

An analysis of Chinese and Western thought and culture from the perspective of the development of gunpowder's uses.

Juanxi Rao¹

¹Guilin University of Technology, Guilin 541006, China

Abstract

Gunpowder, as one of the four great inventions of ancient China, its history of application differentiation profoundly reveals the differences in thought and culture between China and the West. It was initially applied in military affairs in the Tang Dynasty, and in the Song Dynasty, it developed into fire weapons such as "Thunderclap Cannon" and gave rise to the culture of fireworks. However, constrained by the Confucian ideology of "valuing ethics over technology", the technology of gunpowder gradually stagnated at the empirical level and failed to form a scientific development theory. After being introduced to Europe via the Arabs, the Westerns combined gunpowder with mathematics and chemistry, developing an efficient weapon system and turning it into a powerful tool for colonial expansion. This divergence in technological paths reflects the deep-seated thinking patterns and cultural values of the two civilizations. This article will start from the different purposes of using gunpowder in the China and the West, and objectively analyze the ideological and cultural factors behind the development and application of gunpowder from aspects such as Confucian thought in China, the expansionist ideology of Western civilization, social structure and institutional factors, and the differences between intuitive thinking and rational thinking. In the era of globalization, the paradox of gunpowder tells us that true progress requires transcending the binary opposition of "experience and theory", "ethics and interests", and finding a balance point for the benevolent use of science and technology in the mutual learning of civilizations.

Keywords

Cultural differences, Chinese and Western thoughts, gunpowder's uses.

1. Introduction

Gunpowder, as one of the four great inventions of ancient China, not only profoundly changed the form of human warfare but also became a significant marker of the divergence in the development paths of Chinese and Western civilizations. Since its initial application in military affairs during the Tang Dynasty and the subsequent emergence of fire weapons like the "Thunderclap Cannon" and the culture of fireworks in the Song Dynasty, the application of gunpowder in China remained at the empirical level and failed to develop into a systematic scientific theory. In contrast, after being introduced to Europe via the Arabs, the Westerns

combined gunpowder with mathematics and chemistry, rapidly developing an efficient firearms system, which became a key tool for modern colonial expansion. This technological divergence reflects the fundamental differences between the two civilizations in terms of ideological traditions, social structures, and thinking patterns.

The development of gunpowder technology in China was deeply influenced by the Confucian ideology of "valuing ethics over technology". Under the constraints of values such as "benevolent governance" and "non-aggression", the military application of gunpowder was long subject to morality, while its entertainment uses (such as fireworks) better met the social and cultural needs. Meanwhile, the stability of the traditional agricultural society and the suppression of technological innovation by the imperial examination system further hindered the theoretical breakthroughs in gunpowder technology. In contrast, in the West, the innovation of gunpowder technology was closely linked to the expansionary nature of capitalism and the mathematical scientific methodology. The rational thinking and experimental tradition after the Renaissance promoted the refinement and standardization of gunpowder weapons, making them a tool for the West to conquer nature and expand its territory.

This article will analyze the deep-seated reasons for the differentiation of gunpowder's uses from the perspective of comparative ideological and cultural studies. Firstly, the constraints of Confucian ethics on technological development and the driving force of Western instrumental rationality; secondly, the technological stagnation under the centralized system in China and the incentives for military innovation in the competitive society of Europe; thirdly, the differences between the Eastern experiential and emotional thinking and the Western mathematical and logical thinking. On this basis, it further explores the ethical dilemmas of technological development in the era of globalization, gunpowder is both a catalyst for civilization progress and a symbol of violent conflict. This paradox suggests that true technological progress needs to transcend the binary opposition of "experience and theory", "ethics and interests", and seek balance in the mutual learning of civilizations. Ultimately, the path to the goodness of science and technology lies in respecting life and rationally conquering nature, which is precisely the profound enlightenment of the history of gunpowder differentiation for the contemporary collision of civilizations.

2. The development overview of gunpowder in China and the West

In 1620, the British philosopher Francis Bacon wrote in his book *Novum Organum* "Printing, gunpowder and the compass have changed the face and state of the whole world." Bacon was right. These three inventions indeed promoted the development of world history. Among these three inventions, gunpowder might be the most "unfortunate" yet great invention of the Chinese. Some people often lament: "The Chinese invented gunpowder but only used it for firecrackers. What a pity!"

In fact, like many other inventions in ancient China, the invention and application of gunpowder in China were merely the result of long-term accumulation of production experience. Ancient Chinese inventors only cared about the invention itself and seldom explored the underlying principles. Therefore, in terms of understanding, it always remained at the perceptual level. Modern science relies on deductive reasoning and experimental induction to explore the laws

behind things, thereby elevating perceptual knowledge to the rational level. This is also the difference between ancient science and modern science.

As one of the four great inventions of ancient China, the origin of gunpowder can be traced back to the accidental discovery of alchemists. During the Sui and Tang Dynasties (8th to 10th centuries), the formula for gunpowder was initially formed and was first applied in the military field at the end of the Tang Dynasty. By the Song Dynasty (10th to 13th centuries), China had invented early firearms such as "Thunderclap Cannon", and used gunpowder for military defense. At the same time, it developed in the civilian field, and entertainment uses such as fireworks and firecrackers gradually became popular. However, after the Yuan Dynasty, Chinese gunpowder technology stagnated, while during the same period, gunpowder was introduced to the Arab region through the Mongol westward expansion and then to Europe via Spain. After the Renaissance, Europe, combining scientific theory with military needs, rapidly improved the gunpowder formula, promoting a military revolution. By the time of the Industrial Revolution, Western firearms technology had comprehensively surpassed that of the East.

This differentiation is not only a difference in technological paths but also a profound collision of the genes of Chinese and Western civilizations. The East, with Confucianism at its core, pursues social harmony and cultural mutual learning; the West, driven by expansionism, emphasizes instrumental rationality and competitive interests. The difference in the uses of gunpowder is a microcosm of this civilizational divide. This article will analyze the deep logic behind the differences in the uses of gunpowder from the perspective of ideology and culture.

3. Reasons for the Different Development Trends of Gunpowder

Applications

3.1. Elements of Chinese Confucian culture and Western religious culture factors

Confucian culture has profoundly influenced the technological development path of China. Since Emperor Wu of Han adopted Confucianism as the dominant ideology, the scholar-official class focused on ethical norms and moral precepts, regarding technology as "unimportant skills", which led to a long-term lag in the research of gunpowder theory. Although the Song Dynasty attempted to apply gunpowder to military purposes, it lacked scientific support such as mathematics and physics, resulting in limited firepower of firearms. In the Ming Dynasty, literati even used the concepts of Yin-Yang and Five Elements to explain gunpowder formulas, highlighting the lack of scientific thinking. The Confucian "The Golden Mean" further inhibited technological innovation. Scholar-officials tended to maintain social stability rather than promote military reforms. Confucian culture emphasized the "The Golden Mean" and "harmony is precious", which prioritized ethics, leading to the gradual shift of gunpowder towards civilian applications, becoming a cultural symbol of "peace and prosperity".

Confucian culture profoundly influenced the reverence for "fire". In ancient China, fire was regarded as a sacred object that "transformed all things" (from The Book of Changes), and gunpowder was endowed with the symbolic meaning of warding off evil and bringing blessings. The popularity of fireworks and firecrackers was not only due to entertainment needs, but also reflected the philosophy of "interaction between heaven and man".

China's diverse applications of gunpowder demonstrated its cultural inclusiveness. The military use of gunpowder was not completely abandoned, but its entertainment-oriented path was more in line with the philosophy of "harmony between heaven and man", emphasizing harmonious coexistence with nature. This choice also implicitly embodies altruism: by reducing war damage, it maintained the well-being of the people. However, excessive emphasis on ethical orientation led to technological stagnation, ultimately being surpassed by the West in modern times.

The core of Western culture encompasses three aspects: individual competition, rational thinking, and religious culture. They do not recognize that humans are innately endowed with the instinct of altruism and believe that human nature is inherently greedy. It can be said that Western culture has extinguished the conscience of inherent altruistic thinking in humans through rational thinking methods. Therefore, typical Westerners only possess rational thinking abilities and self-interested thinking abilities, lacking the altruistic thinking abilities that maintain human morality. However, religion plays a role in Western culture in part by compensating for the problem of moral deficiency.

Max Weber's "Protestant Ethic and the Spirit of Capitalism" reveals the deep-seated driving force behind the militarization of Western gunpowder. The Protestant doctrine holds that "glory to God requires the conquest of nature", and regards gunpowder as "a tool bestowed by God for conquest". This religious thinking combined with scientific rationality gave rise to a breakthrough in gunpowder technology: Lavoisier determined the optimal ratio of black powder through chemical experiments, replacing the empirical formulas from the East. Bacon's philosophy of "knowledge is power" further alienated gunpowder technology into a symbolic symbol of legitimacy for colonial expansion. For instance, the Spanish fleet blasted open the door to America with cannons and declared, "To spread Christian civilization with gunpowder."

3.2. Factors of Social Structure and Institutional Environment

The long-standing centralized imperial system of China contrasts sharply with the competitive state system of Europe. Although the Song Dynasty was the first to weaponize gunpowder, but firearms mainly served the maintenance of the existing ruling order. The Ming Dynasty established military armory factories, but the technological inheritance was interrupted due to social unrest, and no continuous innovation mechanism was formed. The unified pattern of China's great unity reduced the pressure of military competition, and gunpowder gradually turned to civilian use. Fireworks and firecrackers became the core elements of festival celebrations, expressing the yearning for "domestic peace and people's prosperity". This choice reflects the value of "harmony being valued above all else". The centralized system also limited technological innovation.

Furthermore, the imperial examination system made the elite focus on Confucian classics rather than science. Due to the fact that Confucianism highly values people's moral cultivation, after becoming the orthodox ideology of the ruling class in China, in the Confucian system for selecting officials, personal morality was a very important indicator. Therefore, in ancient China, morally upright people were more likely to enter the political career and be promoted, and their interests would receive certain compensation. Through the selection system of officials and the Confucian education system, Confucian moral values influenced the intellectual class and the general public in China. The current moral level of the Chinese people is the result of the

combined effect of these two completely different forces. Through this mechanism, the altruistic thinking ability of the Chinese people was partially preserved.

The advantages of the Western way of thinking fully stimulated the ability of individuals to satisfy their desires, making the entire society full of vitality. However, there is also a difficult social problem: frequent disputes. In a world dominated by Western thinking patterns, it is an unstable world, filled with various forms of conflicts. In this system, because every individual (whether a country, a group or an individual) strives to maximize their own interests without considering the feelings of others and the fairness of the outcome, this will inevitably lead to many disputes.

For the same reason, disputes between countries are endless. The final means of resolving disputes between countries is often war. In the Western world dominated by this thinking pattern, the number of wars among European countries far exceeds that of China during the same period.

The feudal fragmentation and frequent wars in medieval Europe (such as the Hundred Years' War) provided an experimental field for gunpowder technology. Countries competed to improve firearms in order to seize hegemony, and gunpowder rapidly transformed from an "Eastern secret art" into a conquest tool. The lethality of gunpowder was maximized, becoming a powerful weapon to overthrow the knightly class and promote the bourgeois revolution. This pragmatic orientation is consistent with the competitive logic of the "forest law" in Europe.

After the Renaissance, Europe established natural science systems such as mathematics and chemistry, providing theoretical support for the improvement of gunpowder. For example, the optimal ratio of black powder was determined through experiments, replacing the empirical formula in China. This instrumental rationality regarded gunpowder as a means to "control nature", reflecting the conquest desire of the Western culture towards the material world.

The escalating cost of gunpowder warfare intensified the demand for fiscal centralization in European countries. The revealed "bureaucracy-taxation" symbiotic mechanism led to a positive feedback loop between the large-scale production of gunpowder weapons and the military revolution. However, the small-scale agricultural economy foundation of China could not support a continuous arms race, and the application of technology showed intermittent characteristics. The firearms troops of the Ming Dynasty experienced technological stagnation during the stable period of the dynasty, confirming the inhibitory effect of the stable social structure on technological breakthroughs.

Marx regarded gunpowder as "the lever for the collapse of the feudal system", but the deep-seated driving force still lies in the transformation of the economic structure. The European knightly class was not directly eliminated by gunpowder weapons, but was forced to expand the state machinery by the fiscal demands triggered by gunpowder wars, and finally completed the replacement of classes through institutional reconstructions such as the French Revolution. Although China was exposed to gunpowder earlier than other countries, the strong resilience of the imperial examination system and the bureaucratic system mitigated the impact of the technological revolution on the traditional social structure, resulting in a special phenomenon of "technological transformation without structural change".

3.3. The thinking mode of moral sensibility and scientific rationality

Due to the long-term influence of Confucian culture, the biggest difference between Chinese people and Westerners lies in that Chinese people have preserved the original altruistic

thinking ability of human beings and attach importance to interpersonal relationships and social harmony. Chinese people also admit the rationality of personal desires and interests, but in order to maintain harmonious social relations, they are willing to appropriately control their private desires and have relatively strong self-discipline ability, and consider it a virtue. When interacting with others, they are more willing to consider the other party's interests, and in situations where there is a consideration of interests, they seldom pursue the maximization of interests, but prefer to obtain mutually beneficial results. In contrast, the pleasure of life for Westerners is highly materialized, only recognizing sensory stimulation and material interests. While Chinese people's pleasure of life includes not only material aspects but also harmonious interpersonal relationships, there is a saying of "enjoying the happiness of family life".

Unlike the rational Western civilization, the early Chinese civilization originated from human nature and was emotional. In interpersonal interactions, more attention was paid to the harmonious relationship and feelings between people. People's thinking mode was similar to that of animals, balancing altruistic thinking ability and self-interest thinking ability, while rational thinking ability was very weak. However, the original Chinese-style thinking mode also had serious flaws. Firstly, Chinese people valued sensibility more than rationality, so compared with Westerners, the rational thinking ability of ancient Chinese was very weak, especially lacking scientific thinking ability. Therefore, when Chinese and Western civilizations met in the 16th-18th centuries, China's technological development level was far lower than that of the West.

The emphasis on "ritual" in Confucian culture led China to incorporate gunpowder into the system of interaction between heaven and man, and firecrackers became a medium connecting the mundane and the sacred. This cultural encoding weakened the urgency of military innovation and led to the stagnation of technological cognition at the empirical level. In contrast, in Europe, firework performances were given scientific enlightenment functions since the 17th century, and the Saint Petersburg Academy of Sciences even used them as educational tools for the masses. This cognitive difference enabled Europe to achieve a transformation from magical thinking to empirical science in the conversion of gunpowder technology, laying a knowledge foundation for military applications.

Gunpowder is the product of arithmetic thinking and experience. Without scientific modeling, only technology and no scientific modeling, ancient Chinese could only remain at the stage of black gunpowder, while Westerners used mathematical modeling to study (that is, chemistry), knowing the principle of gunpowder and the quantitative relationship based on chemical equations, so they could manufacture a large number of various formulas and functions of explosives.

After the Renaissance, Europe established natural science systems such as mathematics and chemistry, providing theoretical support for the improvement of gunpowder. For example, the optimal ratio of black powder was determined through experiments, replacing the empirical formula of China. This instrumental rationality regarded gunpowder as a means to "control nature", reflecting the conquest desire of the Western culture towards the material world.

The inheritance of Chinese science and technology was restricted by non-systematic knowledge production. The gunpowder formula was passed down orally and by word of mouth among artisans. While Western science and technology established axiomatic systems since the Galileo era, decomposing the study of gunpowder into sub-disciplines such as combustion science and

gas dynamics, ultimately giving birth to Nobel's revolution in smokeless gunpowder. Chinese gunpowder development relied on experience accumulation. The gunpowder formula in the Tang Dynasty contained more than ten kinds of impurity components. Craftsmen adjusted the proportion of saltpeter through trial and error, but they could not establish a standardized ratio formula, resulting in the power of gunpowder remaining at the stage of black gunpowder. While in Europe after the Renaissance, using mathematical modeling to precisely calculate the aspect ratio, pressure parameters, and through chemical experiments determine the optimal ratio of nitroglycerin, sulfur, and carbon, the performance of firearms achieved a leap from phenomenon to essence.

4. Conclusion

Chinese and Western cultures are two distinct cultural systems with their own characteristics. Their origins and development paths are different. China is a society guided by tradition, and Confucianism has dominated for thousands of years. Traditional thought rules and methods have persisted to this day and are recognized by everyone, becoming collective consciousness that regulates people's behaviors. Chinese people advocate harmony and unity and emphasize the power of the group, not advocating the prominence of individuals. Moreover, China has a history of over five thousand years, with rich experiences and lessons, which to some extent also makes Chinese culture inclined to value the past. The Western countries represented by the United States are deeply influenced by religious culture and have a strong sense of self-centeredness, believing in individualism. The core of cultural values is individualism, emphasizing achieving the ultimate realization of personal value through personal struggle.

At the same time, technological development cannot do without the nourishment of cultural soil. The pacifism of China needs to be combined with scientific rationality, and the instrumental rationality of the West needs to be constrained by ethics. Only in the mutual learning of civilizations can gunpowder, this "double-edged sword", truly serve human well-being.

The history of gunpowder is a condensed history of cultural dialogue. It not only witnessed the wisdom of the East in transforming hostility into harmony, but also exposed the limitations of the West in "conquering others by force". In the era of globalization, re-examining this history not only helps understand cultural differences, but also provides enlightenment for technological ethics: true progress should embrace both the power of reason and the light of humanity.

References

- [1] 王坚,杨小明,高策.曹焕文与中国火药史研究[J].自然科学史研究,2014,33(04):467-478.
- [2] 许秀华,玖月.从爆竹到枪炮,改变世界的黑火药[J].科学大众(小学版),2023,(Z1):10-12.
- [3] 杜颖初,鲁明源.《黄帝内经》火热理论研究进展[J].山东中医药大学学报,2022,46(03):416-422.DOI:10.16294/j.cnki.1007-659x.2022.03.023.
- [4] 王仰旭.[美]欧阳泰:《从丹药到枪炮:世界史上的中国军事格局》[J].海交史研究,2023,(02):123-126.DOI:10.16674/j.cnki.cn35-1066/u.2023.02.008.
- [5] 王汝发.思维、文化基因与中国古代科学[J].电子科技大学学报(社科版),2002,(01):101-105.

- [6] 周翰林. 浅谈西方艺术与东方悖论——探讨东西方文明冲突与融合的历史背景[C]//文化比较研究论文集. 北京: 社会科学文献出版社, 2014: 203-216.
- [7] 朱歌幸.西方宗教伦理与儒家伦理价值的现实启示[J].怀化学院学报,2005,(04):65-66.
- [8] Jack Goody. The Theft of History[M]. Cambridge: Cambridge University Press, 2006.
- [9] J. W H .New Age Religion and Western Culture:Esotericism in the Mirror of Secular Thought[M].SUNY Press:1997-12-31.DOI:10.1515/9781438405650.
- [10]Peter A. Lorge. The Asian Military Revolution: From Gunpowder to the Bomb[M]. Cambridge: Cambridge University Press, 2005.
- [11]Geoffrey Parker(1996)The Military Revolution: Military Innovation and the Rise of the West, 1500-1800, Cambridge University Press
- [12]Peter Lorge(2008)The Asian Military Revolution: From Gunpowder to the Bomb, Cambridge University Press