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Is *The Military Revolution* Dead Yet?
by *Geoffrey Parker*

Is The Military Revolution *Dead Yet?*

The Military Revolution: Military Innovation and the Rise of the West, 1500-1800 is now approaching its 35th anniversary, and its author intends to update and restate in a new edition the original assertions of the 1988 edition (with one exception: we need to discard the fallacious term '*trace italienne*'), while applying the theoretical framework of 'punctuated equilibrium' to military affairs. The new edition of The Military Revolution will situate a series of episodes of intense change within a prolonged process of evolution and adaptation. This essay offers the opening arguments of the new edition of *The Military Revolution*, and includes (by way of example) the analysis of one revolutionary episode – the battle of Lützen (1632) – which combines the results of recent 'battlefield archaeology' with the numerous surviving eye-witness accounts.

Keywords: 'Military Revolution' thesis, 'Punctuated equilibrium' theory, Battle of Lützen (1632), Battlefield archaeology

Cambridge University Press first published *The Military Revolution* in 1988 and it has been reprinted more than twenty times and translated (so far) into Chinese, French, German, Italian, Japanese, Korean, Spanish and Turkish[1]. This may surprise some in view of the hostile reception of the book and its argument in some quarters. The most critical assessment, which was also one of the first to appear, was a 'review essay' in "Technology and Culture", in which Bert S. Hall and Kelly DeVries professed themselves "disappointed by the number of lost opportunities

[1] German, Spanish and Italian editions of *Military Revolution* appeared in 1990, followed by editions in French (1992 and 2013), Japanese (1995) Chinese (1996), Turkish (2007) and Korean (2012).

to create a genuine comparative perspective that might aid our assessment of technology and change in military affairs". They concluded that «Geoffrey Parker's grand and vivid vision of Europe's 'military revolution' could have made room for such an analysis. His failure to do so may mean that his thesis will have a short life span"[2].

Others agreed. In *Early Modern Military History* (2004), Geoff Mortimer declared that the military revolution debate "has outlived its usefulness"; and two years later Christopher Duffy denounced "the notion of a 'Military Revolution' which distorted the study of early modern military history for decades". In his survey *Warfare in the Seventeenth Century* (2001), John Childs grumbled that "Over the past fifty years, military historians of sixteenth- and seventeenth-century Europe have been obsessed with defining the nature and chronological location of a 'Military Revolution'", and he included a section optimistically entitled *Death of the 'military revolution'*. According to Peter Brown, a historian of Imperial Russia, in 2009: "The expression 'military revolution' has circulated for more than a half century and unquestionably bears signs of discursive fatigue and the arcane, inasmuch as it has made the rounds for so long". Finally, in 2019 Scott Taylor, a historian of interpersonal violence in Spain, proclaimed "The military revolution is dead", and for this he blamed "[my] lack of real understanding of the effectiveness of non-European armies", which "gave [me] a blinkered view of European exceptionalism". In his opinion, two recent books – *The Gunpowder Age* by Tonio Andrade and *Empires of the Weak* by Jason Sharman – "have now put the final nails in the military revolution's coffin"[3].

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[2] B.S. Hall, K.R. DeVries, *Essay Review–The "Military Revolution" Revisited*, "Technology and Culture", 31, 1990, 3, pp. 500-507, at pp. 506-7. The following year, in the same journal, H. Dorn, a distinguished historian of science and technology, published a trenchant criticism of the neo-antiquarianism that underlay this 'Review essay'. Harold Dorn, *The 'Military Revolution': Military History or History of Europe?*, "Technology and Culture", 32, 1991, 3, pp. 656-658. The editor of "Technology and Culture" invited Hall and DeVries to respond to Professor Dorn, but they declined (letter from Editor Robert C. Post to Geoffrey Parker, 17 Mar. 1992, in the Author's possession).

[3] J. Childs, *Warfare in the Seventeenth Century*, Cassel & Co., London 2001, pp. 16-17; P.B. Brown, *Gazing Anew at Poltava: Perspectives from the Military Revolution Controversy, Comparative History, and Decision-Making Doctrines*, "Harvard Ukrainian Studies", 31, 2009-2010, 1/4, pp. 107-133, at p. 107; S.K. Taylor, *Moving beyond the Military Revolution*, "Bulletin for Spanish and Portuguese Historical Studies", 44, 2019, 1, pp. 163-70: a review essay of Tonio Andrade, *The Gunpowder Age. China, Military Innovation, and the Rise of the West in World History*, Princeton University Press, Princeton (NJ) 2016, and J.C. Sharman, *Empires of the Weak: The Real Story of European Expansion and the Creation of the New World Order*, Princeton University Press, Princeton (NJ) 2019.

Three decades after the book first appeared, perhaps the time has come to re-open the coffin, to shake off the "discursive fatigue", to correct my "blinkered view of European exceptionalism", and to resurrect, restate and refine the Military Revolution in the hope of prolonging the "life span" of my thesis.

The term first appeared in a treatise written by a British officer, Campbell Dalrymple, published in London in 1761 and reprinted in Philadelphia in 1776 to inform the Continental Army raised by the Ungrateful Colonials about warfare in Europe. According to Dalrymple: "The effect of [musket] fire begins now to be disputed – at least, it is not believed so formidable, as it was; which in time may produce another military revolution, and send us back to the arms in use before the invention of gunpowder"[4]. Wisely, the Continental Army paid no attention.

The phrase then apparently slumbered until 1955 when Michael Roberts delivered a dazzling Inaugural Lecture as professor of history at the Queen's University of Belfast (Northern Ireland) entitled *The Military Revolution, 1560-1660*. He perceived four critical changes in the art of war in Europe:

- a 'revolution in tactics' (the replacement of lance and pike with firepower);
- a rapid increase in army size (tenfold in the case of some states), which in turn;
- forced upon commanders a 'revolution in strategy' in order to bring these larger armies into action;
- the new-scale warfare had an enhanced impact on Europe's political and social development.

This novel thesis would surely have passed into oblivion, like most Inaugural lectures, had Roberts not invited Sir George Clark to give a series of lectures on a topic, any topic, at the Queen's University of Belfast. Clark chose *War and society in the seventeenth century*, and he published his lectures as a book in 1958, in which Roberts's military revolution became the new orthodoxy. Henceforth almost every work on early modern Europe that mentioned warfare included a paragraph or two that summarized Roberts's argument.

In 1984, I too received an invitation to give a series of lectures on a topic, any topic, in the field of military history [Figure 1].

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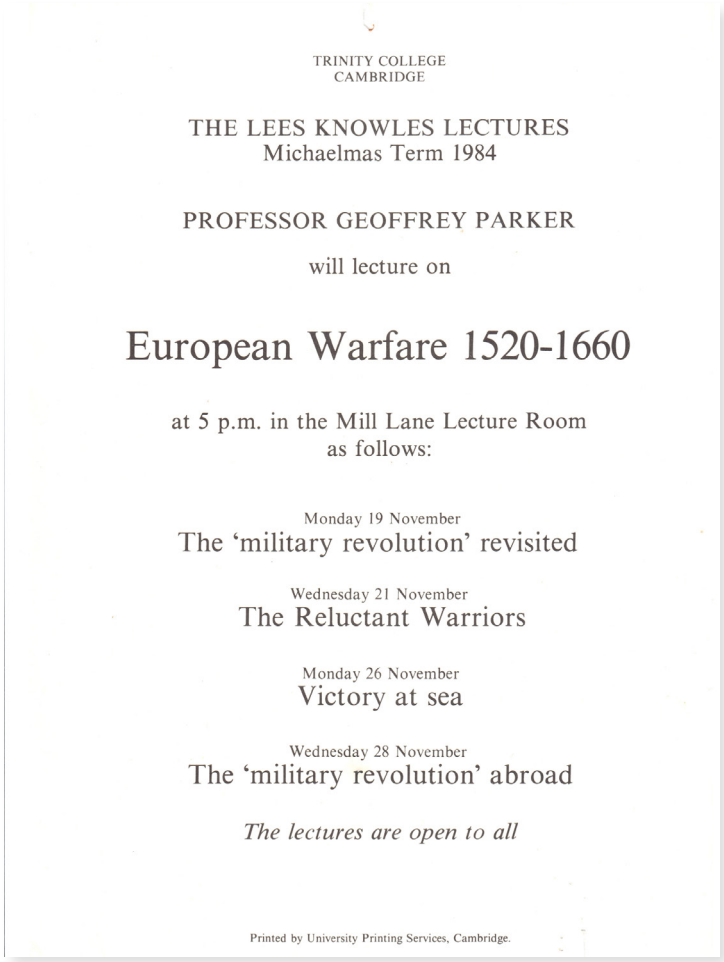
[4] C. Dalrymple, *A military essay containing reflections on the raising, arming, cloathing and discipline of the British infantry and cavalry; with proposals for the improvement of the same,* Printed for D. Wilson, London 1761, Part I, p. 56. Dalrymple (1725-67), governor of Guadaloupe, completed the first edition in 1759 and dedicated it to the future George III.

Figure 1. Birth of a project: four lectures on "The Military Revolution" given at Cambridge University 1984. Reproduction of the original in Author's possession.



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I chose 'The Military Revolution' because I felt that Roberts had overlooked two important developments: changes in naval warfare, and the role of military and naval innovations in Europe's overseas expansion before the Industrial Revolution. After giving the lectures, I puzzled over whether they would make a book, or should appear as separate articles. I was also worried how Roberts might feel about a whole book devoted to qualifying his original idea.

I therefore decided to visit him and find out. He immediately re-assured me that he found my choice of subject flattering; and he promised to read my lectures and then deliver his verdict on what to do with them. That verdict arrived three weeks later:

> [The first two lectures are] good, but basically unsurprising, except for [the] richness of illustration… I still think that [they] might be more sharply focused; […] but III is fine and IV, sensational… The *total* experience of the lectures makes me think that much would be lost if they were dissected and distributed: they need to make their impact together.

With Roberts's gracious and generous letter, a book was born[5].

Since 1988, several historians have written or edited entire books on the subject[6]. In 1995 Cliff Rogers published an excellent collection of articles and essays. Jeremy Black, who has published two books on the subject so far, deemed the military revolution "The single most influential concept in studies of early modern warfare"[7]. In 2011 Jerzy Maroń published *Towards the Theory of a Military Revolution – Selected Problems*; with special reference to Poland; in 2017 a conference took place in Portugal on *The First World Empire: Portugal, War and Military Revolution*; in 2018 Oleksii Sokyrko published (in Ukrainian) *Eastern Europe and the 'Military Revolution'*[8]. The role of the military revolution in European expansion overseas has also attracted attention. In 2014 a special

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5 Michael Roberts to Geoffrey Parker, 27 Jan. 1985, letter in the Author's possession. I dedicated my book to Michael Roberts.

6 D. Eltis, *The Military Revolution in Sixteenth-Century Europe*, Tauris Academic Studies, London 1995; A. Ayton-J.L. Price, *The Medieval Military Revolution: State, Society and Military Change in Medieval and Early Modern Europe*, Tauris Academic Studies, London 1995.

7 J. Black, *European Warfare, 1660-1815*, UCL Press, London 1994, p. 3. See also C.J. Rogers (ed.), *The Military Revolution Debate: Readings on the Military Transformation of Early Modern Europe*, Westview, Boulder, CO 1995; J. Black, *A Military Revolution? Military Change and European Society, 1550–1800*, MacMillan, Basingstoke-London, 1991; Id., *Beyond the Military Revolution: War in the Seventeenth Century World*, Palgrave Macmillan, Basingstoke 2011.

8 J. Maroń, *Wokół teorii rewolucji militarnej. Wybrane problemy*, Wydawnictwo Uniwersytetu Wrocławskiego, Wrocław 2011; O. *Сокирко, Східна Європа і концепт "мілітарної революції", історіографічні зауваги* (*Eastern Europe and the Concept of 'Military Revolution': Historiographical Remarks*), *„Європейські Історичні" Студії* („European Historical Studies*")*, 9, 2018, pp. 127-44; H. Carvahal, A. Murteira and R. Lee de Jesus (eds.), *The First World Empire: Portugal, War and Military Revolution*, Routledge, Abingdon-New York 2021.

issue of "The Journal of World History" focussed on *Globalizing the Military Revolution*[9]; and just since 2016 Princeton University Press alone has published three books on the subject: one by a historian, one by an economist, and one by a sociologist[10]. In the opinion of David Graff, a distinguished historian of East Asia, writing in "The Journal of Military History":

> For several decades now, the Military Revolution has reigned as the dominant intellectual construct shaping our understanding of war in the early modern world[11].

All of these authors, and many others, took Roberts's 1955 lecture as their starting point; and just before his death, Michael wrote to me, with characteristic modesty:

> It is a sobering thought that an obscure Inaugural in a provincial university should provide the pretext for forty years of debate. I can't help feeling that for once in my life I did *invent* something[12].

***

So did I, too, *invent* something with my *Military Revolution*? I certainly invented at least one error: I used the term *trace italienne* to describe the 'artillery fortress' developed in sixteenth-century Italy, thinking it was the term used by (non-Italian) contemporaries. I had done the same in a previous book, *The Army of Flanders and the Spanish Road: the Logistics of Spanish Victory and Defeat in the Low Countries Wars*, published in 1972 by Cambridge University Press. But it appears I was wrong. In his article *La 'trace italienne*', published in 2014, the Belgian scholar Philippe Bragard complained that he could not find any early modern example of those words. Neither could I when I searched desperately for my source

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9 *Focus: Globalizing the Military Revolution*, "Journal of World History", 25, 2014, 1, pp. 3-124.

10 T. Andrade, *The Gunpowder Age, China, Military Innovation and the Rise of the West in World History*, P.T. Hoffman, *Why Europe Conquered the World?*, J.C. Sharman, *Empires of the Weak: The Real Story of European Expansion and the Creation of the New World Order*, published respectively in 2016, 2015, and 2019.

11 *Beyond the Military Revolution: War in the Seventeenth Century World*, by Jeremy Black, reviewed by D.A. Graff, "Journal of Military History", 76, 2012, pp. 229-31.

12 Michael Roberts to Geoffrey Parker, 9 Jan. 1995, letter in the Author's possession. For one example of the article's impact, see I.A.A. Thompson, *War and Society in Habsburg Spain* (Aldershot, 1992), p. IX: "My interest in the historical study of war [was] inspired by Michael Roberts's seminal essay on 'The Military Revolution'".

– although I did find that in a manual intended to instruct young French noblemen published in 1674 the French Jesuit Jean Du Breuil described four different techniques of fortification: French, Dutch, Spanish and "selon l'ordre italien", and invited his readers to pick up a pen and ruler and "tracer le plan" – which is tantalizingly close, but not close enough. According to a Google Ngram search, '*trace italienne*' first appeared in 1972, so it certainly appears that I manage to 'invent something'. Too bad it's wrong[13].

Because so much new material on the subject has appeared since 1988 (and in order to banish '*trace italienne*' from the lexicon of military historians), here is how I plan to restate, refine and expand my argument. The original *Military Revolution* made four linked assertions:

1. That a series of innovations in the nature of warfare on sea and land in Western Europe combined to create a new way of fighting that merits the name 'Military Revolution'.
2. That although many innovations had both medieval antecedents and non-European parallels, the *scale* of the changes in early modern Europe was unique.
3. That the combined impact of the innovations far exceeded the sum of its parts because they created a 'challenge-and-response' dynamic among protagonists – a dynamic that Arnold Toynbee identified as one of the "Possible positive factors" in clashes of civilizations[14].
4. That the 'Military Revolution' not only produced asymmetrical conflicts within Europe but also tipped the balance of power between the West and the rest of the world. By 1775, it had allowed relatively small groups of Europeans to gain control over Siberia, most of the Americas and the Philippines, and parts of Africa and South Asia – in all, over one-third of the world's land surface – and to dominate all of the world's oceans.

Several aspects of my argument proved controversial, including the chronological framework. Some critics, perhaps misreading the title, as-

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13 Philippe Bragard, *La "trace italienne". Réflexions sur une expression infondée*, in Nicolas Faucherre, Pieter Martens, Hugues Paucot (sous la direction de), *La genèse du système bastionné en Europe / The genesis of the bastionned system in Europe, 1500-1550*, Cercle Historique de l'Arribère, Navarenx 2014, pp. 49-52; Jean de Breuil, *L'art universel des fortifications françoises, hollandoises, espagnoles, italiennes et composées*, 3rd ed., chez Jacques Du Brueil, Paris 1674, pp. 90-1: «*Pratique XVIII. Pour fortifier toutes figures régulières selon l'ordre italien*».

14 A. Toynbee, *The Study of History*, I, Oxford University Press, Oxford 1934, pp. 271-338. I thank Jon Sumida for suggesting to me that one might apply this concept to the military affairs.

sumed that 'my' Military Revolution began in 1500 and ended in 1800, and objected that few revolutions last for three centuries. Others asserted that critical developments took place in the Middle Ages, so that (to quote Andrew Ayton) "the main innovations which have been seen as the core of the 'military revolution' do not appear so new when viewed from a medieval perspective". Jeremy Black argued that the 'major changes' in the western way of war all took place either in the Middle Ages or "after 1660, so that Roberts' century [1560-1660] was in relative terms one of limited change between two periods of greater importance"[15].

Now establishing the exact chronology of 'major changes' is always challenging, because not all the major changes take place simultaneously. So is it possible to be more precise? After all, scholars in other disciplines have managed this feat. Thus diplomatic historian John Ikenberry has written of "ordering moments", which he defined as "the settlements of great-power conflicts" when "the rules and institutions of the international order are on the table for negotiation and change". Each "ordering moment" created "a sort of constitutional framework in which the subsequent flow of international relations takes place". By contrast Stephen Jay Gould, a palaeontologist, postulated a process of 'punctuated equilibrium' in biological evolution, with long periods of equilibrium (or gradual incremental change) punctuated by short bursts of radical changes and corresponding adjustments – a concept brilliantly adapted to military history by Clifford Rogers[16].

In *The Dynamics of Military Revolutions*, Macgregor Knox and Williamson Murray offered a metric for identifying revolutions in military affairs that put the emphasis on conceptual rather than on technological change. When discussing land warfare on the Western Front during World War I, Knox and Murray stressed the curious fact that:

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[15] The quotations are respectively from Ayton-Price, *The medieval military revolution*, cit., pp. 16-17; Black, *A Military Revolution?*, cit., p. 97 (repeated verbatim in Id., *European Warfare, 1650-1815*, cit., p. 7).

[16] G.J. Ikenberry, *Liberal Leviathan: the Origins, Crisis and Transformation of the American World Order*, Princeton University Press, Princeton (NJ)-Oxford 2011, pp. 12, 38; S.J. Gould, *Punctuated equilibrium*, The Belknap Press, Cambridge (Mass.)-London 2007, pp. 49-52. Clifford Rogers first applied the 'punctuated equilibrium' model to military affairs in 1993 (Rogers, *Military revolution debate*, cit., p. 77), and ten years later L. Henninger hailed this as the 'definitive' model. See Laurent Henninger, *La "révolution militaire". Quelques éléments historiographiques*, "Mots. Les langages du politique", 73, 2003, *Les discours de la guerre*, pp. 87-93, at p. 89.

A British or German battalion commander from summer 1918 could have understood the underlying concepts governing warfare in 1940, 1944, or even 1991. But a 1914 battalion commander magically transported to the Western Front battlefields of summer 1918 would have had great difficulty in understanding what he saw[17].

This, they argued, measured the true scale of the transformation that occurred in the last years of the Great War.

Let me now apply the Knox-Murray paradigm to land warfare in early modern Europe. The commanders at a mid-sixteenth century battle like St. Quentin "could have understood the underlying concepts governing warfare" in the early campaigns of the Thirty Years' War, but they would have had great difficulty in understanding what they saw at the battle of Lützen in 1632. Conversely, if "magically transported" to the Western Front battlefields of 1914, once they had overcome their envy of the superior firepower and manpower available to their successors, the commanders at Lützen "could have understood the underlying concepts governing warfare" with little difficulty.

In a fine essay in the Knox-Murray volume, Holger Herwig proposed a similar paradigm for European naval warfare: "The number of guns aboard warships", Herwig wrote, "roughly doubled from 1700 to 1815, but the basic formula – tiers of muzzle-loaders firing broadsides – had not changed. Tactics had correspondingly changed little"[18]. One could extend Herwig's paradigm back to the Dutch navy that destroyed the Spanish fleet at the Downs on 21 October 1639, using the line-ahead formation (apparently for the first time). Once he had overcome his envy of the superior firepower and sail-power available to his successors, Maarten Harpertszoon Tromp, the Dutch admiral at the Downs, could have understood the underlying concepts governing the battle of Trafalgar in 1805, fought on the same day: 21 October – not a day often celebrated by the Spanish navy. But both Tromp and Nelson would have been totally mystified had they watched the battle of Jutland, fought in 1916 by two fleets of ironclad steamships, deployed in line ahead, armed with fewer but far more powerful guns as well as with torpedoes, informed by aerial spotters and radio intercepts, yet largely unaffected by both winds and tides.

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17 M. Knox, W. Murray (eds.), *The Dynamics of Military Revolution, 1300-2050*, Cambridge University Press, Cambridge 2001, p. 11.

18 Herwig, *The Battlefleet Revolution, 1885-1914*, cit., pp. 114-31, at p. 115.

In the light of these arguments, I plan to publish in 2023 a thoroughly revised edition of *The Military Revolution*. There is no place here to explain my proposed revision of each part of my argument, so – by way of example – let me offer my plans for a new chapter 1. It will examine four significant developments in land warfare in early modern Europe:

- the emergence, after a prolonged period of experimentation, of gunpowder artillery capable of smashing down walls in the 1430s;
- the emergence of fortresses capable of withstanding the new gunpowder artillery in the 1520s;
- the emergence of larger field armies in the 1540s;
- finally, the emergence of volley fire by infantry armed with muskets, supported by field artillery in the 1590s.

After substantiating each of these developments, I will argue that these four developments first coalesced into an 'ordering moment' at the battle fought at Lützen in Saxony on 16 November 1632 by some 40,000 men: a Protestant army led by King Gustavus Adolphus of Sweden and a Catholic army led by Albrecht von Wallenstein, duke of Mecklenburg.

For the first time, both sides drew up their musketeers in ranks, protected by field guns, and (according to Wallenstein's report, written the day after the battle):

> The battle began at 10 a. m. and was fought until the dead of night with such fury that no one has ever seen or heard the like, with one engagement after another fought with the greatest determination the world has ever seen. Entire regiments of the enemy were destroyed as they stood in their battle order, and on our side several thousand also fell, with most of the officers either dead or wounded[19].

Now I recognize that most generals believe that they have just fought the biggest and worst battle ever; but the available evidence supports Wallenstein's view.

Traditional sources portrayed Lützen as essentially a cavalry encounter; but that was before the battlefield archaeologists and the bio-archaeologists came along. A survey of the terrain (the largest European battlefield archaeology project to date) has produced so far over 10,000 objects, and also a shallow pit [Figure 2] containing some 200 bodies, buried naked, without weapons and without personal effects.

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[19] G. Droysen, *Gedruckte Relationen über die Schlacht bei Lützen, 1632* (2nd edn., Halle, 1903: Materiellen zur neueren Geschichte, I), 3-4, Wallenstein to Johann von Aldringen, 17 Nov. 1632. This vivid account soon appeared as a printed broadsheet.

Figure 2. Lützen – A mass grave excavated on the battlefield of Lützen in 2011 (photos: J. Lipták, O. Schröder).

These are just a few of the 6,000 soldiers who perished in a few hours, hastily buried in mass graves. So far, 47 skeletons from the grave have been analysed in a laboratory. Predictably, all were males and all were aged between 15 and 50. Most were in their 20s when they met their violent death[20]. Less predictably, half of those Killed in Action at Lützen had recovered from earlier wounds, almost certainly combat wounds, because their skeletons reveal healed or healing fractures.

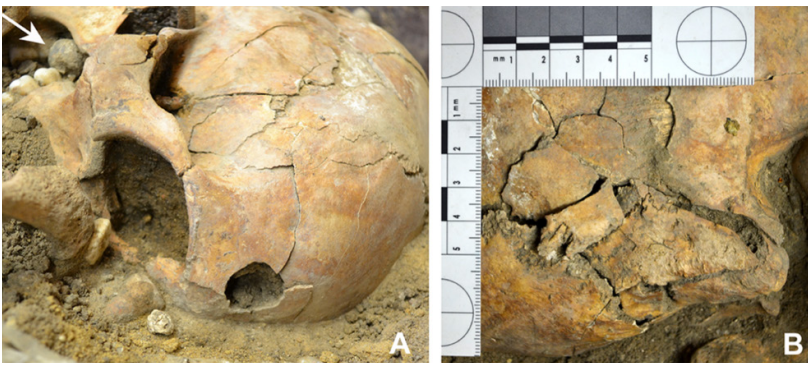
Almost half of the men had suffered blunt force wounds to the skull, face and jaw that doubtless proved fatal [Figure 3].

[20] Some early looting led the archaeologists to divide the bodies into two blocks, as shown in Figure 2, each weighing about 25 tons, which they removed to a local museum with preservation facilities.

Figure 3. Reconstructed cranial gunshot wounds, excavated on the battlefield of Lützen (photos: N. Nicklisch).

We know that bullets caused many of these blunt force wounds, because the bullet remains lodged in the skull. Those men would have died instantly [Figure 4].

Figure 4. *In situ* documentation of a retained projectile, excavated on the battlefield of Lützen.



Other skeletons had bullet wounds in the torso or long limbs, and they probably bled to death. In addition, some skeletons presented evidence of wounds caused by blade weapons, but more men died from bullets.

So at least in this part of the battlefield, firearms decided the outcome; but the sample is only 47 out of over 6,000 Killed in Action. What about the rest? Numerous eyewitness accounts recorded the deadly effect of musket volleys delivered at close range, so that (according to an imperial commander) "it was a wonder to see in a moment an entire corps reduce to a mound of corpses"[21].

Firearms also killed or injured almost all the senior commanders, including Count Pappenheim, the imperial second-in-command, aged 38, felled by one round fired by a field gun and three balls fired by muskets, leaving bloodstains on his last letter from Wallenstein, sent the previous day, ordering him to make haste to join him at Lützen[22] [Figure 5].

Firearms also killed Gustavus. As he led a cavalry charge, a bullet shattered the king's arm above the elbow, and as he tried to reach safety an enemy trooper recognized him and fired his pistol into the king's back (visible in the elk-skin buff coat he wore in combat, because a bullet wound in his neck received in an earlier battle prevented him from wearing armour) [Figure 6].

As Gustavus slumped from his horse, his adversaries crowded round and delivered several sword thrusts through his body. When one of them asked him to confirm his identity, he murmured: "I *used to be* the king of Sweden". Then, as a Swedish party approached to rescue their king, someone finished him off with a bullet at close range through the head[23].

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21 R. Brzezinski, *Lützen 1632. Climax of the Thirty Years War*, Botley, Oxford 2001, p. 67, quoting Giulio Diodati.

22 Brzezinski, *Lützen*, cit., p. 80, notes that "nearly *all* the senior officers present were hit". Wallenstein's letter, now in the Heeresgeschichtliche Museum, Vienna, reads: "Der feindt marchirt hereinwarths. Der herr [lasse] alles stehen undt liegen undt incaminire [sich] herzu mitt allem volck undt stücken auf[das] er morgen frue beÿ uns sich befünden [kan]. Ich aber verbleibe hiemitt des herrn dienstwilliger. AhzM [Albrecht, Herzog zu Mechlenburg] Lützen den 15. Novemb. Ao 1632. Er ist schon an dem pas wo gestern der böse weg gewest ist". Rough translation: "The enemy is marching towards us. Please drop everything and set out with all your men and guns to be with us early tomorrow. I always remain your servant. AhzM. Lützen, 15 November, 1632. P. S. The enemy is already at the pass where yesterday the road was bad".

23 Brzezinski, *Lützen*, cit., pp. 62-4 – the most detailed reconstruction available, but written a decade before the battlefield archeologists arrived on the scene. See now A. Schürger, *The Battle of Lützen 1632: The Battle Reassessed*, forthcoming by Helion & Company in spring 2023.

Figure 5. Wallenstein's letter to Pappenheim, Lützen, 15 November 1632. Wikimedia Commons[24].

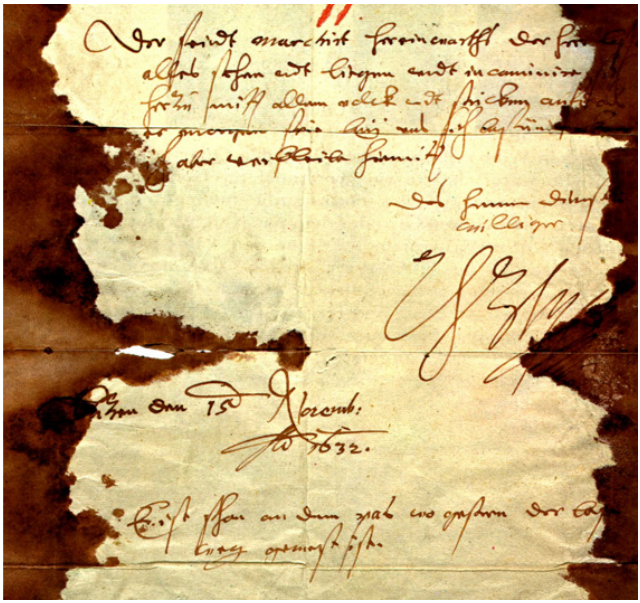
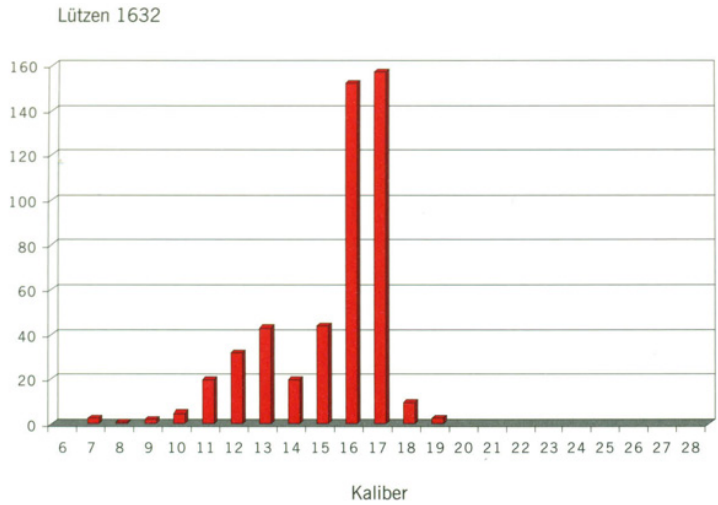


Figure 6. Buff coat worn by Gustavus Adolphus at Lützen. Note the bullet wound in the back and the frayed elbow (photos: Bonnevier, Helena, Livrustkammaren/ SHM).

[24] https://commons.wikimedia.org/wiki/File:Wallenstein_Hilfegesuch_an_Pappenheim_1632.jpg.

Let me now shift focus from the victims to the weapons – and here I rely on the wonderful research of André Schürger. Most of the excavated bullets from the Lützen battlefield – almost 3,000 so far – reveal a remarkable consistency. Although they range in size between ¼ and ¾ inch (the smaller ones presumably fired by cavalry pistols), the overwhelming majority were a uniform 5/8 inch – the classic musket calibre[25] [Figure 7].

Figure 7. Histogram of lead shot recovered from the battlefield at Lützen (by André Schürger).



[25] P. Engerisser, *Von Kronach nach Nördlingen. Der Dreißigjährige Krieg in Franken, Schwaben und der Oberpfalz. 1631-1635*, Verlag Heinz Späthling, Weißenstadt 2007, pp. 546-7; A. Schürger, *Die ersten Minuten der Schlacht von Lützen (16.11.1632): Isolanis Kroaten und Stalhandskes finnische Reiter aus archäologischer Sicht*, in *Lützener Gespräche III*, Redaktion: Maik Reichel-Inger Schubert, [sine nomine], Lützen/Göteborg 2011, pp. 103-120, at p. 112; Nicole Nicklisch, *The face of war: Trauma analysis of a mass grave from the Battle of Lützen (1632)*, „PLoS ONE", 12, 2017, 5: e0178252 https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0178252 (especially Figure 2. The Lützen Mass Grave, Figure 3. *Reconstructed Cranial Gunshot Wounds*, Figure 4. In situ *documentation of a retained projectile*). In 1604 the Dutch army experimented with 'muskets without rests' which could be used by soldiers 'the same as they have done so far' with an arquebus; but the rest remained in use until the 1670s. See Olaf van Nimwegen, *The Dutch Army and the Military Revolutions, 1588-1688*, The Boydell P., Woodbridge 2010, pp. 95-6 and 399-401. The Dutch army successfully used musketry volleys to repel their enemies at the battle of Nieuwpoort in 1600, but they still had to retreat. Moreover, the battle led the military leaders of the Republic to adopt a risk-averse strategy: it fought no more land battles for many decades. See G. Parker, *The Limits to Revolutions in Military Affairs: Maurice of Nassau, the Battle of Nieuwpoort (1600), and the Legacy*, "Journal of Military History", 71, 2007, pp. 331-72.

I maintain that Lützen was an 'ordering moment' because although never before in human history had the outcome of a battle been decided by muskets, fired in volleys by ranks and later by entire platoons, that deployment would decide the outcome of battles for the next two centuries.

Lützen also exemplified three other aspects of the new *Military Revolution*:

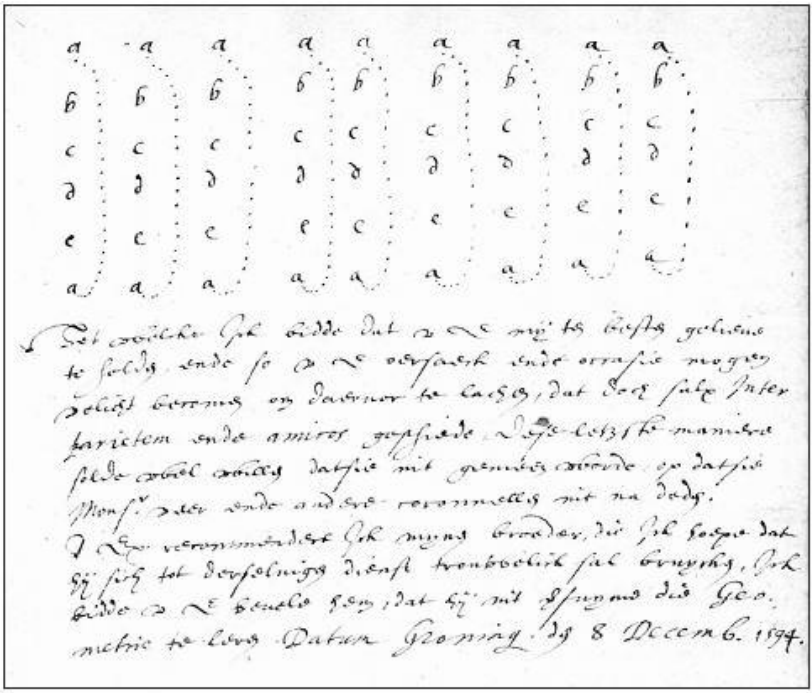
- First, it depended on a fleet of sailing warships to convey Gustavus's army across the Baltic to the European mainland and to supply and reinforce it there. Providence has preserved one of those ships, because it sank on its maiden voyage in 1628 and has been excavated: the *Vasa*, 1200 tons and 64 guns, can today be admired in its special museum in Stockholm.
- The 1632 campaign also formed part of a coherent strategy. Gustavus spent more than a year securing fortresses along the southern shore of the Baltic and up the river Oder, providing him with both toll revenues from the southern Baltic ports and a fortified chain of supply depots in a strategic triangle pointed south towards the Catholic heartland. By the time of his death, he commanded not only 20,000 men at Lützen but 100,000 men campaigning elsewhere in accordance with a single strategic plan.
- Finally, Lützen exemplified one of the key characteristics of the Military Revolution: the transfer of major innovations between protagonists. Gustavus himself taught volley fire to non-Swedish units in his service, including the regiment of Scottish highlanders commanded by Robert Monro, who described how the king personally demonstrated how to fire and reload muskets while lying down. Volley fire brought victory at the battle of Breitenfeld in September 1631. But Gustavus also taught his enemies, albeit indirectly: fourteen months later, his Catholic foes used the same volley technique at Lützen.

The long and winding path to that 'punctuation', to that 'ordering moment', at Lützen on 16 November 1632 is the subject of chapter 1 of the new *Military Revolution*.

I hope to update all other chapters with a similar combination of written, visual and archaeological sources, but I also have to say a little about the final – and perhaps the most controversial chapter: *The military revolution abroad*.

Permit me to stay with the example of volley fire, which I traced back to a letter written by Count Willem Lodewijk of Nassau to his cousin Maurice in December 1594 [Figure 8], describing how he had adapted

Figure 8. Letter written by Count Willem Lodewijk of Nassau to his cousin Maurice in December 1594 (The Hague, Koninklijke Huisarchiefm). Metadata: author, 劉大榕 ; date and time of data generation: 22:55, 20 November 2016.



the methods "of the ancient Romans to drill soldiers, form battalions, and create a line of battle" using "the weapons used in our wars today". The count devoted special attention to his success in applying the 'precepts' in *Aeliani De militaribus ordinibus instituendis more Graecorum liber* [*Book on the Greek manner of drawing up troops*], an illustrated treatise prepared for the Roman Emperor Trajan fourteen centuries before. "I have discovered *ex evolutionibus*" (that is, from Aelian's discussion of infantry drill in the age of Alexander the Great):

A method of getting the musketeers and soldiers armed with arquebuses not only to keep firing very well but to do it effectively in battle order (that is to say, they do not skirmish or use the cover of hedges …) in the following manner: as soon as the first rank has fired together, then by the drill [they have learned] they will march to the back. The second rank, either marching forward or standing

still, [will next] fire together [and] then march to the back. After that, the third and following ranks will do the same. Thus before the last ranks have fired, the first will have reloaded, as the following diagram shows: these little dots [*stippelckens*] :|: show the path of the ranks as they leave after firing[26].

I continue to see Willem Lodewijk's *stippelckens* as the true origin of volley fire in Europe because, although other military writers highlighted the same technique (sometimes known as the 'countermarch'), sometimes drawing inspiration from the same Classical texts, they could only *describe* whereas Willem Lodewijk could *implement*.

Maurice and Willem Lodewijk tested their theories with small units over the winter until on 19 August 1595 they oversaw the first mass drill to take place in Europe since Roman times watched by Antonis Duyck, a political associate of Maurice, who left a striking account in his diary. On that day about 2,500 infantries deployed in "various battle orders turning, facing about, forming and reforming, uniting and dividing, in order to accustom the troops to maintain their files and ranks". Thereafter, Duyck noted, "the soldiers in the army drilled daily" to learn how to stand fast even when the front ranks of musketeers appeared to retreat in the face of the enemy.[27] At the battle of Nieuwpoort, fought after five

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[26] Koninklijke Huisarchief, 's Gravenhage [hereafter KHA], A22-1XE-79, Willem Lodewijk of Nassau to Maurice of Nassau, Groningen, 8 Dec. 1594 OS, draft in the hand of Everhart van Reyd with a holograph correction by Willem Lodewijk. (Although the count used both the Julian and the Gregorian Calendars in his correspondence, almost certainly this time he used OS, so its "true" date was 18 Dec. 1594 NS.). Guillaume Groen van Prinsterer, *Archives ou correspondance inédite de la maison d'Orange-Nassau*, 2e série, Kemink & Fils, Utrecht 1857, vol. I, pp. 334-6, printed parts of this document; L. Mulder, *Journaal van Anthonis Duyck, Advokaat-Fiscaal van den Raad van State*, (3 vols., Nijhoff, 's Gravenhage 1862-1865), I, pp. 717-23, printed it all, followed by an "afzonderlijke aanteekening" on how the Romans had used drill to get an army on the march into battle order (ivi, pp. 723-4.) The letter was also published twice in its entirety by Werner Hahlweg (who reported that the "afzonderlijke aanteekening" had disappeared): W. Hahlweg, *Die Heeresreform der Oranier und die Antike. Studien zur Geschichte des Kriegswesens der Niederlande, Deutschlands, Frankreichs, Englands, Italiens, Spaniens und der Schweiz vom Jahre 1589 bis zum Dreissigjährigen Krieg* (Junker und Dünnhaupt Verlag, Berlin 1941; reprinted Biblio-Verlag, Osnabrück, 1987; hereafter Hahlweg, *Antike*), 255-64; and Werner Hahlweg, *Die Heeresreform der Oranier. Das Kriegsbuch des Grafen Johann von Nassau-Siegen*, Historischen Kommission für Nassau, Wiesbaden, 1973 (hereafter *Kriegsbuch*), pp. 606-10. I have followed the last-cited version, collated with the original document.

[27] Mulder, *Journaal*, I, cit., p. 636. Duyck estimated the size of the army at 7,800 foot and 1,000 cavalry that summer (ivi, I, p. 619), and so the 'one third' that performed the drill must have numbered around 2,500.

more years of intensive training, Maurice's musketeers deployed in ranks and mowed down their enemies in what a contemporary called "a hail of volleys". Willem Lodewijk's *stippelckens* had turned into a production line of death.

Now one of the major developments in Military Revolution studies since 1988 is the *globalization* of the military revolution, and this has revealed that armies elsewhere introduced the countermarch with muskets at much the same time. Günhan Börekçi, who worked with me at the Ohio State University as a graduate student, noted the rapid evolution of volley fire in the Ottoman army. Some of Börekçi's sources were written, like the following description of drilling with muskets in the 1595 entry in the chronicle of Abdülkadar Efendi, secretary of the sultan's artillery corps: the Janissary regiments, he wrote "stood in three ranks" and then, "after the first rank fires their muskets, the second rank fires' while the first rank reloads. As the third rank fires, the second rank prepares their muskets. Then the first rank stands up and fires their muskets again"[28]. The use of the present tense – the only example in the entire chronicle – almost certainly means that Abdülkadar Efendi was describing something he had just seen.

Börekçi also used visual sources, like this beautiful miniature by someone who had served in the Ottoman army in Hungary and evidently visited its Christian opponents: the soldiers in the second rank are pouring powder and ramming bullets down their musket muzzles as the front-rank fires[29] [Figure 9].

The Gunpowder Age, a brilliant book by Tonio Andrade (whom I advised at Yale University), includes a woodcut from a Chinese book published circa 1621 that illustrated an ancient technique known as *Ten thousand crossbows shooting in concert* [Figure 10].

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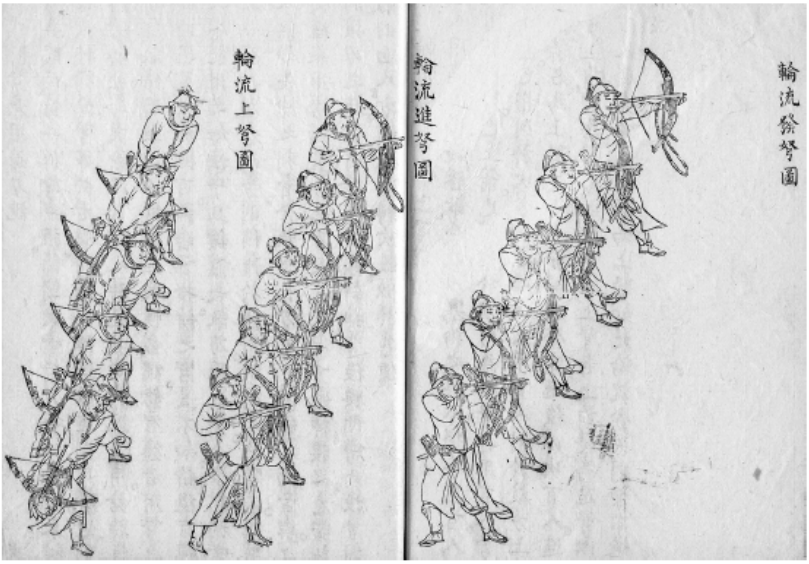
[28] G. Börekçi, *A Contribution to the Military Revolution Debate: the Janissaries Use of Volley Fire During the Long Ottoman-Habsburg War of 1593-1606 and the Problem of Origins*, "Acta Orientalia Academiae Scientiarum Hungaricae", 59, 2006, 4, pp. 407-438, at p. 416 quoting from the chronicle of Topçular Kâtibi Abdülkadir Efendi.

[29] Börekçi, *A contribution*, cit., pp. 417-20, discussed the image from the special presentation copy of the poems of Ganizade Mehmed, also known as Nadiri, illustrated with miniatures by Nakşi, dated to 1604-5. Börekçi proved that the action depicted is a clash near Nicopolis in 1597.

Figure 9. The Janissaries use of Volley Fire. Original in *Divân-ı Nâdirî*, Topkapı Palace Museum Library, ms. H. 889, fol. 26b.

Figure 10. Chinese infantry fire crossbows in ranks. Illustration of a Ming volley fire formation using crossbows. From Cheng Zongyou 程宗猷, Jue zhang xin fa 蹶張心法 ca. 1621. Metadata: author, 劉大榕 ; date and time of data generation, 19:06, 20 November 2016.



Those in the first rank (right) are about to shoot; those in the centre stand ready to shoot; those in the third rank (rear) are reloading. "In this way", according to the martial artist Cheng Zongyou, "they revolve and take turns firing a constant stream, and the crossbows sound without cease".

Other military experts in late Ming China recognized that musketeers could easily adopt the technique, and we find woodcut prints to prove it in the manual *Jun qi tu shuo* by Bi Maokang, published in the 1630s[30] [Figure 11].

Nevertheless, none of these sources disprove my claim that invention of musket volley fire in Western Europe originated with Willem Lodewijk's *stippelckens*. Neither the volley tactics described by Abdülkadar Efendi or Bi Maokang led to the killing fields at Lützen; those described by Willem Lodewijk did.

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30 Andrade, *The Gunpowder Age*, cit., pp. 156-7.

Figure 11. Chinese infantry fire muskets in ranks. Illustration of a 1639 Ming musketry volley formation. From Bi Maokang 畢懋康, Jun qi tu shuo 軍器圖說, ca. 1639. Metadata: author, 劉大榕 ; date and time of data generation: 23:18, 20 November 2016.

Let me end by restating the general thesis of *The Military Revolution*. In 1973 David Fieldhouse, an economic historian, asserted that "The proportion of the world's land surface actually occupied by Europeans, whether under direct European control as colonies or as one-time colonies, was 35 per cent in [1775], 67 percent in 1878 and [in 1914] 84.4 per cent"[31] (the precision of economic historians never ceases to amaze me!). Eight years later, Daniel R. Headrick took this striking claim as the starting-point for his influential study, *The Tools of Empire: Technology and European Imperialism in the Nineteenth Century*. In it, Headrick described:

> The relationship between technological innovations and the European colonial conquests… Among the factors that explain this dramatic expansion, certain technological innovations – in particular steam engines, better firearms, and medical advances – played a major role. Technology is now widely recognized as a necessary, if not sufficient, explanation for the 'New Imperialism'.

Twenty-five years later, in another book entitled *Power over peoples*, Headrick revisited his earlier assertions. He stood by his definition of 'technology' as "all the ways in which humans use the materials and energy in the environment for their own ends, beyond what they can do with their bodies", but he went on to wonder:

> If one accepts the idea that technological innovations were essential to the European conquests of the nineteenth century, does it then follow that technological factors explain other conquests at other times in the past? … Or was the case of nineteenth-century European imperialism a fluke, an aberration?

Although critics have attacked Headrick's work as over-determined, his final rhetorical question remains valid: "[Did] technological factors explain other conquests at other times in the past? Was the case of nineteenth-century European imperialism a fluke, an aberration?"[32]

The new *Military Revolution* will apply Headrick's challenge to the three preceding centuries. Historians still need to explain why the states

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31 D.K. Fieldhouse, *Economics and Empire, 1830-1914*, Cornell University Press, Ithaca (NY), and Weidenfeld and Nicolson, London 1973, p. 3.

32 D.R. Headrick, *Power over Peoples. Technology, Environments, and Western Imperialism, 1400 to the Present*, Princeton University Press, Princeton (NJ) - Woodstock 2010, pp. 1-2, 4 (the source of all quotations from Headrick).

of Western Europe, which in 1500 could lay claim to less than one-tenth of the world's habitable land, by 1775 could lay claim to just over one-third of it, as well as dominating all its oceans. I believe that a few key innovations played an essential role in this massive expansion of the West – the evolution of heavy artillery and of the artillery fortress; the perfection of the sailing warship; and the development of massed firepower on the battlefield – together with the ability to combine them into a system.

Nineteenth-century European imperialism was thus neither a fluke nor an aberration, but rather an essential part of the 'Rise of the West' that had begun three centuries before – a process in which military and naval innovations played a crucial role. And that is why I believe that the *Military Revolution* is not quite dead yet.

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