

## **WILLIAM H. McNEILL-- The Age of Gunpowder Empires, 1450-1800**

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Any big change in weapons and military organization affects politics and society by helping some people attain their ends more easily than before, while putting new, perhaps insuperable, obstacles in the way of others. The advent of guns was such a change. Appearing as curiosities in the fourteenth century, gunpowder weapons became devastatingly effective in sieges by about the middle of the fifteenth century. This suddenly changed the balance of power between those who owned or occupied fortified strongholds and those who owned or controlled the new artillery, first in western Europe, where these guns were developed, and then in all the other parts of the civilized world.

The spread of big guns inaugurated what may be called the age of gunpowder empires, although, as we shall see, there was no uniformity in the way different peoples exploited the possibilities of the new weapons. Nonetheless, whenever they were able to monopolize the new artillery, central authorities were able to unite large territories into new, or newly consolidated, empires. This occurred in the Near East, in Russia, in India, and, in a considerably modified fashion, in China and Japan. The Spanish empire of the Americas together with the Portuguese empire of the Indian Ocean also relied on artillery, though the most important Spanish and Portuguese guns were on shipboard, not on land.

In western Europe, the original home of these guns, the response was different. No single ruler was ever able to monopolize siege cannon. Within a short time discovery of a different sort of fortification suddenly reduced the effectiveness of the new wall-destroying monsters. Perennial rivalries among neighboring states and rulers therefore put a forced draft under the continued evolution of the art of war, and a long series of improvements in organization, armament, training, and supply gradually raised the effectiveness of European armies above the level other peoples had attained. By 1700 the disproportion between European and other styles of warfare had become pronounced and, in conjunction with parallel improvements in naval management and equipment, allowed Europeans to expand their power literally around the globe in the course of the eighteenth and nineteenth centuries. By 1700, therefore, gunpowder empires of the kind created in the fifteenth and sixteenth centuries had become old-fashioned. One by one they crumbled before the intrusive Europeans in the next century and a half.

This essay therefore deals with an era in which Europeans had begun to exert a limited

primacy within the civilized world, but before command of superior military power allowed traders, missionaries, and empire builders from western Europe to trample on other peoples' sensibilities and interests almost at will. Focusing attention on the military and technological underpinning of European power, and on the way other societies borrowed guns and fitted them into their local political, military, and cultural systems, narrows the range of actual civilizational encounters to what mattered most in the eyes of rulers and courts and leaves out intellectual, artistic and religious interactions. This is not quite as silly as it seems because by building a series of vast and impressive imperial states between 1450 and 1650, the rulers of Asia allowed Moslem and Chinese intellectuals to believe they could afford to pay little or no attention to European thought and art. Fatefully, rulers and military administrators, too, did not try to keep up with subsequent European innovations in military and naval matters, leaving them woefully exposed to attack after 1700. The story is therefore an important one, preparing the way for the era of European world dominance that started about 1700 and ended after World War II.

### **I. FROM CATAPULTS TO GUNS**

Gunpowder was invented in China shortly before A.D. 1000 and was first used in war as an incendiary. That, at least, is a plausible interpretation of a text that tells how in A.D. 969 an emperor of the Sung [sic] dynasty awarded a prize to officers who had invented a new "fire arrow." The arrow probably carried a charge of gunpowder, since it is hard to imagine what else could be new about such a weapon. Further development of gunpowder weaponry was inhibited by the fact that the Chinese style of warfare under the Sung dynasty (960-1279) was defensive, and since the emperor's troops usually fought from behind walls, they had absolutely no incentive to invent guns that could attack fortifications.

This situation changed, however, when the Mongols conquered China between 1205 and 1279. The horsemen who followed Genghis Khan and his successors were accustomed to attack, but could not hope to capture forts and walled cities from horseback. They therefore welcomed anything that would allow them to break through defensive walls quickly. Catapults had been used for that purpose since Roman times, and the Mongols took to them eagerly. But the explosive force of gunpowder also seemed promising, and Mongol armies routinely used lengths of bamboo filled with gunpowder to attack city gates by blowing them open. In this primitive form, gunpowder weapons reached Europe in 1241, when Mongol armies ravaged Poland

and Hungary.

The Chinese pioneered the next improvement in firearms also. If, instead of allowing the powder to shatter its bamboo container, a stronger vessel, open at one end, were constructed to hold the powder, then the exploding gases could be made to launch a missile placed over the vessel's mouth. Chinese texts from 1290 seem to show that this sort of "gun" was in use. By then Genghis Khan's grandson, Kublai, was ruling in Peking [Beijing]. His empire extended across most of the Middle East and included European Russia. Caravans moved across Asia regularly, and ships moved to and fro along the China coast and into the Indian Ocean. Consequently, many thousands of persons, Marco Polo among them, traveled back and forth between the Far East and the Far West and disseminated information more rapidly than ever before.

News of China's new weapons therefore reached Europe quickly. Indeed, the first portrait of the new contrivance, dated 1326, comes from western Europe in the form of a crude manuscript painting preserved at Oxford. It shows a vase-shaped container, lying on its side, with a touchhole on top and a large arrow affixed to a circular base closing off the mouth. Just six years later, a Chinese drawing shows a very similar vase-shaped receptacle for the powder with an arrow-shaped projectile. The resemblance between the two drawings is so close that a common origin for these vase-shaped weapons seems certain. Chinese priority is hard to doubt, though interpretation of the technical terms in Chinese texts that deal with early gunpowder weapons is beset with uncertainties.

What is clear about the early history of artillery is that Europeans soon outstripped the Chinese and others by building bigger and bigger guns. One reason was that Europeans had access to more metal than other civilized peoples (with the possible exception of the Japanese), thanks to developments in hard-rock mining that dated back to the eleventh century. Methods for cracking bedrock and for ventilating and draining mines allowed Europeans to follow metalliferous lodes deeper into the earth than was done elsewhere. Full and free exploitation of such techniques depended on property law and on political practices that made it safe to invest large amounts of capital in the enterprise. European mining was thus sustained by the general context of Western society and institutions.

Specialized skills centered initially in the Harz Mountains of Germany, but German miners carried them subsequently to other metalliferous region – the Erzgebirge of Bohemia; the Carpathians of Transylvania (modern Rumania), and elsewhere. Simple transfer of European mining techniques to other societies was difficult or impossible, since the security of property needed to make such an elaborate investment payoff could not be transferred to new ground without far-reaching political change and this rulers were unwilling to countenance. As a result, Europeans

continued to enjoy a persistent advantage over other peoples, all the way from the eleventh to the nineteenth centuries, since cheap and abundant metal was useful both in peace and in war-but especially in war.

A second reason impelling European artificers [craftsman, inventor] and rulers to build more powerful guns was a clear idea of how bigger and better guns might make their owners more powerful. To begin with, the idea far outran reality. Early guns were mainly good for scaring horses, and should have scared the men who risked firing them; but they were not efficient weapons. Most of the force of the explosion was wasted because the expanding gases simply rushed around the sides of the projectile, and aiming was extremely inaccurate. Still, the awesome noise and obvious force of exploding gunpowder promised truly superhuman results, if only it could be harnessed effectively. Guns, if powerful enough, might even become capable of destroying an enemy's best-built stone fortifications after just a few shots, thereby abruptly altering the balance between defenders and attackers. Soon after 1400 this vision of the possible took firm hold on the imagination of a few rulers and artisans in western Europe. Substantial resources were therefore lavished on building gigantic "bombards."

These weapons differed from the vase-shaped gun of 1326 in being cylindrical tubes, closed at one end. Instead of firing an arrow, poised at the lip of the gun, they shot spherical stone cannonballs, propelling them the length of the tube before allowing the exploding gases to disperse in thin air. In this way a more accurate aim was assured and a much more effective use of the force of the explosion to accelerate the projectile could be assured. Guns, as we know them, were on their way. The earliest bombards were made of wrought-iron strips, hammered together. But such guns were liable to burst at the seams. Far stronger guns could be made by casting them as a single block of metal; and it so happened that western European craftsmen were already expert at casting large church bells, using bronze or brass.<sup>1</sup> Preparing a mold, melting ingots to produce the necessary bronze or brass, and pouring the liquid metal into the mold took large resources and considerable skill. But the difference between casting a bell and casting a gun was trivial, so, with the necessary skills already in hand, Europeans pressed rapidly ahead, and soon were making bigger and better guns than anyone else, including the Chinese. For the first time, western Europeans began to leave other civilizations behind in at least one important respect.

By about 1430, European-made-bombards were twelve to fifteen feet long, fired -a projectile up to about thirty inches in diameter, and had become truly formidable engines. They weighed so much and were so awkward to move that on some famous occasions artisans actually cast the big guns on the spot, instead of trying to transport them to the site of the siege. Yet such weapons did accomplish their purpose, causing

stone fortifications to crumble and allowing a besieging army to storm through the breach after only a brief bombardment.

The capture of Constantinople by Sultan Mohammed the Conqueror in 1453 is the most famous example of how such clumsy weapons could make a decisive difference, allowing a superior field force to overcome otherwise invulnerable defenses. The fact that the sultan hired Christians from Transylvania to build and operate the cannon he needed to overcome the famous and formidable defenses of Constantinople attests the superiority that European metalworkers and gunsmiths had achieved, as well as his eagerness to acquire what he recognized as a clearly superior weapon.

The rapidity with which the Turks reacted to the novelty is striking, for such guns had not existed before about 1430, and the first Western ruler to use them systematically was the king of France, who in 1450 set out to drive the English from the Continent. His new guns made old fortifications quite useless. Consequently, English garrisons surrendered so rapidly that the hitherto interminable Hundred Years War came to an end in 1453—the same fateful year in which Mohammed captured Constantinople. Historians have often used that year to divide medieval from modern history, and not without reason, since the advent of the new weapons system signaled by the twin events for which 1453 is famous did alter the way political and military power was distributed, not just in Europe but around the world.

## **II. THE GUNPOWDER REVOLUTION IN WESTERN EUROPE**

After defeating the English in 1453, the king of France still faced a formidable rival in the form of an over-mighty subject—the duke of Burgundy, who had accumulated territories stretching from the Low Countries at the mouth of the Rhine to the borders of Switzerland. As it happened, the most skilled gun makers of the age inhabited his territories. Therefore, when the Burgundians decided they must arm against the French, lest the French king do to them what he had done so successfully to the English, they had an ample technical base for improving on the gun design of the 1450s.

The Burgundian-French rivalry promptly precipitated an arms race of the sort so familiar to us in the twentieth century. Metalworkers on both sides aimed at a single goal: to make guns mobile without sacrificing their battering power. Between, 1465 and 1477, designers solved their problem brilliantly by resorting to smaller, denser projectiles. They discovered that a comparatively small iron cannonball could strike a more damaging blow than stone projectiles (that fractured on impact) could ever do, no matter how large. This meant that guns could be made smaller but had to be stronger too.

The tradeoff turned out well, for even with thicker walls, the new guns weighed a lot

less than the great bombards and became genuinely mobile. Mounted on wheels, a gun six to eight feet long, capable of firing an iron ball of eight to ten inches in diameter, could travel wherever a heavy wagon could go. Simply by unhitching the trail from a forward pair of wheels and planting it on the ground, these guns were ready for action and, having fired, could move on, if need be, to some new vantage point, all in a matter of minutes. Yet such cannon were just as effective as the monster guns of the previous generation when it came to knocking down stone walls.

A gun park with a few such weapons therefore allowed a ruler to threaten his subjects or neighbors with speedy and assured destruction of defenses behind which in earlier times an inferior force could shelter for weeks and months until starved out by besiegers. Keeping a superior force on enemy territory for a long time was always difficult because supplies were hard to deliver in sufficient quantity. With the new guns, that was no longer necessary. A few hours' bombardment now sufficed to bring down the most formidable walls wherever guns could be brought to bear. The balance of power between central and local authorities was thereby transformed, making whoever controlled the new siege cannon into a sovereign and reducing those who could not afford them to a subjection they had not previously experienced.

As it happened, the Burgundians, though they had taken the lead in perfecting mobile siege artillery, were not destined to profit from it. Instead, Charles the Bold, duke of Burgundy, being too impatient to await the arrival of his guns on the battlefield at Nancy, led a cavalry charge against a massed formation of Swiss pikemen, who had dared to oppose him, and met his death on the points of their pikes in 1477. His lands were then swiftly partitioned between the French king, Louis XI, and the Hapsburg heir, Maximilian, who married Charles's daughter and only heir.

Even after Maximilian became Holy Roman Emperor of the German Nation in 1493 he lacked a bureaucracy and army with which to exploit the possibilities of the new artillery. Louis XI and his successor, Charles VIII, were better situated in this respect, and proceeded to consolidate their kingdom as never before. Then, in 1494, Charles VIII, after annexing Brittany decided to use his new military power for ventures abroad. He invaded Italy, the richest and most sophisticated part of western Europe, in order to enforce his dynastic claim to the Kingdom of Naples. This required him to march the length of the peninsula. He did so, bringing his big guns with him and using them to threaten anyone who dared oppose his passage. On the rare occasions when he met resistance, his cannon demonstrated their devastating force by reducing famous fortresses to rubble at the word of command.

In 1494, the Renaissance rulers of Italy had long since developed a professionalized art of war, combining cavalry, pikes, and crossbows. They were accustomed to set the pace for all of Christendom in war as well as in peace. To be so suddenly

outdistanced by the French was therefore a great shock, which was not diminished by the fact that the French invasion inaugurated a long series of wars (1494-1559) in which foreigners -- French and Spanish primarily -- fought over Italy. Even the largest Italian states, dwarfed by the newly consolidated kingdoms of France and Spain, proved incapable of defending themselves or of driving the foreigners away.

The reason the Italian wars were so long drawn out was that early in their course military engineers discovered a way to make fortifications safe from the new guns. In 1500 Florence attacked Pisa, using heavy guns to break through the ring wall, only to find that the Pisans had erected a new earthen wall [revetment] inside, behind the threatened breach. Moreover, to get earth for their emergency wall, the Pisans had scraped out a ditch in front of it that blocked a direct, running assault. But the important thing was that cannonballs fired into the earthen wall buried themselves in the soft soil without doing much damage. As a result, the Florentine attack was foiled, and Pisa retained its independence.

In the light of this experience, Italian military engineers saw quickly how to make fortifications safe again. All they needed to do was to protect brittle stone walls with a sloping layer of earth to absorb cannon fire, while obstructing access to such revetted walls by carving out ditches in front of them, just as the Pisans had done. In a sense, the new design turned ordinary fortification upside down, making empty ditches the principal obstacle an attacker had to traverse, while walls became merely an aid to the defenders in protecting the ditch. The advantage of a ditch, of course, was that it was completely unaffected by cannon fire, and earth-covered walls were nearly as secure. Yet the new style of fortification did not make cannon useless. Rather, guns emplaced on projecting bastions were needed to defend the ditch. Others had to be hidden behind the main ring wall, ready to attack besieging artillery. Careful geometry could assure clear lines of fire for guns of every caliber, making a well-designed and adequately garrisoned city or fortress impregnable to sudden attack.

By 1520 the refinements of building cannon-proof fortifications were well understood, and what came to be called the *trace italienne* made it possible for anyone who could afford the new style of fortification to erect a stronghold that was proof against cannon fire. Sieges therefore again became a feature of European warfare because small garrisons, protected by the new style of fortification, could hold off a superior attacker for months at a time. But there was a difference: The new fortifications were expensive to construct and used even more of the big guns than attackers did. Only states and rulers with access to artillery and with enough money to pay for an ample stock of the new weapons could hope to compete in European war and diplomacy.

As a result, urban wealth and skills became more decisive than before in military matters. Without access to the products of urban workshops, and without money to

pay for them, no government and no military captain could expect to succeed. Capitalist enterprise and military enterprise were wedded together more closely than in any earlier age or than anywhere else in the world. Each nourished the other, making European armies, navies, and governments much more powerful than before.

But just because European armies and governments mobilized greater and greater resources for war and defense, no single empire succeeded in uniting western Europe. Big guns were never monopolized, and by 1519, when the Hapsburg heir, Charles I and V, king of Spain and emperor of Germany [& HRE], had gathered together all the diverse territories he inherited and seemed to have a real chance of defeating the French and establishing hegemony over all of western Europe, it was already too late for the new siege guns to have the sort of effect they had in some other parts of the civilized world. By then the *trace italienne* was already available, so that even when Charles did drive French forces from the field in Italy, he could not press ahead, invade France, and expect to see the French king's fortresses crumble as soon as they were attacked.

In 1450 that could have happened, but not in 1525 or subsequently. Instead, a defeated army could expect to withdraw into prepared defenses and hold off attackers as long as food stocks allowed. Quick and easy conquest had become impossible. The window of opportunity for consolidating western Europe into a single gunpowder empire had closed. One may even speculate that it was the division of the Burgundian lands after the death of Charles the Bold in 1477 that assured this result. To begin with, gun-casting skill was concentrated in the Low Countries [Belgium & Netherlands] near the mouths of the Scheldt and Rhine rivers. If a single ruler had continued to control that region and been able to monopolize the new guns for as long as a generation, he might have been able to use his mobile wall destroyers to achieve hegemony wherever the new siege guns could reach. Instead, the kings of France and the Hapsburgs of Germany divided the Burgundian lands along with Burgundian guns and gun-makers between them, assuring a standoff which became permanent, thanks to the improvements in fortification that came into being very swiftly after 1500.

A balance of power therefore persisted, keeping Europe divided among dozens of sovereigns. As far as gunpowder weapons were concerned, after the 1480s military invention shifted away from artillery, concentrating instead on improvements in small arms. Even more decisive were improvements in the training, management, and supply of armies, and in the way officers were chosen and promoted so as to create a reliable chain of command from top to bottom of the armed establishment. Before sketching these developments, however, a brief discussion of the importance of big guns for overseas commerce and naval warfare is called for.

### III. GUNS ON SHIPBOARD

European shipbuilders had learned how to construct stout, maneuverable, all-weather sailing ships about the beginning of the fourteenth century. Multiple masts and sails, together with a sternpost rudder and a double-planked hull nailed to a rib and keel skeleton, and strengthened by multiple decks, constituted a structure strong enough to withstand both Atlantic storms and the recoil of the new cannon that emerged from the French-Burgundian arms race of the 1460s and 1470s.

Cannon weighed so much that if a ship, specialized for war, were to carry anything like as many guns as it had room for, they had to be mounted near the waterline to avoid top-heaviness. This in turn required cutting gun ports in the side of the hull and finding a way of sealing them against stormy seas when fighting was not in prospect. In 1514, a ship built for King Henry VIII of England pioneered a suitable design, allowing the vessel to carry a row of cannon on each side. Innumerable improvements followed, but European warships continued to conform to this general pattern until the 1840s. Such a vessel could shower a broadside of shot against an enemy ship at a range of up to two hundred yards and expect to reduce it to helplessness by damaging masts, sails, rudder, and rigging. To sink a ship completely was difficult because nearly all hits came above the waterline, and stout hulls could take a great many cannon shots without suffering irreparable damage.

Cannon were eminently well suited for the defense of ordinary merchantmen, though of course they did not carry as heavy an armament as specialized warships did. Consequently, from the 1480s, when the cannon first became available, financiers who fitted out ships for long and perilous voyages found it very much worthwhile to install a few of the new weapons on board each ship, because guns improved the chances of a safe return with cargo intact. In many waters, raiding and trading were not clearly distinguished. This was true in the Mediterranean, for example, and wherever else peoples with conflicting loyalties competed for dominion on the seas. When encountering strangers, the decision whether to bargain or to fight all depended on circumstances, and the most important circumstance was the balance of force at the command of the two parties concerned. Guns capable of inflicting damage at a distance were therefore enormous assets for European merchantmen. Indeed, it is scarcely an exaggeration to assert that in the first century of European transoceanic trading, their principal stock-in-trade was the superior force with which they could compel others either to hand over goods as tribute or else to sell at prices the Europeans found advantageous.

European ability to assert superior force in distant regions of the earth reflected the fact that even a few shipboard cannon could render old fashioned coastal defenses untenable and could completely destroy lightly built ships. In the Mediterranean and in

the Indian Ocean, calmer seas made the heavy construction Europeans had developed for Atlantic waters quite unnecessary; but light vessels, fitted for those seas, were unable to use the new cannon. As Newton's laws of motion eventually made clear, the force of a cannon's recoil was exactly equal to the force of the cannonball it launched. Ships less strongly built than those required to withstand the stormy seas of Europe's Atlantic face were therefore liable to be shaken apart by a heavy gun's recoil after just a few firings. They were almost equally vulnerable to shot, for flimsier construction meant that a few smashed boards threatened the integrity of the entire hull.

The result of these facts was to give cannon-carrying European vessels an easy superiority over all other shipping at almost exactly the time when European ships and navigators first discovered how to exploit ocean winds and currents so as to sail at will between home ports and the Americas or Asia. The only shipbuilding tradition that compared in stoutness with the European was Chinese; and Chinese seagoing ships had carried a complement of guns that were smaller than those Europeans favored, but superior to anything they met in the Indian Ocean and South China Sea. But it so happened that the Chinese government, for reasons of its own, prohibited the construction of seagoing ships in 1436. Chinese shipbuilding therefore decayed to the furtive levels that illegal "pirates" could sustain long before the first European ships, with their cannon, showed up on the China coast.

The Moslems [Muslims], who had played a leading role in Indian Ocean commerce for centuries, and who had successfully rolled back Christian sea power from the eastern Mediterranean after 1453, did not simply acquiesce in the sudden appearance of European ships in seas they had been accustomed to dominate. Ottoman rulers, after all, were acutely aware of the importance of big guns, as the capture of Constantinople showed. But their naval administrators were unable to imitate Europeans' prodigal use of cannon on shipboard because Mediterranean skills and traditions of naval architecture (not to mention shortages of metal) stood in the way.

Nevertheless, after the news of Vasco da Gama's arrival in southern India in 1498 reached the sultan's court, the Ottoman government dispatched expert gun makers to Sumatra so that the local Moslem ruler might better protect himself from the European threat. In addition, the Ottoman government built a navy in the Red Sea to guard the holy cities of Mecca and Medina from infidel attack and drive the Portuguese from the Indian Ocean, as similar Turkish fleets had driven the Venetians and other Christians from the eastern Mediterranean.

Accordingly, when all was ready, in 1509 the Turkish admiral assembled his fleet and allied Moslem naval forces of the Indian Ocean for a major assault on the Portuguese. Ramming and boarding were the tactics familiar to the Moslem sailors. Crossbows were available to assist their assault, but heavier missiles were difficult or impossible to

accommodate on board vessels that depended on rowers for maneuverability in battle and were jammed full of nimble, lightly armed crewmen for the climactic act of boarding hostile vessels. Cannon were worse than useless, since their recoil would have been fatal to the light, fast galleys.

When battle was joined, off the port of Diu in northwestern India, Portuguese cannon proved devastating to the crowded and vulnerable Moslem warships. Despite an enormous discrepancy in numbers, the intruding Europeans easily prevailed because their ships were fast enough and maneuverable enough to prevent the Moslems from coming to close quarters. The battle of Diu (1509) therefore became completely lopsided and established European naval superiority in the Indian Ocean for centuries to come. In 1538 a revised Moslem strategy tried to drive the Portuguese from Diu by land attack, supported by a rebuilt Ottoman fleet, but this also failed ignominiously, whereupon the government in Constantinople gave up the attempt to operate armed forces in the area of the Indian Ocean, leaving the defense of Moslem interests to local rulers and peoples.

Local rulers of the Indian Ocean coastlands did not even attempt to compete with the newcomers by building ships and cannon like those the Europeans brought with them. Perhaps the break with old, established customs and skills was too sharp. More likely, access to the comparatively vast quantity of metal needed to equip a ship with big guns was too expensive to be contemplated, much less carried through. Instead, Indian Ocean sailors persisted in using their accustomed light, cheap vessels and continued to conduct most of the trade up and down the coast simply by undercutting Portuguese charges. The Portuguese tried to assert a trade monopoly, but evading their patrols was easy since the foreign ships were few, and native trading vessels did not have to submit to the police of a regular port, being small enough to beach themselves on any sandy shore where they could, do business-and be gone again, leaving no trace.

Further east, European merchant ships met less opposition, partly because at first they came in very small numbers. Thus when Portuguese traders first appeared along the coast of China, beginning in 1520, the Chinese government made no special effort to resist them. That would have required a reversal of the decision whereby the Chinese had prohibited naval construction. In any case, the government had no resources to spare from the defense of the northern land frontier against the nomads, and a few Europeans offered no conceivable threat to the imperial majesty of the Son of Heaven. Instead, the Portuguese were allowed to set up a coastal station at Macao in 1557, where they attended to their own defense and internal governance, thanks to the tacit acquiescence of local Chinese administrators.

In Japan, no central government had practical power over the warrior chieftains who controlled the southern ports where Europeans first arrived in 1543. Local policy

depended on local encounters, but for the most part a lively curiosity dominated the earliest Japanese reactions to the European ships and mariners who began to frequent their shores. Intense interest in details of their armament and other novelties was prominent from the start. Even the mysteries of the Christian religion aroused far warmer response in Japan than elsewhere in Asia, as the Spanish Jesuit missionary St. Francis Xavier discovered. Initial curiosity and eagerness to acquire new skills and ideas from the Europeans only gave way to a more suspicious stance at the end of the century. Yet, in 1638 the government eventually imitated the Chinese by prohibiting Japanese subjects from building seagoing ships and limited foreign shipping far more strictly than the Chinese ever tried to do.

From the point of view of the Chinese government, the first Portuguese merchant ships that ventured into Chinese and Japanese waters merged into and became part of a Far Eastern piratical society, based on various offshore islands along the south China coast. The mixed ethnic origins of these pirates allowed the Chinese government to regard them as foreign; but in fact they were heirs of the older Chinese naval tradition, and some of their seagoing junks could carry big guns without suffering undue damage from recoil. The pirates' problem was to get hold of such guns, for neither the craftsmen nor the metal needed for their manufacture was easily accessible to them.

Nevertheless, Portuguese guns and Portuguese manpower did infiltrate the pirate society of the Far East, in much the same way that European sailors and guns infiltrated the world of the Barbary pirates in the Mediterranean in the sixteenth century. Both piratical communities therefore responded to the new European style of naval architecture and warfare in a way the great land-based empires of Asia never did. But pirates lacked the material resources and organization ever to challenge Europeans when it came to long-distance commerce. Instead, each vessel was on its own when sailing through pirate-infested waters, and in such encounters European manned vessels usually held their own without too much difficulty, having far better access to guns and other equipment than locally based pirates enjoyed.

Oddly enough, despite the Mediterranean Sea's proximity to Atlantic Europe, the superiority of Atlantic-style naval vessels was considerably slower to assert itself there than in the Indian Ocean or the South China Sea. As late as 1571, both Christian and Ottoman fleets used old-fashioned ramming and boarding tactics at the battle of Lepanto. At Lepanto, to be sure, a few Venetian galleasses, equipped with a single bow-mounted cannon, contributed conspicuously to the Christian victory; but that sort of cannonade was a pale imitation of the broadsides Atlantic vessels were by then accustomed to deliver. Ten years later, in 1581, Spain and Turkey signed a truce, thus suspending organized naval war in the Mediterranean. The struggle was never resumed, and although state-supported war galleys continued to sail in Mediterranean

waters for several decades thereafter, privately managed cannon-carrying ships of Atlantic design began to dominate both trade and piracy in the Mediterranean from the beginning of the seventeenth century, if not before.

#### **IV. TRANSFORMATIONS OF EUROPEAN ARMIES TO 1700**

Wealth garnered from overseas trade enhanced the Europeans' capacity to pay for land as well as for naval armaments. Cities that could not or did not succeed in protecting themselves from land attack ceased to be seats of large-scale, long-range commerce simply because the men who financed and organized such enterprises wanted security for themselves and their capital and carefully sought out those places where security was best. The fate of Antwerp, sacked by Spanish soldiers in 1576 when it became clear that a bankrupt King Philip II [of Spain] could not pay their back wages, illustrated this fact. Antwerp had been the chief center of northwestern Europe's commerce and finance before 1576; after its sack, capitalists and entrepreneurs fled to Amsterdam, where the merchant oligarchy that ruled that city and the surrounding province of Holland was eminently solicitous of business interests.

Consequently, Amsterdam took over Antwerp's metropolitan role for European big business within an amazingly short time. Unlike the Flemings of Antwerp, the Dutch of Amsterdam took care to attend to their own defense by hiring soldiers to keep the Hapsburg heir, King Philip II, and his armies at a safe distance. Philip, however, very much wanted to control the wealth of the Low Countries and assumed that the Spanish soldiers who had won so many victories in Italy would be able to bring the rebellious Dutch to heel. As a result, the Dutch wars (1567-1648), which merged into the Thirty Years War in Germany (1618-48) in their final phase, succeeded the wars in Italy (1494-1559) as the principal proving ground for the European art of war.

In Italy, Spanish soldiers had established their reputation as the best fighting force of Europe. The French had relied on native cavalry, Swiss pikemen, and heavy artillery. The Spaniards defeated them by using an infantry army, composed of Spanish pikemen and new fan led arquebusiers, together with extensive resort to field fortifications for protecting their flanks from cavalry attack. The French artillery seldom reached the battlefield, being too slow to keep up with marching men, and cavalry was useless for siege operations, which again came to the fore as the *trace italienne* spread.

Thus, the Spanish army as it emerged from the Italian wars was composed mainly of pikemen, massed in squares and supported in front and on the flanks by what were called sleeves of arquebusiers. Their guns could inflict wounds at a distance of up to one hundred yards, and thus helped to weaken an opposing body of troops for the "push of pike," whereby battles were decided. Sieges were usually terminated by surrender when the garrison faced starvation, although commanders did know how to

fill in the ditches and silence the fire from enemy bastions that protected the new style of fortification from direct assault. But such methods were costly in time, effort, and casualties, and it was usually preferable simply to wait for time to do its work.

In the course of the Dutch wars, the Spanish level of military efficiency was left behind by the very miscellaneous body of mercenary troops who served under the command of Maurice of Nassau, prince of Orange, who was captain general of Holland from 1585 until his death in 1625 and commanded the forces maintained by other Dutch provinces for varying periods of time as well. Maurice was university trained and looked to the ancient Romans for models of how to organize, train, and discipline his troops. He was also a Calvinist and, in spite of his noble breeding, shared something of the work ethic with which Calvinists have been credited.

What Prince Maurice did, above all else, was to make sure that the soldiers under his command were kept busy. In siege operations, he imitated the Romans by ordering his soldiers to construct field fortifications for their own protection. Digging became incessant, for Maurice also required his troops to construct elaborate assault trenches so they could close for an attack on the ditch and walls without suffering losses in the approach. Such tactics turned sieges into victories rather than endurance contests; moreover, it kept the besiegers busy, solving problems of indiscipline and dissipation that had always before corroded besieging armies.

Soldiers, of course, spent most of their time doing garrison duty or just waiting for the next field campaign. Maurice occupied his soldiers' idle hours by insisting on drill—endless, repeated, systematic. He divided his army into battalions, companies, platoons, and squads, with a commander over each unit. A 550-man battalion was the largest unit that could respond to a single human voice; the squad (usually 10 men) was the smallest unit that could act independently—marching, deploying, firing. The chain of command reached symmetrically from Maurice at the top to each and every corporal in command of a squad. In principle, if not always in practice, Maurice could move his troops about on the battlefield as a chess player moves pieces on his board. Flexibility, precision, and predictability in battle increased with such organization and drill, and to make that result even more certain, Maurice established officer-training schools where each rank learned exactly what its role and duties were.

Practice of battlefield maneuvers was only part of Prince Maurice's drill. Soldiers also practiced weapons handling—over and over and over. To make every motion count, Maurice (or someone under him) analyzed the movements needed for the handling of pikes and of matchlock handguns, dividing them into a series of separate, distinct muscular acts. Drillmasters then set out to make the soldiers perform the prescribed movements in unison and at the word of command. The practical effect was to minimize error. If an arquebusier failed to ram a wad down the barrel of his gun so as to keep

the powder in place, or to follow that with a bullet, and then another wad, before priming the firing pan and getting his burning match into proper position to ignite the gun, his weapon was sure to misfire. In the excitement and confusion of battle, error and omission of this sort was inevitable, but endlessly repeated practice could reduce its frequency and thereby increase the quantity of lead a given number of soldiers could shoot at the enemy. Time between shots could also be shortened, and the unison of drill produced a concerted volley that demoralized opposing troops more effectively than scattered shooting could do, largely for psychological reasons.

Drill, however, had other and more important psychological consequences. That is because men who live together and confront an obvious risk to life and limb, as mercenary soldiers must do, respond to the experience of moving their muscles in unison by bonding to their fellows in a quite extraordinary way. Such behavior undoubtedly rouses echoes of humanity's most primitive form of sociality. Even before our ancestors were entirely human and had learned to talk, they danced around campfires -- celebrating past successes in the hunt and rehearsing what they would do to their quarry next time. Hunting bands that succeeded through such dance rehearsals in perfecting their cooperation and mutual support in the field -- each man standing firm when the moment of crisis arose, thrusting home with spear or dagger when the game came within reach, risking wounds, and sharing the triumph of the kill -- had an obvious advantage when it came to begetting and feeding their progeny. That progeny eventually peopled the earth, bequeathing aptitudes and sensibilities to their descendants that still affect human behavior profoundly.

Prince Maurice's drill, like that of the ancient Romans and Greeks, was therefore able to call on a very powerful primitive aptitude for cooperation and mutual support, creating a visceral sense of "belonging" to and with one's fellows. Only someone who has undergone long hours of close-order drill in a modern army is likely to appreciate or believe that an activity so mindless (and in our time no longer functional in battle) can have such powerful psychological side effects. But drill sergeants and privates, even in our push-button era, still experience the eerie effect of drill. Young men, subjected to such an experience, are automatically differentiated from civilian society, being united instead by a special bond an esprit de corps -- that soon begins to dominate the consciousness of those who move their muscles rhythmically and in unison. Athletic teams and some religious groups -- remember the Shakers and the dancing dervishes -- also have tapped this primitive level of human sociality; but its importance for armies, and especially for European armies<sup>2</sup>, far eclipses other manifestations of this peculiar human aptitude.

No one was entirely aware of the full consequences of Maurice's reforms, at the time or subsequently. Commanders got what they were after: greater efficiency in battle.

They did not wonder much about how and why their men became so ready to obey and conform. Yet in a longer historical perspective, this was by far the most significant aspect of the Dutch army's transformation. Before the 1590s, infantrymen had been potential revolutionaries within European society, coming, as they did, from the poorer classes. Rulers had often preferred to hire foreigners for that reason, since soldiers who spoke a different language were less likely to sympathize with the lower classes or side with them in case of local riots. But as drill became a normal part of everyday experience for European infantrymen, bonding with fellow soldiers took precedence over every other social sympathy. Esprit de corps took over; pride in themselves and their collective prowess supplanted civilian identities.

As a result, the flotsam and jetsam of city streets and the sons of impoverished peasants became thoroughly reliable instruments of aristocratic and oligarchic rule. European governments could afford to invest in technically proficient infantry armies without fearing that the armed poor would challenge the class hierarchy on which those governments rested. No other civilized society of the age enjoyed the same privilege. No other civilized state could arm the poorest classes of society with impunity. As a result, European armies were cheap as well as effective when compared with the aristocratic, largely cavalry forces that exercised government and maintained the social order in Moslem and Indian lands. In China and Japan, as we will see, the managers of the armed establishments were also inhibited by concern for maintaining the existing social hierarchy. Only in western Europe could rulers afford to pursue efficiency in battle to its logical limits with no concern for the disturbance a predominantly infantry force might offer to existing class relationships.

Instead, in European armies, obedience to the word of command became predictable and almost automatic. Officers as well as men were shaped by their experience of drill. Officers, in addition, were fitted into a bureaucratic hierarchy of rank, so that deference and obedience no longer depended on personal connections and inherited social ties but on bureaucratic appointment and promotion, signified and proclaimed by inconspicuous badges of rank worn as part of a uniform. Indeed, it no longer mattered whose lips framed an order. Soldiers became replaceable parts in a sort of human machine, and so did their officers. A company or platoon obeyed familiar orders that had been practiced endlessly in drill-orders to march, deploy, fire-with about the same accuracy when they came from a competent officer or from a novice. It made scant difference whether the chain of command emanated from a government whose seat was halfway round the earth or whether the sovereign was in the field with his troops, on top of the nearest hill.

Flexible, formidable, and reliable armed establishments of this kind were truly remarkable works of art and ought to count as one of the most extraordinary



achievements of the age. The armies of other civilizations fell far short of what western Europeans now began to take for granted. This, with the continued superiority of their cannon-carrying ships, allowed Europeans to continue expansion overseas with less and less concern about whether or not their increased presence aroused hostile reactions from local peoples.

The efficiency of Prince Maurice's Dutch armies in battles and sieges was of course evident to others, and the new pattern of organization and drill spread very rapidly indeed within the European circle of nations. In 1607 the Dutch published a book illustrating each step of their manual of arms, so that even illiterates could learn exactly how it was done. A German edition came out in 1614; a Russian translation followed in 1649, and by then even the Spanish, having been defeated at the battle of Rocroi in 1643 by a French army that had used the new drill, reluctantly went over to their enemy's style of discipline and organization. Improvements did not halt with Prince Maurice and the Dutch. During the Thirty Years War, Germans and Swedes experimented with battle tactics that involved the coordination of infantry and cavalry with newly designed light field artillery. Later, toward the end of the seventeenth century, arquebuses and matchlocks were superseded by more reliable flintlock muskets as the standard weapon for European infantrymen. As handguns improved, pikes became less important, and when the ring bayonet was invented, about 1690, pikes became entirely unnecessary, since musketeers could now both fire their guns and protect themselves even from cavalry attack simply by fixing bayonets to their guns.

The Peace of Westphalia that ended the Thirty Years War made France the greatest power of Europe, and for a while it looked as though King Louis XIV (reigned 1643-1715) might use his army to extend his kingdom into the Rhinelands and, perhaps, renew a bid for hegemony over the Continent. But a coalition of other states soon formed to check his ambition and thereby maintained the uneasy balance of power that continued to differentiate western Europe from the vast empires that prevailed in other civilized lands.

Nevertheless, the headlong pace of military innovation in Europe slowed perceptibly after about 1700, largely because professional standing armies now dominated the scene, and to profit from the interchangeability of parts and personnel such armies needed uniform equipment. When standing armies numbered more than a hundred thousand, a new design for a handgun, or anything else, cost too much to be accepted lightly. If the proposed weapon required changes in drill routines, it jeopardized any gain the new design offered during an awkward transition period, lasting for years. Minor design improvements therefore ceased. Weapons designs, which had continually evolved by virtue of innumerable small changes ever since gunpowder first

came in, therefore stabilized as far as Europe's armies were concerned. (Fine hunting guns for private use did continue to improve, but that had no immediate effect on armies.) As a result, a nearly fixed routine soon set in that made the wars of the eighteenth century less disruptive to European society than those of the sixteenth and seventeenth centuries had been. But stability and modulated warfare at home went along with accelerated expansion overseas, where European military superiority became increasingly evident in comparison with the practices of other peoples and states whose responses to gunpowder weaponry had taken a different path.

## **V. EUROPE'S OUTLIERS: MUSCOVY AND THE AMERICAS TO 1700**

The first phase of the gunpowder revolution, focusing on siege cannon, profoundly changed patterns of power in Russia and America. Both regions continued to share in the further elaboration of the European style of warfare, even if they lagged a bit behind the most active centers of innovation. By 1700, consequently, vast regions of the earth, overseas in the Americas and eastward into Asia all the way to the Pacific coast, had been folded into the Europe-centered system of states. By that date, the Russian lands as well as the Americas shared, at least marginally, in a civilization that ought not to be called European any longer, since it had transcended Europe's boundaries.

It is easy to exaggerate the importance of weaponry and of military organization in accounting for this expansion. Disease had more to do with the destruction and displacement of Amerindian populations than did guns, for example; and Russian expansion into the Siberian forests was also accompanied and facilitated by epidemic die-offs among previously isolated and disease-inexperienced peoples. But without guns and the easy military superiority they gave to Europeans in initial encounters with local peoples, the pattern of European expansion would have been very different.

In Russia, the first and quite fundamental consequence of the gunpowder revolution was the consolidation of Muscovy into a vast, single, and autocratic state. Grand Duke Ivan III (reigned 1462-1505) [Tsar Ivan III] knew what cannon could do. After all, guns had smashed the walls of Constantinople just nine years before he came to power in Moscow. He therefore took great pains to acquire a few of the new wall destroyers, and with their help was able to conquer almost all of the other Russian principalities in a very short time. His consolidation of the Russian lands was exactly like what had happened in France a generation earlier when King Louis XI and his son had consolidated their authority over formerly independent feudal domains.

Having united the Russian lands, Muscovite rulers followed the French example a step further by using their new military capability to attack southward and eastward. But unlike the French, who were eventually driven out of Italy, the Russians stayed in the new lands their armies and cannon allowed them to dominate. Thus, in a series of decisive campaigns between 1552 and 1556, Ivan IV, better known as Ivan the Terrible

(reigned 1533-84) conquered the Tartar principalities along the Volga all the way to its mouth. It took another century before Russian power was established securely along the northern shore of the Black Sea, but the dominance of Moscow and of the autocrat who claimed succession to Constantine and the Byzantine emperors of Christendom by taking the title of czar (Caesar) was never successfully challenged again from within the Russian lands. The new Muscovite autocrats relied on the Russian river system, which allowed effective central control over comparatively vast territories. Local resistance to Moscow became impossible when big guns made existing fortresses useless, for the simple reason that cannon could reach them by being hauled up and down the rivers on barges. Portages from one river system to another were more difficult, but sleighs could carry cannon across frozen snowy ground in winter -- and the key portages were short with no great elevations to surmount. As a result, all the cities and strongpoints of the Russian lands were easily accessible by water. Simply by controlling the only mobile gun park in those lands, the czar could dominate them all.

Centralization of absolute, unlimited power, which continued to characterize Russian government thereafter, down to our own day, was the result. Absolutism was reinforced and perpetuated by continued difficulty the Russian government faced in coping with overland threats. Danger came partly from the south, where Tartar cavalymen from the shores of the Black Sea kept on supplying the slave market in Constantinople with captives from Russian villages until late in the seventeenth century. From the west, Swedish and Polish armies, which shared more fully than the Russians in continuing improvements in the European art of war, were able to invade Russian from time to time and even threatened to Conquer the whole country during a dynastic interlude -- the so-called Time of Troubles (1604-13).

Eastward, beyond the Ural Mountains, Russians had no such problems. Instead, it was they who threatened the various peoples and polities of northern Asia. Small bands of frontiersmen, more or less obedient to Moscow and to fur-trading merchants based in Novgorod and other Russian cities, swiftly learned to portage from one river system to the next until they reached the Pacific in 1637. A vast hinterland thus became tributary to Moscow. Soon afterward, the French in Canada (beginning in 1609) and the British Hudson's Bay Company (beginning in 1670) began to extend exactly analogous fur-trading empires across most of North America, operating from bases at Montreal and Churchill. Russian and British (and, presently, United States) fur traders and empire builders collided on the shores of the Pacific in the last decades of the eighteenth century, closing and completing the geographic range of an extraordinarily far-reaching system of trade. Handguns, together with metal knives and hatchets, were vital to these empires, giving European agents and traders command of instruments of destruction and construction on which the aboriginal hunters and gatherers of those snowy wastes soon came to depend for their livelihood.

In the course of the seventeenth century, the Russians were gradually able to check Tartar slave raiding by building elaborate frontier defenses, stationing garrisons in stockaded forts, and constructing mile upon mile of wooden palisades between adjacent forts. Troops equipped with handguns, when they were able to catch up with the Tartars, could kill mounts and men in such number that the old nomad superiority in the field was undermined. The wooden field, fortifications hampered Tartar mobility enough to make it a lot easier to catch raiding parties.

On their western frontier, however, the Russians found themselves at a more persistent disadvantage. Recurrent efforts to catch up by importing the latest forms of European military organization and weaponry sufficed to keep the Russian heartlands immune from conquest, but not from invasion. Thus, in the course of the long Livonian war (1557-82), Swedish armies succeeded in shearing the Baltic coastlands away from Muscovite sovereignty. The Poles, likewise, advanced into the Ukraine in the sixteenth and seventeenth centuries and exercised a powerful attraction on noblemen in the more westerly Russian lands, who resented their subordination to the czar and yearned for aristocratic freedom like that of the Polish Republic.

Under Peter the Great (reigned 1689-1725) a vast effort at military modernization did allow the Russians to catch up, or nearly catch up, with western European levels of organization and equipment. Peter was therefore able to extend his southern borders to the shores of the Black Sea (though initial victories there were almost undone by a subsequent failure in 1711) and even rolled the Swedes back far enough to secure a narrow window to the west along the coast of the Baltic Sea by 1721.

Throughout the eighteenth century, when, as we have seen, European military practices and weapons nearly stabilized, Russian power increased dramatically by comparison with the other states of Europe, thanks to the vast territorial base and growing populations that sustained the czar's armies and brand new navy, all constructed on up-to-date Western models. When an extraordinary industrial and democratic transformation of European polities in the nineteenth century tapped new sources of power, Russian once more fell behind--only to try yet again, in our own century, to catch up and overtake by importing the industrial and military technologies that had raised Western power to new heights.

American development was different. The various colonial societies that arose along the Atlantic face of the Americas after Columbus's discovery were not seriously threatened by overland enemies, but their fate did very much depend on the fluctuating naval power of the competing European states. In imperial warfare, the security of the American colonies depended on guns carried on shipboard, operating in tandem with other guns emplaced in fortresses along the strategic sea routes that were defined by winds and currents as well as by where valued trade goods like furs, silver, and sugar

were to be had. Quebec, Halifax, and Havana became the key fortresses for the French, British, and Spanish empires respectively.

Havana other Spanish strongholds of the Caribbean were defended as much by yellow fever as by guns. Once ashore, soldiers fresh Europe became radically vulnerable to a disease to which they had no prior exposure or immunity. No landing force could survive for longer than six weeks before suffering crippling losses from the mosquito-spread virus of yellow fever. Local Spanish garrisons, on the contrary, were already immune, and so could hold, on to. victory unless supplies ran out. That was why the Spanish empire survived, despite several large-scale British efforts to use their growing naval predominance to conquer the Caribbean. By way of contrast, the French empire in Canada, where disease did not play any critical role, collapsed in 1759 when a British expeditionary force captured Quebec.

Between bouts of imperial, mainly naval, warfare, the various colonies of the Americas had no need of an up-to-date armed establishment of the sort the Russians required for security against their neighbors. Local militiamen were more than enough to cope with sporadic efforts by the Indians to safeguard their hunting grounds and drive intruding whites away. Until after 1700, distance safely separated the land frontiers of the rival colonial systems from each other, although claims conflicted. As a result, a lawless no-man's-land formed between French, English, and Spanish settlements, and in time of war agents of the warring powers supplied Indians with guns to induce them to attack their rivals.

Another lawless zone existed in the Caribbean, where a flourishing pirate world existed very much like the pirate communities of the South China Sea and of the Mediterranean. It was populated by French, English, Dutch, Spanish, Portuguese, and African adventurers together with others of mixed ancestry, sometimes fighting among themselves and sometimes making a common front against legally constituted authorities.

The Russian frontier also supported a fringe of lawless adventurers known as Cossacks. They served as out runners and pioneers of Russian expansion throughout Siberia and along the empire's southern border. New World frontiersmen of the interior played the same role with respect to European colonial society, most notably in Brazil and trans-Appalachian North America.

Ruthless efficiency as measured by monetary results prevailed in the New World. Military considerations prevailed in Russia. Therein lay a fundamental and enduring difference between the two principal outlying societies arising along the frontiers of Western civilization. Overseas it was the market that mattered most; overland it was armed protection that took precedence over other considerations. That was because,

in time of need, high-technology navies and professional soldiers defended European overseas settlements, and for these the colonists did not pay. The Russian lands had no such external resource. They had to pay for their own defense, sporadically importing the latest, most efficient military techniques, whatever the cost.

Where European settlers in the Americas directed the labor of large numbers of black slaves or Indian peasants, the sharp differentiation between rulers and ruled that characterized Russian society was more or less replicated in the Americas, with the difference that economic rather than political-military motives and calculations justified the subordination of the majority to the will of the minority. Where no such ethnic chasm existed, American society became far more egalitarian than was the case elsewhere in the Western world. As a result, the English colonies of North America tended to diverge from the European norm of society in the opposite direction from the way the Russians did. English colonial freedom melting into backwoods anarchy contrasted with Russia's steep social pyramid, which was consciously and deliberately modeled on a military chain of command. Yet the anarchic, egalitarian ideal was not absent from Russian society. It was merely banished to the margins. In remote Siberia and the barren north pioneers lived quite as independently as any American frontiersman. Their freedom constituted an alternative ideal, lurking as a sort of underground in Russian society as a whole. What tipped the balance was the Russians' need for effective, professional, and technically up-to-date military defense-something American colonists did not need to worry about. Contrasts between the United States and the Soviet Union of our own time descend directly and obviously from these differences in the frontier experience of the seventeenth century.

## **VI. MOSLEM RESPONSES TO THE GUNPOWDER REVOLUTION**

As we saw, the Ottoman sultan Mohammed the Conqueror recognized the value of siege guns as early as 1453 and did not hesitate to employ Christian artillerists to cast the weapons he needed to batter down the walls of the city that became his capital thereafter. In addition, the sultan equipped his slave corps of foot soldiers, the famous Janissaries, with handguns from the time that such weapons became effective in the field. Indeed, in the sixteenth century the Janissary corps may have used more handguns than any other armed force in the world, since European infantry were then still mostly pikemen, and in other civilized lands, infantry were not well enough disciplined to be trusted with large numbers of guns.

Until about 1600, therefore, the Ottoman army remained technically and in every other way in the very forefront of military proficiency. Continued territorial conquests attested its superior skill and organization, both against Christians in the Balkans and Hungary and against Moslems in Syria, Egypt and Arabia. The bulk of the Ottoman army consisted of cavalymen, equipped according to the steppe tradition with bows

and arrows as their principal offensive weapon. But the importance of artillery and of the gun-carrying Janissaries was far greater than mere numbers might suggest.

Artillerymen were few and, often, also foreign but their field guns helped the Ottoman army to defeat their only serious Moslem rivals, the Safavid shah's cavalry, at the Battle of Chaldiran in 1514, (The Turks carried their comparatively light field guns in wagons and deployed them for battle in the gaps left when the wagons were hitched together to make a laager for protection against cavalry attack.) Portable field guns were not enough to overcome Vienna's walls, however, as the unsuccessful Ottoman siege of that city in 1529 demonstrated. Moreover, the Ottoman army could not remain in the field long enough to starve the city into surrender or even to bring heavy siege guns all the way from Constantinople. Instead, because the season for campaigning was already drawing toward a close, they had to start back for home a few weeks after reaching Vienna's walls.

Thus, it was distance from Constantinople that allowed the Hapsburgs to retain Vienna and its surrounding Austrian provinces as a frontier against the Turks, and it was distance from Constantinople that also permitted the Safavids to establish a rival Moslem Shi'a state in Azerbaijan and Iran. But within the geographical range defined by their need to muster in spring and disband in the fall somewhere close to the capital, the Ottoman field armies remained superior to any they encountered until after the middle of the seventeenth century.

The discipline and numbers that made Ottoman cavalry so formidable depended on the fact that the sultan controlled a private household of armed men that was clearly and obviously capable of nipping provincial rebellion in the bud. Knowing that, landholders reported punctually for service year after year, and became accustomed to obeying the sultan's officers. These officers were selected from the-imperial household to serve as provincial governors and field commanders over the cavalymen of the district they governed.

In addition to such officers, the sultan's household comprised the Janissary corps of foot soldiers, and a corps of privileged cavalymen as well. All the members of the sultan's military household, from highest field commander to humblest Janissary, were slaves, recruited mainly from Christian peasant villages located in the mountainous wild west of the Balkan peninsula. Recruiters were interested only in boys who were nearly full grown, so the sultan's slaves could well remember their Christian peasant upbringing. But the effect of drill and education on them was as remarkable as the effect of Prince Maurice's regimen on his soldiers. They became obedient, disciplined agents of the sultan's will. For those with unusual natural abilities, the Ottoman slave household offered a career wide open to talent. Even the grand vizier, the chief administrative officer of the entire empire, more often than not had started life as a

Balkan peasant boy. The sultan also entrusted all the other major commands of the empire to his slaves.

After the middle of the sixteenth century, this remarkable military and administrative structure began to lose its efficiency. First of all, the sultans ceased to lead their armies in person and gave up annual campaigns. Toward the end of Suleiman the Lawgiver's reign (1520-66) a series of costly campaigns (both by land and by sea) ended only in unsuccessful investment of frontier fortresses, built on the *trace italienne* plan. That made it clear that no further advance into Europe was possible, and, as we saw before, Ottoman efforts in the Indian Ocean met with decisive disaster between 1512 and 1538. North of the Black Sea, potentially rich lands lay within range of the Ottoman army, but the Ukrainian grasslands were almost empty of agricultural settlement in the sixteenth century, and so were hardly worth conquering, since they could not support Ottoman cavalymen as the Balkan and Asian provinces of the empire did. The Turks did advance into Rumania, but halted there until the 1670s when wars with Poland and Russia for control of the Ukraine revealed the fact that the old Ottoman superiority to Christian armies had begun to decay.

Two factors combined to tip the balance against the Turks in the seventeenth century. First, the internal discipline and morale of the sultan's slave household became unreliable, partly because the sultans ceased to command the army and administration personally, and partly because the pattern of recruitment/to the slave household was changed so as to admit persons of urban background and Moslem birth to its ranks. As the sultans became creatures of the harem, mere figureheads for the intriguing courtiers and civil administrators who actually ran the government, ties between civil society and the slave household multiplied. This brought all sorts of special interests to bear on government policy in a way that had been impossible when the empire was governed by slaves who had severed ties with the remote villages of their birth because of geographical removal to Constantinople and by accepting an (often tepid) adherence to Islam.

Urban interests profited and villagers suffered from this transformation of the Ottoman administration. In the absence of annual campaigns, the old discipline and obedience in the provinces weakened. Local magnates, and bandits soon began to intercept tax revenues and use them for their own local purposes instead of allowing them to flow freely to the support of the central government and capital city. The result was to undermine the central government quite drastically, and efforts to renew the old traditions, undertaken as part of a convulsive reform movement in 1656, proved only partially successful.

The second factor that weakened the Ottoman military posture vis-a-vis the European frontier states with whom they collided after the middle of the seventeenth century was

the unwillingness or inability of the regime to keep up with European technical advances in the art of war. As handguns improved, battle efficiency had come to require infantry armies, but Moslem and nomad traditions valued cavalry too highly to make such a shift acceptable. The social position of Turkish landholders, especially in the Balkans where the peasantry remained Christian, required them to maintain a social distance from the majority, and that was best done from horseback. The government did increase the number of foot soldiers by allowing the Janissary corps to expand. But larger numbers were a strain on the state budget, which was already suffering from a general inflation of prices caused by the influx of American silver. The cure was to permit Janissaries to supplement their pay by working for a living when not on campaign. But this brought on new disorders, for the expanded Janissary corps merged into the Moslem artisan classes of the towns, especially of Constantinople, and ceased to be either obedient to the sultan or willing to submit to the sort of drill that made European troops increasingly effective in battle. The changing balance of military competence between Ottoman and Christian armies was first demonstrated in the Ukraine, where the Russians succeeded in defeating the Turks in a hard-fought war between 1577 and 1581. When the Turks tried to recover their damaged morale by attacking the Hapsburgs instead, and advanced to besiege Vienna for a second time in 1683, they failed once more. In ensuing years they were driven out of Hungary by the generalship of Prince Eugene, commanding troops that had profited from all the technical and organizational advances which had been so ruthlessly field-tested in Germany during the Thirty Years War. Failure in the Ukraine in 1681, and retreat from Hungary, sealed by the Treaty of Karlowitz in 1699, marked the definitive eclipse of Ottoman military superiority in wars against European troops. The empire never recovered. Instead, the circumstances that had inhibited the Ottomans from keeping pace with western Europe in the seventeenth century continued to prevail until the violent destruction of the Janissary corps in 1826, and by then it was too late. The Turks could not begin to match the industrialization of war pursued by the leading European powers after the mid-nineteenth century. Repeated defeats and eventual disruption of the empire in 1923 were the result. In India and Iran two other Moslem empires compared in magnitude and importance with the Ottoman state. Their military history closely resembled Ottoman response to the gunpowder revolution, but lagged behind by a century or more in time, owing to geographical isolation from the European center of technical innovation. The Mughal empire of India got started in 1526 when a descendant of Tamerlane named Babar crossed the Himalayas and began to conquer northern India. Babar and his followers were heirs of an ancient Persian-Turkish warrior tradition that made them skilled cavalymen, archers, and gentlemen for whom a delicious Persian love poem was as admirable as heroic single combat. The Mughal invaders met success" against rulers already on the ground in India (most of whom also

shared in and descended from the same central Asian military tradition) because they had closer connection with the lands to the north whence came the horses and the warriors needed to dominate Indian battlefields. The Indian climate was not good for horses, and they could seldom be successfully bred on Indian soil. Hence, an army had to import mounts from the north just to keep going, and control of the supply of horses became strategically vital, as long as battles were won and lost by cavalry actions.

Babar nonetheless knew about guns and their use in sieges. He even imitated the Ottoman sultan Mohammed the Conqueror by employing artisans to cast siege guns on the spot in order to smash his enemies' fortifications. In that fashion, the superiority of his cavalry in the field could be translated into more lasting victory, since defeated foes could no longer survive by taking refuge in fortified strongholds and expect to live to fight another day. Nevertheless, Babar's control over northern India was never secure, and a few years after his death in 1530 rivals even drove his son Humayun out of India entirely. But after recruiting fresh followers in the north, Humayun returned to Indian battlefields and won back the hegemony of northern India that his father had gained before him. Stabilization of the Mughal regime was achieved only under Humayun's son, Akbar (reigned 1556-1605), who regularized tax collection, came to a modus vivendi with the indigenous Hindu landowning and military class and acquired an imperial gun park that backed up his superior cavalry by giving him the capacity to destroy even the most formidable fortified refuge of a defeated foe. Akbar's guns, as portrayed in the *Akbarnama*, an illustrated record of his victories, were close replicas of the sort of siege guns that had been invented in Burgundy between 1465 and 1477. Hauling them cross-country to invest strongholds, some of which were perched on top of precipitous heights, was very difficult. For that reason, the Mughal hold on the hilly parts of India was always insecure, and the social gap between Moslem invaders and Hindu subjects made rebellion perennial and very easy to foment. Nonetheless, the Mughals maintained a quite effective, central government at Delhi until after 1707, and were able to extend their jurisdiction southward to embrace almost all of the peninsula. But the Mughal government made no attempt to control the seas, allowing Europeans to establish fortified bases along India's coast to safeguard their and themselves. Little by little, the importance of these European enclaves increased as more and more Indians began to produce cotton cloth and other goods for sale to the Europeans. Moreover, when English and French trading companies displaced the Portuguese as the principal European traders along the coasts of India, they began to recruit small garrisons of Indian soldiers, known to the English as sepoys, to guard their fortified shore stations. Drilled by European officers in the European fashion, these troops soon became far more efficient than Mughal foot soldiers.

Then, in the course of the eighteenth century, a remarkable power shift took place. The comparatively small numbers of European-trained infantry proved capable of

dominating Indian battlefields just as had been the case in Europe since 1477. As a result, it was the British who succeeded the Mughals as rulers of India, thanks to their sepoy troops, and to the Royal Navy that kept the East India Company's shore stations and armies in touch with their home base in London.

But long before the East India Company's troops became engaged in decisive battles, internal disorders and renewed invasions had broken up the unity of Mughal administration. A regime whose military power depended primarily on horses and cavalymen, originating north of the mountains-both finding the climate of India debilitating-was intrinsically vulnerable. Innumerable earlier conquest regimes in northern India had decayed after only one or two generations for the same reason. What was different between 1556 and 1707 was the added reach that siege guns gave to the central authority, allowing the Mughal government to extend its power over almost the whole of India, as only one of its imperial predecessors had been able to do in earlier centuries. In that limited sense, the Mughal empire, like the Ottoman, was a member of the family of gunpowder empires.

The other great Moslem state of the age, based in Azerbaijan and Iran, was entirely traditional in military matters when Shah Isma'il (reigned 1502-24) declared himself to be the 'only legitimate successor to the Prophet by claiming descent from Ali, Mohammed's son-in-law. That claim convulsed the Moslem world, much as Luther's claim to reform the church convulsed Christendom fifteen years later. It inspired the Ottoman sultans to embark on a violent repression of the numerous Shi'a sympathizers in Anatolia, who were inclined to accept Isma'il's claim, and, as mentioned above, pitted the Ottoman imperial army against Isma'il's tribal followers at the Battle of Chaldiran in 1514.

Ottoman military discipline and field guns won that battle, and for the rest of the century the Safavid dynasty, founded by Isma'il, relied more on religious incandescence than on technical proficiency to defend itself against its rivals. Then, under Shah Abbas I the Great (reigned 1587-1629), new contacts with the European world allowed the shah to import guns. He thereupon began to create an artillery and an infantry corps at his court, very much on the Ottoman model. The agents who gave Shah Abbas access to the new weaponry were a pair of English merchant adventurers, Anthony and Robert Shirley, who reached Persia by traversing Russia, descending the Volga, and crossing the Caspian Sea. The Russians were willing enough to strengthen the principal Moslem foe of their Ottoman neighbors and rivals, so this circuitous route was not interdicted by political barriers. Instead, the shah was able to build up his personal power vis-a-vis the tribal and territorial chiefs who dominated the Turko-Iranian society he ruled, by counterbalancing their cavalry with his new infantry and artillery just as the Ottoman sultans had done since 1453.

Abbas used his enhanced military strength to attack the Ottomans. He succeeded in capturing disputed borderlands in Iraq and eastern Anatolia, though after his death the Ottomans were able to regain almost all the territory they had lost. These struggles, however, entirely preoccupied the Turks during Russia's Time of Troubles and while western Europe was convulsed by the Thirty Years War.

As far as the Safavid state was concerned, the successors of Abbas found it impossible to maintain the balance between imperial and feudal armed forces that he had created, partly because of difficulties in importing and paying for guns, and partly because vigorous religious and social prejudice against the new-fangled military arrangements at court were very difficult to resist. The commanding personality of Shah Abbas had overcome opposition to military modernization; his successors, weaker men, were unable or unwilling to do so. The Safavid regime therefore disintegrated into warring tribal and territorial fragments by the end of the seventeenth century.

Thus, one must say that guns and the European model of military organization played only a fleeting role in the history of the Safavid state. It ought not, perhaps, to be counted as a gunpowder empire at all-certainly not in its first decades, when its importance in the world of Islam peaked for religious, not military, reasons.

## **VII. THE FAR EAST**

Although invented in China, gunpowder and guns played a less revolutionary role there than elsewhere. Indeed, it is not paradoxical to suggest that because gunpowder weapons evolved in China within the context of a very elaborate art of war, Chinese Mandarin officials were deliberately able to keep them under close control, allowing only a modest alteration patterns of Chinese armament, government, and society. When gunpowder was first invented (before A. D. 1000) the Sung navy's army was very numerous by the standards of other civilized lands, numbering more than a million soldiers. It was composed almost entirely of infantrymen, whose preferred weapon was the crossbow and whose principal role was to guard fortified places along the northern frontier against nomad incursions. Gunpowder was initially of very minor importance useful only to set nomad tents on fire from a distance, or the like.

As we saw above, when the Mongols invaded and then ruled China (1206-1368), they began to explore the offensive capabilities of gunpowder and developed explosive devices, including the first guns, for breaking into fortified strongholds and attacking in the field. But persistent shortages of gunmetal in China meant that Chinese guns were more expensive than those of Europe, and they tended to remain smaller and less powerful as a result.

Disinterest in the offensive capacity of gunpowder weaponry was reaffirmed under the Ming dynasty (1368-1644), after it came to power by evicting the Mongols from the land

of China. Fear of renewed conquest from the steppe dominated Ming military policy. This meant, among other things, that weapons capable of destroying fortifications were of little interest to the Chinese government. Its aim was rather to make fortifications as secure as possible with minimal cost. That required an infantry army, like that of the Sung, to garrison innumerable strongholds along the northwestern frontier, supplemented by a mobile field force, composed mainly of cavalry. Heavy guns, like those Europeans employed so freely, had no place in such a scheme.

Nevertheless, the Chinese continued to know about guns and, indeed, used them to supplement the defense of fortified places. But crossbows, aimed from behind protective walls, were far cheaper and just as effective against nomad cavalry attack, and no one in China advocated a policy of equipping infantry with handguns and then training them so well as to allow them to meet and overcome cavalry in the field. A mobile infantry army, recruited from the bottom of society, would have been difficult for civilian officials to control, and its commanders might refuse to conform to the marginal, quasi-disreputable role that Confucian tradition assigned to soldiers and soldiering.

The Japanese did briefly experiment with gun-carrying infantry, and when they invaded Korea in 1592, detachments of matchlock gunners accompanied the sword-wielding samurai. When the imperial Ming field army intervened, its cavalry, crossbows, and overwhelming numbers helped the Koreans (who had begun to manufacture and use handguns like those the Japanese were employing so effectively) to push the invaders back. In 1598 the Japanese withdrew entirely, taking their handguns with them, and the Chinese never again had to face a well-equipped infantry field force until 1839, when they collided with detachments of British soldiers in the Opium War.

The Ming government also abandoned the navy it had inherited from the Sung and Mongol eras, and in 1436 actually prohibited the construction of seagoing ships in China. Thereafter, supplying cannon for shipboard use ceased to be a drain on imperial resources, making one less reason for trying to keep up with the pace set by European naval armaments.

Traditions of Chinese statecraft, going back to Confucius, deplored resort to military force, viewing fighting as a failure of good government, which ought to depend on the force of example and proper ritual. The task before mandarin officials, shaped by the ideals of the Confucian classics, was to control both the nomads of the steppe and the officers and men of the Chinese army in such a way that neither group would be able to violate the proper order of society by using armed force to ravage the countryside or challenge the mandarins' governance of Chinese society. Careful rationing of supplies delivered to Chinese frontier garrisons, and meticulous fragmentation of military command so that no general could personally control a large field army were the principal methods the civilian administrators used to secure their ultimate control

over the soldiery. Subsidies to some chieftains and diplomatic provocation of quarrels among hostile tribes were ways the Chinese sought to keep the nomads from dangerous and concerted attacks.

Obviously, such traditions and methods had no place for heavy offensive weapons, or for troop formations that could dominate battlefields and capture walled cities as European armies were beginning to be able to do. The social structure and Confucian traditions of China made such a development deplorable even to contemplate. Hence, whatever knowledge they had of European military developments remained irrelevant and regrettable to the elite that governed China. Far from being something to emulate, European military organization and techniques looked like yet another deplorable example of the absence of propriety that characterized and defined barbarian behavior.

Yet it turned out that in spite of all the wiles of Chinese diplomacy and military administration, civil wars, arising in the wake of the Korean campaign against the Japanese, paved the way for another barbarian conquest from the north. In the 1640s, cavalymen from the plains of Manchuria captured the capital, Beijing, and founded a new dynasty, the Qing (1644-1912). The new dynasty established a dual military system, garrisoning key Chinese cities with Manchu detachments but also recruiting Chinese infantrymen for garrisoning frontier posts as before. They entrusted civil administration to Confucian scholars selected in the traditional way by examination, but stationed Manchu observers in most government bureaus check up on loyalty and efficiency.

As a matter of fact, the Manchu emperors and their immediate entourage had become thoroughly imbued with Chinese cultural traditions and ideals before conquering the Middle Kingdom. Thus, the establishment of a new, barbarian dynasty made less difference to China than had been the case when the Mongols brought with them a central Asian cultural taint that promptly provoked the detestation of Chinese elites. Nonetheless, the new rulers did not overcome the last Ming loyalists until 1683, and even after that date a deep-seated Chinese distaste for those they viewed as barbarians maintained a certain level of distrust between rulers and ruled, even in the most brilliant year of the Qing dynasty.

Being steppe dweller and cavalry warriors themselves, the Manchus were in a position to deal successfully with China's other barbarian neighbors as soon as the vast resources of the empire came into their hands. As a result, encounters with Mongols and Tibetans (some armed, some merely diplomatic) led to rapid expansion of their imperial influence into the steppe and forest lands of central and east Asia. There the expanding Chinese imperial power fetched up against the expanding Russians, whose pioneers had reached the Pacific coast as early as 1637. Negotiations defined respective spheres of influence and regularized trade, beginning with the Treaty of

Nerchinsk in 1689.

The advance of Chinese and Russian administration into the steppe signified the waning of nomad military superiority over settled agricultural populations that had been a fixed feature of Eurasian society since the skill of riding directly on horseback had first spread across the grasslands between 700 and 300 B.C. Infantry handguns from the Russian side, and a complex, ill-understood transformation of both Mongol and Tibetan society that made them more accessible to and dependent on peaceful trade with China, underlay the eclipse of the steppe cavalymen's military dominance over civilized populations.

This was a profound change in human patterns-perhaps the most fundamental wrought by the gunpowder revolution, since it was ecumenical within Eurasia. Western Europeans, of course, succeeded the steppe nomads as the principal threat to prevailing military, political, and economic balances of Eurasia and the world, but their avenue of approach was by sea. That meant that ports and coastal areas became the critical frontiers for cultural encounter. Time-tested Chinese, Indian, and Middle Eastern modes of coping with invasion and the threat of invasion from the steppe gradually became trivial and archaic. But of course the Chinese were not aware of the fact at the time, nor was the obsolescence of their military system brought home to them until the nineteenth century. Instead, China's old regime flourished throughout the eighteenth century as seldom before. It made the shock of the Opium War (1839-41), in which small British forces overpowered Chinese defenses with ease, all the greater when it came.

Sixteenth-century Japan was the seat of a highly developed military tradition that valued clan loyalty very highly and put a premium on individual valor and skilled swordplay. Japanese ships may have used guns for their protection, as the Chinese did when the imperial navy was in its prime; but as far as land warfare was concerned, guns and gunpowder did not seem to have had any noticeable impact upon Japanese warfare before three Portuguese adventurers arrived in Japan on board a Chinese ship in 1543. Their arquebuses were of immediate interest to the local clan chieftain who received the Portuguese. He purchased the new weapons at once and ordered his sword smith to make duplicates. Japanese smiths were the most accomplished in the world when it came to making swords, and found little difficulty in turning out handguns in quantity. Matchlocks on the European model therefore began to play a role in increasingly violent battles that broke out among rival clan coalitions as early as the 1560s. In 1575 an army of arquebusiers, ten thousand strong, actually played the decisive role in the battle of Nagashimo. At that time, too, Japanese-made cannon made their first appearance on the field of battle-still relatively small by the standard of European big guns, but able nonetheless to kill at a greater distance than handguns

and capable of destroying lightly built fortifications as well.

Rival captains and clan chieftains employed ordinary farmers to serve as matchlock men, since the necessary skills were elementary compared with the years of training required for wielding bow and sword, as hereditary samurai warriors were accustomed to do. When, in 1584, the mounting intensity of warfare climaxed in decisive victory for an upstart captain named Toyotomi Hideyoshi, Japanese armed establishments were therefore two-tiered, with gun-carrying infantry exercising far more authority on the field of battle than samurai, wedded to their traditional style of single combat with swords, felt to be right. Commanders, of course, were all samurai, and when a further round of war after Hideyoshi's death in 1598 led to the establishment of the Tokugawa shogunate (1600-1868, the new rulers of the country were in a position to act on their dislike of guns, especially when such weapons were in the hands of a social class that might be expected to be restless under the new regime.

The result was a systematic restriction on the manufacture and use of guns, beginning in 1607. By 1625, the government had secured an effective monopoly of gun-making capacity without, however, disarming the country as a whole. Consequently, when Japanese Christians rebelled against the shogun in 1637, handguns again played a key part in the struggle. But it was the last time that these weapons mattered in Japan until Admiral Perry's visits in 1853 and 1854, for after the rebels had been defeated, all been systematically harried from the land, guns were allowed to rust and disappear. They were clearly unworthy of a gentleman and warrior. Since wars also ceased, there was no occasion to arm commoners again, and feudal lords had no further reason for maintaining detachments of matchlockmen as part of their armed establishments.

So, uniquely, the Japanese, after first exploiting the potentialities of gunpowder weapons more, energetically than any other people-even the Europeans-turned their backs on handguns just as systematically as they had initially espoused them. The self-interest of the samurai, the new peace that the shoguns maintained, and an aesthetic, emotional attachment to swords and single combat all conspired to bring about this extraordinary result.

Nevertheless, guns played a very prominent part in uniting Japan in the first place, and at the same time undermined their future role in society by allowing commoners to kill off large numbers of samurai in bloody and decisive battles. In 1636, distaste for things foreign, mingled with some residual fear that alien contact might upset Japan's hard-won internal peace, persuaded the shogun to seal the country from outside contact. Japanese were no longer legally allowed to sail across the seas. A single Dutch ship was permitted to visit Nagasaki annually, but it was required to anchor near an island in the harbor so that unregulated contacts could not occur.



Japan therefore deliberately preserved its old-fashioned military establishment into the nineteenth century, even though samurai swords had only ritual use, thanks to the unbroken internal peace the shogun's bureaucratic administration secured. In Japan, guns were therefore a flash in the pan -- very important for a while, and then no more.

### **VIII. CONCLUSION**

This hasty survey of the variety of responses to gunpowder weapons calls into question the notion of "gunpowder empire" as something common to the civilized world. The new weapons certainly did make a difference- everywhere. But what that difference was depended on social circumstances and public policy. Nothing inherent in the technology of guns dictated the use to which they were actually put by different peoples in different parts of the earth. This should remind us of all the other dimensions of human society-intellectual, artistic, religious, institutional, technological, and ecological-within which gunpowder weapons existed and continue to exist.

Centering attention as much as this essay does on only one variable necessarily creates a partial and imperfect picture of the whole historical vision gains in clarity by such a narrow focus, but at the same time loses sight of other aspects of human life that were more or less autonomous and unaffected by changes in armament. Still, it is also true that armed force is important because it constrains and limits other sorts of human behavior; and it seems obvious that some ways of using gunpowder weaponry worked better than others, though here one must distinguish between short-and long-term success.

In China and Japan, for example, ruling elites deliberately and successfully allowed guns to have only marginal importance for more than two centuries -- and any policy that works well for that length of time has much to commend it. Yet by the nineteenth century that policy exposed both countries to a real risk of domination by Europeans. On the other hand, the reckless abandon with which western European governments exploited the potentialities of gunpowder weaponry cost innumerable lives and helped to keep European society and politics in turmoil. Yet in the long run it also gave Europeans the means enrich themselves (with knowledge and skill as well as with material goods) and allowed them to dominate other lands and peoples around the globe. Gains and losses were therefore anything but simple and straightforward-and, of course, practical policy never foresees really long-term results and only occasionally foresees accurately all the important short-range side effects of a particular decision.

Humanity is still caught up in the arms race evolving from Europe's state rivalries, which fanned the gunpowder revolution. As events unfold, we can be sure that the long-term advantages and disadvantages of past actions with respect to gunpowder and other weapons systems will take new shapes. Study and reflection on the record of how different states and peoples coped with gunpowder weaponry in the first centuries of its

history will not provide shortcuts to wise policy, but ought at least to prepare us for surprises and unanticipated consequences of whatever decisions we make with respect to the organization and equipment of armed force. That, assuredly, was the fate of our predecessors. As long as human foresight remains imperfect, and our passions continue to induce us to fight one another, managing armed force wisely will remain both difficult and important. It therefore deserves historical study, even though military rivalries are only part of the human condition.

### **NOTES**

1. Iron presented early gun makers with special problems. Its melting point was a good deal higher than that of the copper, tin, and zinc that went into making bronze and brass, but European blast furnaces could cope with that if need be. What could not be solved was the tendency of cast iron to crystallize, producing a hard, brittle substance that was liable to fracture under the pressure of an explosion. Until the 1560s, therefore, big guns were made only of bronze and brass.

Then a bed of iron ore in Sussex, England, was found to be suitable for guns. This was due to trace elements that inhibited crystallization, though ironmasters of the time did not understand why Sussex iron was good for guns when other ores were not. Later still, Swedish beds of iron ore also proved to be a suitable gunmetal. Iron, being abundant in nature, was far cheaper than bronze or brass, and first Elizabethan England, then Sweden, profited greatly from having easy access to cheap iron cannon.

2. The history of drill is obscure. Sumerian bas reliefs show men marching in step behind a shield wall, so some sort of drill must have prevailed in that earliest known civilization. But in ancient and modern times, Europeans alone among civilized peoples seem to have built their armies on infantry drill. (Shaka Zulu did the same in Africa early in the nineteenth century and met with spectacular success.) Greek phalanxes and Roman legions maintained formation in battle only after hours of drill; and the psychological bonds that drill created undergirded classical city-state life as powerfully as it was later to undergird European armies. Moslem, Indian, Chinese, and steppe armies do not seem to have relied on drill to the same extent. Wherever cavalry tactics prevailed, as was the case within the whole range of steppe conquest and infiltration-that is, everywhere in the civilized world except Japan and western Europe-drill had far less scope, since horsemen have to adapt to their horses' motions and cannot establish a muscular unison of their own bodies, even if they can manage a concerted charge.

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