much.[67]

[65] Ibid. p.443.
[66] CLAUSEWITZ, Carl von (1908), On War, Vol. 1, London, Kegan Paul, p.119.
[67] SAKURAI, Tadayoshi, (1907), *Human Bullets. A Soldier's Story of Port Arthur*, Boston/New York, Houghton, Mifflin and Company, p.149.

He continued his story describing some impressions from the battlefield after the fighting was over, which underlined the cruelties of war in the 20th century long before anyone could think of Verdun:

> After this battle we captured some machine-guns; this was the firearm most dreaded by us. A large iron plate serves the purpose of a shield, through which aim is taken, and the trigger can be pulled while the gun is moving upward, downward, to the left, or to the right. More than six hundred bullets are pushed out automatically in one minute, as if a long, continuous rod of balls was being thrown out of the gun. It can also be made to sprinkle its shot as roads are watered with a hose. It can cover a larger or smaller space, or fire to a greater or less distance as the gunner wills.[68]

That the enemies were skilled with the new technology was obvious when Sakurai and his comrades found a dead soldier who was hit by more than 70 bullets.[69] Despite the facts that were visible during this war between Japan and Czarist Russia at the beginning of the new century, nobody believed that a civilized European war would have to face the same cruelties. But it happened.

And the First World War really produced new dimensions of warfare. To produce the needed amount of grenades, which rose from a daily production rate of 13,600 per day in 1914 to 100,000 per day in 1916, the French industry had to mobilize all available workforce, while civilians were also actively integrated into the war itself. The same was true for the British economy, which had to produce 1.2 million grenades that were used during the Battle of the Somme in 1917, and at the Battle of Ypres in 1917 when they finally needed 4.3 million grenades.[70] Consequently, the war was no longer a fight between armies; it became one between armories, whole workforces, populations.

Technological advantages should be kept secret, because they were decisive factors of warfare. The United States War Department even advised all officers with regard to the present machine gun manual to make sure to protect the technological superiority on 19 June 1917:

> You are advised that this and all subsequent documents of a similar character, which may be furnished to you from this office, are to be regarded as strictly confidential. They are to be kept at all times in your personal possession, and are not to be copied, nor are any parts of their contents to be communicated either directly or indirectly to the press, nor to any persons not in the military or naval service in the United States. In Europe these documents are not to be carried into the front one trenches, nor farther to the front than the usual post of the officers to whom issued. Strict compliance with this injunction is enjoined upon every officer into whose hands any of these confidential documents may come.[71]

The First World War finally became a technologically based war, due to which the human part needed to be able to control a more and more complex technical one, as another description of the equipment of a machine-gun company or troop explains:

[68] Ibid. p.152.
[69] Ibid. p.153.
[70] CREVELD, (2009), p.84.
[71] ARMY WAR COLLEGE, ed., (1917), *Machine Gun Notes*, No.1, Washington, Government Printing Office, p.5.

> Each machine-gun company or troop is provided with four guns, including tripods, ammunition, spare parts, tools, and accessories, together with the necessary packs. The equipment for each organization is carried on 20 mules, constituting 4 sections of 5 each. The sections are essentially complete units, although certain articles are not carried in every section. The equipment of each section consists of one gun, ammunition, and the necessary equipment for maneuvering the piece in the field. It is divided into the following parts:
>
> Part I. The gun with its ammunition and accompanying parts.
> Part II. The pack harness.
> Part III. The special pack equipment.
> Part IV. The pioneer tools.
>
> A description of each of these parts, together with a statement of total equipment issued to one machine-gun company or troop[72]

Was also part of the more and more complex equipment, the soldiers needed to be able to use during the battles of the First World War. It became a total war of technology, but also a revolutionary war that produced political revolutions as a consequence of its high impact on the civil societies in the participating countries.

One aspect was the speed of technological developments that surpassed everything before. Air fighters, tanks, submarines and many other technologies were adapted almost on an hourly rate.[73] The armies were willing to win the war, and therefore, the enemy had to be defeated, no matter at what cost. Already in the second half of the 19th century, arms races had determined the political struggles in Europe, but the Great War became the vivid expression of the consequences of a lost battle over a more appropriate technology. Now, improvements were needed to change the outcome of a battle, which then might decide the war. The tank was created to destroy machine guns during the battle and to protect the soldiers from its deadly fire.[74] Consequently, one could use the term catalyst for the events between 1914 and 1918.

However, it was not only military technologies that changed the way of warfare. Civil technologies like the phone or chronographs were also used to better control larger armies and technologies of observation, which provided needed impressions of the enemy's movements and conditions.[75] Despite these inclusive elements, there was also an exclusive one. The war was brought to the homes of the ordinary people by the use of technologies like the photograph and the movie. Larger audiences were now confronted with the cruelties of war, as well as with victorious events.[76] Regardless of the new possibilities created by the use of technology, death remained part of the fighting even though Ivan Stanislavovich Bloch (1836-1902) had predicted that the high

[72] U.S. ORDNANCE DEPARTMENT, ed., (1917), Handbook of the Maxim Automatic Machine Gun, Caliber 30, Model of 1904 with Pack Outfits and Accessories, Washington, Government Printing Office, p.7.
[73] Ibid. pp.93-97; METZ, (2006), pp.421-427.
[74] Ibid. 419.
[75] KÖPPEN, Manuel, (2005), *Das Entsetzen des Beobachters. Krieg und Medien im 19. und 20. Jahrhundert*, Heidelberg, Universitätsverlag Winter, p.1; SPREEN, Dierk, (1998), *Tausch, Technik, Krieg. Die Geburt der Gesellschaft im technisch-medialen Apriori*, Berlin et al., Argument Verlag, p.11; TONN, Horst, "Medialisierung von Kriegserfahrungen". In: G. Schild; A. Schindling (Eds.), *Kriegserfahrungen – Krieg und Gesellschaft in der Neuzeit. Neue Horizonte der Forschung*, Paderborn, Ferdinand Schöningh, 2009, pp.109-133, here p.110.
[76] KÖPPEN, (2005), p.37; TONN, (2009), p.110.

spread of technology would end the use of large armies and their manpower.[77] Although the Great War produced almost daily peaks with regard to firepower and mobility, it also needed human sacrifice because the military leaders were not willing to acknowledge the new situation of technological mass destruction.

It was the Second World War (1939-1945), beginning with Hitler's *Blitzkrieg*, that finally overcame the idea of mass armies, which were initially replaced by fast and well-trained elite tank and air fighter forces. Consequently, the events of 1939 could also be called revolutionary in a way because Hitler had used the German economy, politics, and manpower of the so-called Third Reich to prepare a war that shocked Europe, especially with its first fast and successful battle tactics. With regard to this short survey of different events, for which the term Military Revolution could be used, we have to ask the final question: Are Military Revolutions endless at all, or are they part of a larger process of military progress, based on research and development, the adaption of new technologies, and their approval by usability?

3. ENDLESS?

War itself is a collective act by people to kill other people.[78] What seems to be a very simple explanation for war is the root of all possible Military Revolutions because driven by the aim of killing an enemy, people start to think about options to achieve this target without being hurt. Every weapon development was trying to increase the level of damage while decreasing the possible harm to the actor. Therefore, the bow, later the musket, and finally the atomic bomb were invented. By further increasing the technological possibilities, mankind also increased the chance for a delimitation of violence.[79] Trutz von Trotha (1946-2013), a German sociologist, got that interrelationship to the point by stating that:

> Cruelty is a mirror of the living conditions and achievements of a society. It appears to be as old as humanity itself and crosses societal and cultural boundaries. No society can say that it does not allow cruelty to exist, even if societies differ to an extreme in the amount of space they give to cruelty and which forms are practiced in these particular spaces.[80]

This specific development seems to be endless. However, we can recognize that there are peaks of technological adaptations that are, like the Indian example described above, mainly interconnected with defeats. While some military strategists during the Great War still believed that the will of a soldier, expressed by bayonet assaults against the machine gun equipped enemy could make a difference, others were not willing to accept the lessons of the Russo-Japanese War a decade before.[81] This military stubbornness is partly the consequence of the fact that most military staffs are planning

[77] BLOCH, Ivan, (2008), *Is War Now Impossible? Being an Abridgment of the War of the Future in Its Technical, Economic, and Political Relations*, Whitefish, MT, Kessinger [originally published 1899].
[78] METZ, (2010), p.299.
[79] BIERBAUMER, Niels, "Neurogeschichte von Gewalt und Kriegserfahrung". In: G. Schild; A. Schindling (Eds.), *Kriegserfahrungen – Krieg und Gesellschaft in der Neuzeit. Neue Horizonte der Forschung*, Paderborn, Ferdinand Schöningh, 2009, pp.83-107, here p.90.
[80] TROTHA, Trutz von, "*On Cruelty: Conceptual Considerations and the Summary of an Interdisciplinary Debate*". In: J. Rösel and T. v. Trotha (Eds.), *On cruelty, Sur la cruauté, Über Grausamkeit*, Cologne, Rüdiger Köppe Verlag, 2011, pp.1-67, here pp.4-5.
[81] Dr. Jacob is actually finishing a comprehensive study on the long-term effects of the Russo-Japanese War.

future wars by looking back in time. Therefore, they keep running systems in existence because they cannot determine a need for advance.[82]

Nowadays we experience another phenomenon, namely the end of traditional warfare between armies fighting for nation-states. We face a war against terrorism, which means the war against an invisible enemy. These "Low-Intensity Wars"[83] or "New Wars"[84] are the evidence that technological supremacy is no longer an assurance of victory.[85] Consequently, the military has to adapt new technologies and strategies, and it has to revolutionize itself again.[86] Modern wars are planned and prepared in laboratories and by hackers who determine the future of the so-called Cyber War; however, there is still sufficient time and space for further Military Revolutions, which are not endless in themselves but are part of an endless revolutionary process. And like all revolutions, whether they are political, economic, social, or technological, the military impact of the revolution per se is part of a historical continuum.

CONCLUSION

To conclude, we will shortly answer again our initial questions. Was the Military Revolution global? Yes, it was and still is a global process that cannot be limited to Europe. If we do that, we will remain in the position of a Eurocentric historiography that would no longer be sufficient for the global context of history itself. Were there numerous revolutions? This question cannot be answered in a universal sense. We can say that there were numerous Military Revolutions, which however would still be part of a larger process of research and development, adaption and evaluation. However, if we use the term in an overly inflationary way, we would have to argue that there is no Military Revolution at all. Actually, we tend to argue that there were *numerous* Military Revolutions; however, the definition itself should be discussed again and in detail, including those historians who are working on non-European topics. Such a broad discussion could lead to a general and suitable definition of a Military Revolution, which could also cover more eras and regions than early modern Europe. And finally, is the revolutionary process in military history endless at all? Yes, the process is endless while the numerous instances of revolutions are not. As long as there are people trying to kill other people, there is space and time for another revolution. One could even go further and state that the initial revolutionary impetus never stopped. It just became faster and faster, leading to military inventions during the 20th and 21st century, which were not revolutionary only with regard to their military perspective, but particularly with regard to the pace and frequency with which came into existence.

[82] METZ, (2010), p.116; MÖSER, (2009), p.497; MÜNKLER, (2002), p.253; SCHMIDTCHEN, Volker, (1990), p.17.

[83] CREVELD, Martin van, (2004), *Die Zukunft des Krieges*, Hamburg, Murmann, pp. 45-55.

[84] The term "New Wars" has been recently criticized: LANGEWIESCHE, Dieter "Wie neu sind die 'Neuen Kriege'? Eine erfahrungsgeschichtliche Analyse". In: G. Schild; A. Schindling (Eds.), *Kriegserfahrungen – Krieg und Gesellschaft in der Neuzeit. Neue Horizonte der Forschung*, Paderborn, Ferdinand Schöningh, 2009, pp.289-302.

[85] This dilemma was already visible during the war in Vietnam, see PRIBBENOW II, Merle L., "The -Ology War: Technology and Ideology in the Vietnamese Defense of Hanoi, 1967", in: *The Journal of Military History* 67, 1 (2003), pp.175-200, here p.200.

[86] METZ, (2010), p.309. The Chinese army for example is also discussing future options for its development, HWANG, Byong-Moo: "Changing Military Doctrines of the PRC: The Interaction between the People's War and Technology", in: *Journal of East Asian Affairs* 11, 1 (1997), pp.221-266, here pp.222-224.