THE KOREAN SNAP MATCHLOCK: A GLOBAL MICROHISTORY

by Hyeok Hweon Kang

The musket[1] was one of the first "global" objects to circumnavigate the world. Of all the objects and ideas that spread during the early modern period, few matched the gun in its speed and extent of diffusion. Even such world-stirring stimulants as tea, coffee and cocoa took centuries to circle the earth, their local integration being still further removed from the time of first use or "discovery."[2] Yet, muskets travelled far and fast, driven by exigencies of war, diplomacy and trade. Born to the Germanic area by 1500, the true matchlock musket took just a few decades to traverse Eurasia. On land, it journeyed through Turkey, Persia and India, reaching China's western border by the early 16th century. Aboard ships, it rounded the Cape of Good Hope by 1510, breaching Goa and soon thereafter, Malacca. In about a century, the technology arrived at the other end of the vast Eurasian landmass–Chosŏn Korea (1392–1910). There, it was first used in warfare in 1592, and remained as a dominant projectile machine until the late 19th century.

This essay is a "global microhistory" of the Korean matchlock.[3] It focuses narrowly on a single technology–the gun and its parts–yet brings global perspectives to bear on understanding its origin and diffusion. Specifically, it traces the worldly voyage of the so-called snap matchlock from Bohemia to Korea, emphasizing its travel through the 'waystations' of Portugal, Goa, China and Japan. This story goes beyond assuring the importance of European innovations; it exposes a complex fabric of local adoptions and adaptations.

Though this approach, we can answer questions about the musket's introduction to East Asia: when and how did it arrive, and what did it look like? Seemingly simple, these questions still generate scholarship in several languages and disciplines, including but not limited to works by Japanese and Chinese historians of diplomacy, globalist Anglophone historians as well as museum curators and arms collectors from across the world. In Japanese scholarship, for instance, it has been debated for nearly a century about who introduced the musket to Japan and when.[4] Chinese historians too have discussed the same question for China with little resolution.[5] And for Korea, not much has been explored beyond the well-known episode of the Japanese introduction during the East Asian War of 1592–1598.

The key is to open the "black box" of technology–undoing specimens and poring over material research on guns and gun parts as arms historians have. In this essay, I thus combine insights from material studies with historical data, old and new. The resulting analysis traces in greater detail than before the *"entangled itinerary"* through which the snap matchlock arose, moved and eventuated in Korea, the terminus of its eastward journey.[6] In doing so, it sheds new light on the circulation of the *"first"* muskets in East Asia during the first half of the sixteenth century. It also resolves the longstanding debate on the origin of the snap matchlock in East Asia.

The Musket: Whence and Whither?

The question of the matchlock's origin goes back at least four centuries. One of the first to address it was a Chinese statesman and firearms expert Zhao Shizhen (趙士禎, 1554–1611?). In his *Manual of Extraordinary Arms* (神器谱), an illustrated book on firearms, Zhao presented drawings and explanations of muskets from Ottoman Turkey, Western Europe, Portuguese Goa and Japan as well as his own hybrid inventions.[7] Zhao's work was first printed in 1598 and meant to contribute to China's fight against the Japanese who invaded Korea and inaugurated the East Asian War (1592–1598).[8] The Japanese use of muskets was considered lethal during the war, and Zhao sought new firearms to outgun the Japanese.

For our purposes, this manual included one of the earliest theories about the origin of muskets in East Asia. With his worldly collection of firearms and access to official channels of information, Zhao put it as follows:

> *I remember that it was during the days when my grandfather was a Deputy Judge in the Grand Court of Appeals, that the Japanese pirates first trespassed upon the coast of Zhejiang province, but they did not at that time possess any muskets; it was only six or seven years later that they had such weapons. My grandfather once spoke to me as follows: 'I heard that during previous reigns the Turpan (吐魯番) annexed its neighbor Hami (哈密).[9] Ming China then appointed someone as Commander of an Expeditionary Force who enlisted tens of thousands of soldiers, and went to aid [the Hami] from different directions. But because the Turfan troops borrowed efficacious firearms from Ottoman Turkey (魯密),[10] our soldiers could not rescue [Hami], which ultimately fell into their hands. Now Turkey is near the Mediterranean region (水西洋) by sea.[11] Could it be that this weapon was transmitted from there to the Western Europeans (西洋), who in turn brought it to the Japanese?[12]*

Citing his grandfather's story, Zhao posits that it was during the Turpan-Hami War (1473–1493) that the Chinese first encountered the musket.[13] This conflict engulfed China's northwestern border region, namely today's Xinjiang area, and involved the use of Ottoman guns against the Chinese aid troops. The Ottoman guns, the theory goes, were then transmitted westward to the Europeans, who in turn carried them back eastward, to Japan. By the mid-sixteenth century, (Japanese) Wako pirates armed themselves with muskets and ravaged China's southeastern coast.

To validate this theory, we must first understand how information about the outside world circulated in China. Remarkably, despite its occurrence in a remote border, the Turpan-Hami War was quite well-known across the Ming officialdom. Various literati writings from the period mention it, and Zhao, as we're told, also heard it from his grandfather, a high-ranking statesman. But what's surprising is that some Chinese elites also had reasonably accurate understanding of world geography, being able to chart in their

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minds the relative locations of places as remote as Turpan, Turkey, Europe and Japan–and all of this before the famous Matteo Ricci translated his world map into Chinese in 1598.[14]

It turns out that Zhao's theory had a precursor from as early as 1548. At the time, governor of Zhejiang province Zhu Wan (朱紈, 1494–1550) was tasked with eradicating Japanese pirates in China's southeastern coast. In his raids against the pirate den of Shuangyu Island, or Liampó–as the Portuguese dubbed it–Zhu stumbled upon a crucial piece of information from the captured pirates: Portugal was located not in the neighborhood of Malacca–as conventional wisdom had it at the time–but further across the *"outer sea and in the northwest."*[15] With typical brevity, Zhu then found that this information "mutually reinforced" the story of the Turpan-Hami War.[16]

There are at least two ways to interpret this. Zhu, as one scholar noted, may have implied that the Portuguese guns spread to Turfan, where they were then employed against the Hami.[17] But in accordance with the outlines of his theory, Zhu probably meant the converse: the Ottoman guns spread to the land of the Portuguese who–being located farther than previously imagined–then took them on a long journey to the east, crossing the "outer sea" and reaching Japan.

What's remarkable here is that already in the sixteenth century, guns were global objects that sparked global thoughts in people's minds. Separated by exactly fifty years, Zhu and Zhao pieced together the faint vignette of a Turkish gun in a minor border conflict with their limited understanding of world geography. Sketched in their minds was a rough yet expansive thought–a single route of transmission that crossed the greatest extents of the world as they knew it.

There is much to commend this theory, but is it correct? For one, the implication that Turkey was the first to develop matchlock technology doesn't hold water anymore. While the historian of science Joseph Needham had also entertained this possibility, there is now overwhelming evidence that it was in Europe, not Turkey, where the first matchlocks were born.

Zhao and Zhu couldn't possibly have anticipated this. After all, resolving this puzzle is no less difficult for the modern historian. The basic questions that intrigued Zhao and Zhu, in fact, are still relevant: How was the first matchlock born? Whither did it go and whence did it come? In Japanese scholarship, historians have debated fiercely the circumstances of the musket's arrival in Japan, namely, whether it was indeed the Portuguese who had transmitted the technology to the island of Tanegashima in 1543.[18] But consensus has yet to emerge, other than that the actual construction of the gun should be considered.[19] In the following sections, I advance the discussion by first providing an overview of the technological history of small arms, and then explaining how one model–the snap matchlock–came to circulate widely in early modern East Asia.

The Classic Gun

Historians have shown that by the turn of the 16th century, European guns matured into a classic form: whether cannon or handgun, they grew long and thin barrels, became lighter, and proved more powerful and accurate than their predecessors.[20] This so-called "classic ordnance synthesis" was the result of a centuries-long experimentation by European artisans and practitioners.[21] It would also define–for three more centuries–the shape and function of gunpowder weaponry in Europe and elsewhere. To date, this scholarship on the classic gun has focused mostly on the lengthening of barrels and on large artillery pieces that supposedly set the trend for handguns.[22] But this has obscured another "classic" dimension to the gun as we know it today: a deadly weapon operated by the ease of a finger pull.[23]

The invention of the trigger–or the lock mechanism, of which it was a part–began with small arms and then spread out. Before the said invention, the act of firing a handgun required juggling a metal barrel on one hand and a source of ignition (i.e., cinder or a red-hot rod) on the other–or obliging two people for the ordeal. But with the advent of the lock, a handgunner in the 16th century could now hold the piece steady with both hands (wrapped comfortably around a wooden stock that extended along and behind the length of the barrel), concentrate on taking aim, and just move a finger at the desired moment.[24] Later, the lock system was adapted for large artillery pieces as well as for non-military devices such as animal traps and electromechanical switches still in use today.[25]

Where and when did this technology first emerge? Needham once argued that the Chinese had invented it in the early 1400s and transmitted it westward.[26] But ample evidence shows the contrary: the matchlock mechanism arose not in China, but in Europe and within a particular historical context that is 15th century Germany. To be sure, one can find precursors to the said mechanism in various cultures of crossbow-making.[27] Still, artisans in the German-speaking world were unusually vigorous in experimenting with ignition systems for handguns, and they eventually developed the matchlock musket–the "first real gun-lock."[28] Why?

The answer lies in German craftworkers who practiced a distinctive culture of prototyping in the 15th century. As historian Rainer Leng shows compellingly, blacksmiths and metalworkers in Southern Germany began to leave their traditional workplaces during this period and specialize in gunsmithing–a nascent field that paid well and allowed them to climb the social ladder. For various reasons–including but not limited to high mobility, potential danger for the loss of knowledge (due to accidents and wartime service) and requirement by contract to produce material proof of expertise, these emerging craftsmen then put pen to paper and produced sketches, recipes and technical writing.[29] This new culture of artisanship has left us with dozens of pictorial catalogues and personal sketchbooks. The manuscripts are highly unusual when compared to other occupations and certainly to other countries in Europe. *"Although gunpowder technology had been common knowledge in Europe since the first decades of the fourteenth century, and many German master gun-makers served in other countries,"* Leng notes, *"no comparable manuscripts have been found in Italy, France or England."*[30]

It was from these practices of sketching and designing that new gun designs eventually emerged: the matchlock musket. As early as 1411, an unnamed gunsmith drew an ignition method that anticipated this gun.[31] Namely, his illustrated notebook featured a pole-mounted handgun furnished with a Z-shaped metal arm–also called "simple serpentine" (Figure 1).[32] Named after its serpent-like shape, this serpentine was rotated on the wooden pole and had angular bends, such that pulling it would bring the burning cinder on the other end into the touchhole and ignite the shot.[33] In the next few decades, German gunsmiths continued to grapple

with the idea and produced many variations. Depicted in another manuscript from the mid-1400s, namely, are four serpentine guns, each styled with a different combination of flash deflectors and sights for aiming.[34]

With the spread of the serpentine mechanism, it lay close at hand for the next generation of gunsmiths to develop a full-fledged matchlock system. The latter was a more complicated technology: rather than a single piece of metal rotated on the stock, a number of intricate parts were to be assembled on a separate lock-plate–such as a spring-loaded hammer, a trigger and a combination of levers, tumblers, cranks and/or sears that connected the two. Importantly, the hammer clamped a source of ignition–cinder, flint, or for our purposes, the slow-burning match (cord saturated with saltpeter). Pulling the trigger released the catch that restrained this hammer and the mainspring in the lock drove the burning match into the powder pan.[35]

This system originated with locksmiths, as suggested by etymology as well as its similarity to door-fastening locks. If true, the knowledge may have passed into a gun workshop through temporary collaborations–or as locksmiths, like some of their metalworking peers, ventured into the nascent profession of gunsmiths. On these possibilities, we may only speculate. But what is clear is that aspiring metalworkers like Martin Merz (c. 1426–1501) did avail themselves of relevant knowledge to leave behind the first unequivocal evidence of a matchlock system.[36] Merz apprenticed in a bell foundry at Amberg and went on to become a master gunsmith for the Palatinate (Southwestern Germany). Sometime before 1501, the artisan then drew a matchlock pistol in his notebook (Figure 2). Merz's gun featured a weak lock spring that kept the match hammer away from the powder pan. By squeezing the trigger, the said hammer dipped slowly into the pan; and upon releasing the trigger, the spring returned the hammer backwards to its original position.[37]

Figure 1. A simple serpentine gun, 1411. Austrian National Library, Vienna, Codex Vindobana 3069, f. 38v. A crude barrel is pole-mounted and fired with a Z-shaped metal arm (serpentine). The other figure is casting bullets.

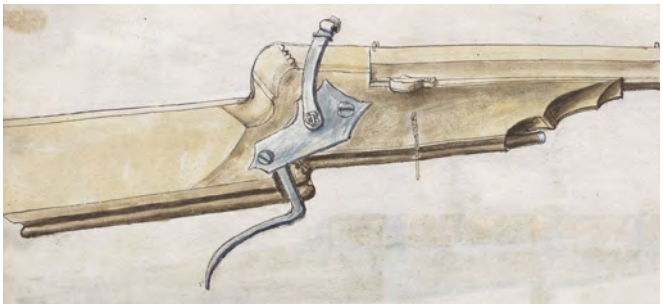

Figure 2. Early sear matchlock, c.1473. In Martin Merz (c.1425–1501), Feuerwerksbuch, Bavarian State Library, Munich, Codex Germanicus 599. The gun featured a match hammer that mounted onto a small lock plate, which was then fixed to the side of the stock. At the tip of the hammer was an "eye" through which a smoldering match was fitted.

Arms historians have labeled Merz's design *"sear matchlock."*[38] This is one of two main categories of matchlock guns and one that became the standard infantry gun in European militaries until the late 17th century. Did this artifact traverse the world and become the Korean musket? Tracing the travel of the sear matchlock shows that although it spread far–becoming a mainstay in Turkey, Persia, India and Qing China, it was another more sophisticated design that ended up in Chosŏn. This is the aforementioned snap matchlock, whose use in Europe was so short-lived that only a few know of its existence. The artifact was also developed within the German-speaking realm.

In the late 15th century, just as Merz was sketching his design, gunsmiths in Bohemia–under the control of the German empire (i.e., Holy Roman Empire)–were at work on another lock design.[40] For this, we do not have an extant artisanal drawing. But the material specimens from Bohemia (in today's Czech Republic) speak volumes. In the city of Pilsen, a late 15th century gun is found whose mainspring worked in the opposite direction–i.e., forcing the hammer into the pan rather than away from it.[41] To fire, the hammer was first raised to a *"cocked"* position, held up by a catch in the lock-plate; then, a trigger pull released this catch, letting the spring drive the hammer down with a *"certain violence."*[42] This system was distinguished by an instant ignition: the spring-loaded hammer snapped into the powder pan, and hence its name *(G: Schnapp lunte schloss).*[43] In fact, some historians consider it the "first real gun-lock" for pioneering the use of a catch-and-release mechanism for ignition.[44]

But perhaps due to their complex and costly nature, snap matchlocks in Europe saw limited use.[45] To be sure, they were exported across the European continent for decades, being mass-produced by Italian artisans, seeing action in the hands of English gunners under Henry VIII (1491–1547)[46] and as we shall see, becoming adopted by the Portuguese who sailed across the world. But after the mid-1500s, snap matchlocks fell out of military use and became a civilian technology: apparently, given the sharp, clean release of their locks, they became the preferred weapon of choice for European marksmen, rather than as infantry weapons (like their simpler and cheaper sear counterparts).[47] Indeed, the last of them–made in the late 17th century–were exquisite pieces decked with mother-of-pearl, and they trace back to European nobility who used them for hunting.[48]

This shows how the snap matchlock emerged in a particular environment within Europe and then was quickly forgotten. How did this curious artifact make its way around the world to enjoy popularity in Korea–a country as far removed as possible from Bohemia and still be on the same landmass?

From Bohemia to Korea: A Technological Travelogue

So how did the snap matchlock round the world? Central to its journey was the rising Portuguese empire. At the turn of the 16th century, King Manual I of Portugal (r. 1495–1521) purchased thousands of matchlocks from Bohemia[49] and welcomed German gunsmiths to help domesticate their production at the Lisboan workshops.[50] Around this time, then, as the Portuguese went on to set up outposts on *"every known continent,"* these guns also spread.[51] First, Iberian ships ventured along the Guinea Coast, bringing the said guns to the attention of local craftsmen: carved into West African sculptures and salt-cellars from this period are the exact shapes of a button-triggered matchlock in Portuguese service.[52] The same guns then rounded the Cape of Good Hope and sailed into the Indian Ocean. After 1509, as the Portuguese occupied several ports of consequence in South Asia–first Goa, then Ceylon (Sri Lanka),[53] they employed a wide array of weapons including the snap matchlock, a point proven inter alia by the excavation of the Bom Jesus, a Portuguese carrack sunk in 1525 en route to India.[54]

But from South Asia onwards, the travel of the musket became not just a matter of Portuguese agency, but also of local practitioners who adapted it to their taste. In 1510, Afonso de Albuquerque (c. 1453–1515) arrived in Goa and recognized the city's existing capacity for gunmaking. In the letters he wrote home as the governor of Portuguese India, he sang high praise of the local artisans and their iron-working skills in particular. In one note, the governor exclaimed that Goans made *"guns as good as the Bohemians and also equipped with the screwed breech plugs."*[55] This shows their surprising ability to replicate snap matchlocks, including even the difficult technique of screwing the breech. Also, as Albuquerque explained in another missive, quality gun barrels were forged *"of iron here in Goa and are even better than the German ones."*[56] The terse comparison likely indicates twist-forging–a distinctive method of wrapping the barrel, which was innovated by Turkish gunsmiths and then transmitted to Goa before the arrival of the Portuguese.[57]

So Goan artisanship was precocious,[58] but how did it bear on the snap matchlock and its travel eastward? An important clue is found in a rare artifact stored in Dresden, Germany (Figure 3), which is to date, the only handgun attributed to Portuguese Goa.[59] This gun is legible in terms of the entanglement of various craft traditions–e.g., German, Dutch, Italian, Turkish and Goan–in the local workshops.[60] To begin, it has a snapping lock that derived from the Luso-German designs of the turn of the 16th century. This trait was presumably introduced by European craftsmen and bombardiers from Lisbon as well as from various German, Dutch and Italian cities who worked in the Goan arsenals.[61] Upon a closer look, the Goan gun also shows unusual traits that reveal different vectors of influence. Rather than a single-leaf spring–which is characteristic of European pieces up to this point, it carries a double-leaf (U-shaped) spring.[62] Also, while the barrel is closed in the breech with a screwed plug as per usual, it is twist-forged and damascened with local patterns.[63] These were changes wrought by the Turkish-Goan craftsmen.

More needs to be said about Goan artifacts and what they represent: the entanglement of artisanal knowledge across the global early modern. But it suffices here to understand that a new hybrid style of snap matchlocks was born from it, and that this "Luso-Goan" gun spread subsequently to Southeast and East Asia.

Sometime after 1511, as the Portuguese influence in Malacca grew, artisans in Southeast Asia also encountered the Luso-Goan technology[64] and birthed their own istingar after the Portuguese musket, espingarda. Rather than simply replicating, however, Malay makers introduced important changes.[65] That is, to combat humidity–and the persistent problem of rusting on iron locks, local craftsmen chiseled theirs out of brass. If not for the extremely wet weather of their environs, this technological choice is inexplicable: iron was cheaper, more available and expertly handled by local artisans, while brass was less appropriate, lacking the springy nature of the original snap lock. Indeed, matchlocks made in Southeast Asia have thick brass mainsprings and heavy match hammers that

Figure 3. A Goan Matchlock from the Middle of the 16th Century. Rüstkammer, Staatliche Kunstsammlungen Dresden, G1116. Presented to the Saxon Elector Christian I by Francesco I de Medici, Grand Duke of Toscana, in 1587 and recorded in the Dresden Armory's (Rüstkammer) inventory in 1606. The painted stock resembles a style found in the Church of St. Francis of Assisi in Goa, built in 1661.

make for a rather slow snapping action.[66] But other than this–and the highly ornate nature of the surviving specimens, the istingar was certainly a snap matchlock.[67]

Did this Luso-Goan-Malay technology end up in East Asia? In 1543, the story goes, a pirate junk departed from Siam to China, carrying a motley group of primarily the wakō *(倭寇, C: wokou, K: waegu)*–Chinese and Japanese corsairs in South China Sea–but also two (three, according to some accounts) Portuguese men who had defected from their post in Southeast Asia. But after encountering a malicious storm, this junk ended up at the Japanese island of Tanegashima. There, it happened that one of the Portuguese castaways–a certain Francisco Zeimoto–had a chance to demonstrate his gun and gift it to the local daimyo Tanegashima Tokitaka (種子島時堯, 1528–1579).

Deeply impressed, the Japanese lord had this gun copied by swordsmith Yaita Kinbei Kiyosada (八板金兵衛清定, n.d.). Apparently, Yaita and his team of local artisans reenacted the artifact no problem by drawing on the existing tradition of iron-forging. One detail eluded them, however: the screwed plug.[68] While the Japanese smiths could manage the screw (bolt with male threads) itself, the issue at hand was of "drilling the barrel helically" so that this plug could turn snugly into the breech.[69] For this, a "Portuguese" blacksmith had to come and transmit its secrets to Yaita the following year.[70] But after that, the Japanese teppō (鉄砲 "iron gun")–i.e., a snap matchlock with a double-leaf spring, brass lock and screwed breech plug–was born.[71]

There are gaps and disparities in this account, and we cannot ascertain whether Zeimoto's gun was an istingar or espingarda, or whether it was made in Lisbon, Goa, Malacca, or any other Portuguese outpost in Asia.[72] Still, there was certainly more than one episode of encounter and various designs were introduced. In Bungo, for instance, a Japanese province located in eastern Kyushu, the manufacture of guns was *"divulged separately"* by a Portuguese also named Francisco.[73] Meanwhile, in Satsuma, the other end of Kyushu, another daimyo named Tōgō Shigeharu (東郷重治, fl. 1548) obtained Portuguese guns through the wakō that frequented Southeast Asia–not unlike how his counterpart in Tanegashima availed themselves of the junk from Siam.[74]

At any rate, soon after its arrival, the snap matchlock spread all over East Asia. In China, muskets had been introduced even before the first transmission to Japan in 1543.[75] Apparently, however, the snapping lock design was only mastered after the help of a Japanese practitioner. In 1548, the story goes, a Ming commander captured and interrogated a "barbarian chief who was good at guns" (fanqiu shanchong zhe 番酋善銃者).[76] This chief was in fact Tōgō's man–a certain Shinshiro (新四郎, fl. 1548) from Satsuma–and he conveyed the secrets of manufacture to the Chinese, resulting in muskets that were *"as intricate and exquisite as those of the Western barbarians (xifan 西番) themselves."* [77] The said commander's son–Lu Xiang (盧相, n.d.)–then visited Beijing to replicate the knowledge at the imperial workshops, where muskets were produced by thousands.[78]

Meanwhile, in Japan proper, which was undergoing the bellicose Warring States period (1467–1568), the teppō found extensive use. By the 1550s, snap matchlocks *"spread all over Kyushu"* and found swift application in warfare.[79] Soon, production also began in other major centers such as Sakai and Kunitomo and by the 1570s, matchlocks became ubiquitous in the bellicose archipelago.[80] By 1592, when the forces of a unified Japan invaded Korea, these guns had fused seamlessly with the Japanese way of war, which combined musketry volley fire with close-combat fighting using swords and pikes.

More needs to be said about the early muskets of Japan and China, the transformations wrought by artisans in each locale, and their remarkable diversity. But for our purposes, it suffices to understand this: as the two powers assimilated the Luso-Goan-Malay technology, their neighbor–Korea–also became entangled in the process.

To be sure, Koreans also encountered the Portuguese directly: in a little-known incident of 1544, they met a wakō junk carrying these Lusitanian seafarers and what seems to have been Frankish cannons.[81] Beyond this, however, no significant exchange occurred, and new gunpowder weaponry were being presented by Japanese and Chinese agents instead. The textual records on this are reticent, but they suggest a growing influx of new materials and knowledge, including the snap matchlock. A year after the aforementioned encounter, a Chinese castaway (tangin 唐人) at Cheju Island transmitted a *"metal pellet"* gun *(ch'orhwan 鐵丸)* to the Government Arsenal, teaching its artisans to reproduce the alien design.[82] In 1554 and 1555, then, two Japanese experts also demonstrated guns that were "extremely intricate" *(chŏnggyo 精巧)*, one of them even staying in Korea with a military post (probably at the Arsenal).[83] Also, between 1571 and 1574, there were conflicts involving piracy in Chŏlla province, where the Korean coastal guards captured a wakō ship replete with cannon, arrowed projectiles and again, metal pellet guns (presumed to be matchlocks).[84] Finally, in 1589, three years prior to the East Asian War, the court received a pair of "bird guns" (another name for matchlock muskets) from Tsushima.[85]

Due to the ambiguous descriptions, historians have debated whether Koreans had indeed encountered the snap matchlock at this time.[86] Yet, in light of the story of its circulation in the region, which we have traced thus far, the question is not whether but how these foreign objects were received in Korea. In various episodes, we learn that Korean artisans were tasked with reverse-engineering the alien design. This, in turn, is how new types of firearms emerged on the peninsula precisely at this time and with striking similarities to the matchlocks that traversed the early modern world. Throughout the latter half of the 16th century, for instance, Korean cannon founders at the Arsenal produced so-called "victory guns" that approximated the length-to-bore ratio of matchlocks. And the "special make cannon" from 1587 even simulated the octagonal shape of forged iron barrels yet in cast bronze.[87]

In the next century, as more snap matchlocks became available and demonstrated effectively in battle, Koreans came to produce exacting replicas. During and after the East Asian War, Chinese and Japanese experts were co-opted into new military shops which emerged around such manufacture. New artisanal identities, including the locksmith, sear-maker and the screwsmith ensued domestically. And through their skills and associated knowledge, the Korean snap matchlock took its mature form by the end of the seventeenth century (Figure 4)–with *inter alia*, the forged iron barrel, screwed breech plug and the brass snapping lock mechanism. The snap matchlock had arrived in Korea, and the local artisans had adopted and adapted it on their own terms.[88]

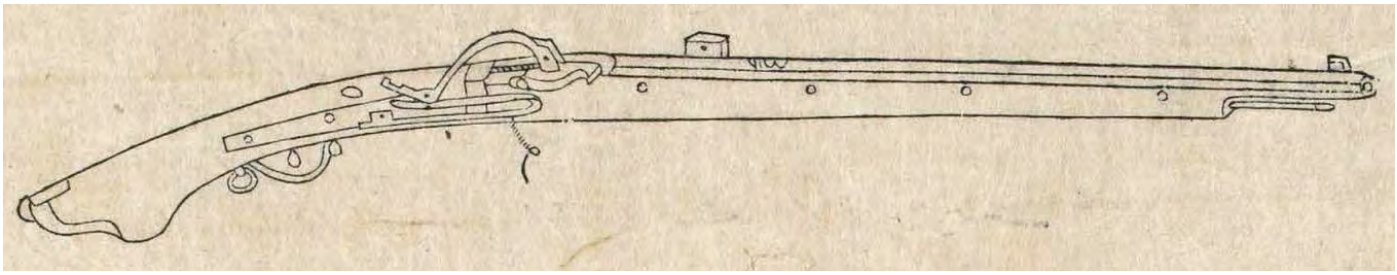

Figure 4. Drawing of a Korean Snap Matchlock. In *Yungwŏn p'ilbi 戎垣必備* [Essential Weapons for the Commander] (Special Manufactory, 1813), Toyo Bunko Collection, Tokyo, VII-3-127. A fully-fledged snap matchlock is shown with all of its details, including the barrel (with an institutional mark shortly before the back sight), the match hammer, U-spring, tear-shaped trigger and a wooden stock with brass plating at the bottom.

Endnotes

1 The term musket has been used in English language to refer to various kinds of small arms developed and used in East Asia. Some prefer to use more specific terms such as arquebus or matchlock. Following previous scholars, I use musket as a general term for long-barreled matchlock firearms from the sixteenth and seventeenth centuries.

2 Rudolph P. Matthee argues that these objects not only took centuries to spread, but underwent a long "gestation period" before becoming part of the social fabric of the countries where they spread. Tobacco, however, was among to fastest to spread and integrate into societies across the globe, not unlike the musket. *The Pursuit of Pleasure: Drugs and Stimulants in Iranian History, 1500-1900* (Washington, D.C.: Mage Publishers, 2005).

3 For general discussion, see Mark Gamsa, "Biography and (Global) Microhistory," *New Global Studies* 11.3 (2007): pp.231-241; and Hans Medick, "Turning Global? Microhistory in Extension," Historische Anthropologie 24.2 (2006): pp.241-252. For an example of global microhistory, see Tonio Andrade, "A Chinese Farmer, Two African Boys, and a Warlord: Toward a Global Microhistory," *Journal of World History* 21.4 (2002): pp. 573-591.

4 In Japanese scholarship, historians have debated about the origin of the Japanese musket for decades. For the latest developments, see Murai Shōsuke 村井章介, "Teppo denrai to wako seiryoku: Udagawa Takehisa shi to no tōron" 鉄砲伝来と倭寇勢力：宇田川武久氏との討論, *Bulletin of the National Museum of Japanese History* 国立歴史民俗博物館 201(March 2016): pp. 81-96; Udagawa Takehisa 宇田川武久, "Futatabi tetsuho denrai ron : Murai Shōsuke shi no hihan ni kotaeru" ふたたび鉄炮伝来論：村井章介氏の批判に応える, *Bulletin of the National Museum of Japanese History* 190 (January 2015): pp. 1-28. For relevant works in English, see Olof G. Lidin, *Tanegashima: The Arrival of Europe in Japan* (Copenhagen: Nordic Institute of Asian Studies, 2002); Rainer Daehnhardt, *The Bewitched Gun: the Introduction of the Firearm in the Far East by the Portuguese* (Lisbon, 1994); and Ian Bottomley, 'Some observations of the origin of Japanese guns,' *The Armourer: the militaria magazine* 52 (July-August 2002): pp. 66-69.

5 For works in Chinese, see Yin Xiaodong 尹曉冬 and Yi Degang 儀德剛, "Ming mo Qing chu Xi fang huo qi chuan hua de liang ge jie duan" 明末清初西方火器傳華的兩個階段, *Nei Meng gu shi fan da xue xue bao (Zi ran ke xue Han wen ban)* 內蒙古師範大學學報(自然科學漢文版) 36.4 (2007): 504-8; Nan Bingwen 南炳文, "Zhong guo gu dai de niao chong yu Ri ben" 中國古代的鳥槍與日本, *Shi xue ji kan* 史學集刊 2 (1994): pp. 60-66.

6 Pamela H. Smith, ed. Entangled Itineraries: Materials, Practices, and Knowledges Across Eurasia (Pittsburgh: University of Pittsburgh Press, 2019).

7 There are two editions of this text: an old manuscript version that was later included in a compilation by Zheng Zhenduo 鄭振鐸 in 1941, and a Japanese reprint with preface and annotations by Shimizu Masanori 清水正德 from 1808. For the former, see Zhao Shizhen 趙士禎, Shen Qi Pu 神器谱 (China: Changluo Zheng shi 長樂鄭氏, 1941), in Xuan lan tang cong shu 玄覽堂叢書 85. A good modern reprint version is: 赵士祯 (Zhao Shi Zhen) (1981). 神器谱 (Shen Qi Pu). 台北:国立中央图书馆出版 (Tai Bei: Guo Li Zhong Yang Tu Shu Guan Chu Ban). For the latter, see Zhao Shizhen 趙士禎, *Jingifu* 神器谱 (Tōto 東都: Hanabusa Heikichirō 英平吉郎, Bunka 文化5 [1808]), Harvard-Yenching Library. For a brief discussion in English, see relevant pages in Kenneth Chase, *Firearms: A Global History* (Cambridge: Cambridge University Press, 2003).

8 For a military history of the war, see Kenneth Swope, A Dragon's Head and a Serpent's Tail: Ming China and the First Great East Asian War, 1592–1598 (Norman: University of Oklahoma Press, 2009).

9 Hami, which is located in present-day Xinjiang, was home to a Mongol kingdom known as Kara Del or Qara Del. It was ruled by Chagatayids from 1389 to 1463. It was destroyed as a result of the wars between Ming China and Oirat Mongols and dynastic succession struggles in 1513.

10 Lu Mi or Rūm refers to Byzantine, and therefore Ottoman Turkey. For more, see Salih Özbaran, "Ottomans as 'Rumes' in Portuguese Sources in the Sixteenth Century," *Portuguese Studies* 17 (January 2001): pp. 64-74. For a general discussion of the Ottoman expansion into the Indian Ocean, see Salih Özbaran, *Ottoman expansion toward the Indian Ocean in the 16th century* (Istanbul: Istanbul Bilgi University Press, 2009).

[11] So far, the notion of the Mediterranean region (水西洋) occurs for the first time in Zhao's manual. The use of the character "water" as prefix was probably referring to the "water-locked" nature of the Mediterranean countries.

[12] I use Joseph Needham's translation with minor modifications. Joseph Needham, with the Collaboration of Ho Ping-Yu (Ho Peng Yoke), Lu Gwei-Djen and Wang Ling, *Science and civilisation in China*, vol. 5, *Chemistry and Chemical Technology*, Part VII, *Military Technology: The Gunpowder Epic* (Cambridge: Cambridge University Press, 1986), p. 441.

[13] The moment of Chinese encounter with Ottoman guns seems to be 1493. At the time, Ming lost control of Hami and the Turpan forces captured the Hami leader and residents of China in Hami (Hami was a vassal state to Ming).

[14] Sun Laichen, "The military implication of Zhu Wan's coastal campaigns in southeastern China: focusing on the matchlock gun (1548-66)," in Early Modern East Asia: War, Commerce and Cultural Exchange: Essays in Honor of John E. Wills, Jr., edited by Kenneth M. Swope and Tonio Andrade (Abingdon, Oxon: Routledge, 2018).

[15] Zhu Wan 朱纨, *Piyu zaji* 甓餘雜集 [A collection of miscellaneous writings], Si ku quan shu cun mu cong shu 四庫全書存目叢書 Jibu 集部 78 (Ji'nan 濟南: Qi Lu shu she chu ban she 齊魯書社出版社, 1997), juan 5:58, as cited in ibid., 23.

[16] Ibid.

[17] Sun, 23.

[18] Representative works of Japanese scholarship on the teppo include Hora Tomio 洞富雄, *Teppo denrai to sono eikyo: Tanegashimaju zohoban* 鉄砲伝来とその影響：種子島銃増補版 (Azekura Shobo 校倉書房, 1959); Arima Seiho 有馬成甫, *Kaho no kigen to sono denryu* 火砲の起原とその伝流 (Yoshikawakobunkan 吉川弘文館, 2013); Tokoro Sōkichi 所荘吉, *Hinawajū* 火縄銃 (Tokyo: Yūzankaku Shuppan 雄山閣出版, 1964); Udagawa Takehisa 宇田川武久, *Teppō to Sengoku gassen* 鉄砲と戦国合戦 (Tokyo: Yoshikawa Kōbunkan 吉川弘文館, 2002); Udagawa Takehisa 宇田川武久, *Teppō denrai: heiki ga kataru kinsei no tanjō* 鉄炮伝来：兵器が語る近世の誕生 (Tokyo: Kōdansha 講談社, 2013); Udagawa Takehisa 宇田川武久, *Higashi Ajia heiki kōryūshi no kenkyū: 15--17-seiki ni okeru heiki no juyō to denpa* 東アジア兵器交流史の研究：十五-十七世紀における兵器の受容と伝播 (Tokyo: Yoshikawa Kōbunkan 吉川弘文館, 1993).

[19] A crucial part of the Japanese teppo debate is whether the gun locks in Japan and Southeast Asia were different from European ones: the former had a match holder that snapped forward–away from the bearer of the gun–while the latter used one that fell backwards–towards the bearer of the gun. So far, this argument has been challenged by Setsuko Matoba and Nakajima Yoshiaki who cited evidence of European guns that used the same lock design as the Japanese ones–the so-called "instant ignition" mechanism with a forward-acting cock. It was also suggested that Southeast Asian guns may have been influenced by the Japanese rather than the other way around. In a recent debate, historians on both sides agreed with the importance of considering actual guns and their construction. For latest developments in the debate, see footnote 4 above.

[20] Andrade, *The Gunpowder Age*, 103.

[21] Hall, *Weapons and Warfare*, 87–108. As recent works in global military history have shown, a similar trend also developed in contemporaneous China, albeit more slowly due to the relative lack of warfare there. Andrade, *The Gunpowder Age*, 103–23.

[22] Andrade, *The Gunpowder Age*, 106. Also see Hall, *Weapons and Warfare*, 95.

[23] Of course, loading and handling these guns were all but "easy" (i.e., involved more than a dozen steps), but the point here is about the moment of firing.

[24] Arne Hoff, "Late Firearms with Snap Matchlock," in *Four Studies on History of Arms* (Copenhagen: Tøjhusmuseets Skrifter, 1963), 9; Howard Blackmore, Guns and Rifles of the World (London: Optimum Books, 1979), 9; Daehnhardt, *Espingareda Feiticeira*, 45–6; William Wellington Greener, *The Gun and Its Development* (New York: Cassell, 1910 [originally 1881]), 44–51.

[25] For instance, European cannons were fired by connecting a slow-burning match to the touch hole in the breech. Later, the British Royal Navy and the US Continental Navy took the flintlock mechanism on a standard musket and attached it to a cannon breech.

[26] Needham argued that along with other Chinese inventions such as the mechanical clock, the blast-furnace and block-printing, matchlock technology (i.e., simple serpentine) also spread westward to Europe around the turn of the century. His evidence is as follows: 1) philological and textual sources that trace back Chinese designs to the mid 1300s, "certainly well before 1400," 2) long tradition of crossbow triggers in China (and more specific argument that discounts similar evidence from Western Europe), and 3) cluster of transfers in the late fifteenth century. For details, Joseph Needham, et al., *Science and Civilisation in China* (Cambridge: Cambridge University Press, 1954), vol 5, Chemistry and Chemical Technology, pt 7, Military Technology: The Gunpowder Epic, 459–65.

[27] In fact, it lay close at hand for any crossbow-maker–whether European, Chinese, or Ottoman Turkish–to adapt the existing trigger system for guns. M. L. Brown, *Firearms in Colonial America: the Impact on History and Technology, 1492-1792* (Washington: Smithsonian Institution Press, 1980), 25; Needham, et al., *Science and Civilisation in China*, 459–65.

[28] Hoff, "Late Firearms," 10.

[29] Rainer Leng, "Social Character, Pictorial Style, and the Grammar of Technical Illustration in Craftsmen's Manuscripts in the Late Middle Ages," in *Picturing Machines 1400-1700*, ed. Wolfgang Lefèvre (Cambridge, MA: MIT Press, 2004), 88-90. These manuscripts show an early shift made by German gunsmiths from a longstanding practice of transmitting craft knowledge orally, to one that recorded technical know-how on paper. It allowed for the ascendancy of "subliterate groups" like German artisans. As Leng put it, "these uneducated authors had just stepped out of an oral tradition in the direction of technical literacy." Ibid., 88–9, 91.

[30] Ibid., 87. There were also other reasons for the precocity of German gunsmithing. During the 15th century, "Germany" was fragmented into small city-states whose military interests were more defensive than offensive. Rather than large artillery for aggressive siege warfare, Germans thus invested in smaller handguns for wall-defense. For one, the use of handguns was favorable because unlike cannon, they did not require an "extended training period or very much logistical support." The German states, moreover, also had urban centers equipped with a suitable pool of resources and the critical mass of artisans trained in precision metalworking–both factors that contributed to the development of new small arms. Finally, the Germanic region was exposed to gun warfare from early on–such as during the Hussite Wars (1419–1434) Hall, *Weapons and Warfare*, 98–100, 107.

[31] This firearm is named "simple serpentine" by most scholars. It is not to be confused with the "simple serpentine gun," which Daehnhardt uses to refer in fact to the sear matchlock. Daehnhardt, *Espingareda Feiticeira*, 90–3.

[32] Austrian National Library, Codex Vindobona 3069. This unnamed manuscript–referred to as *Liber de arte bellica germanicus* ("The German Art of War") or simply, Kriegskunst ("Warfare")–is attributed to Johannes Hartlieb based on a bibliographic entry from the late 19th century, but historian Thomas Fudge makes note of "the lack of basis for the Hartlieb attribution." Close examination shows that it is a collection of excerpts–most prominently from German military engineer Konrad Keyser (1366–1405)'s *Bellifortis* ("Strong in War," c. 1405). Johannes Hartlieb, *Liber de arte bellica germanicus*, Vienna, Österreichische Nationalbibliothek, MS 3062, f. 86; Thomas A. Fudge, *Jan Hus Between Time and Eternity: Reconsidering a Medieval Heretic* (Lanham, Maryland: Lexington Books, 2016), 185n77. Also see Kaiserlich-Königliche Hofbibliothek, *Tabulae codicum manuscriptorum praeter Graecos et Orientales in Bibliotheca Palatina Vindobonensi asservatorum 2*, (Vindobonae: Gerold, 1868).

[33] Hoff, "Late Firearms," 9–10; Hugh Pollard, *A History of Firearms* (Birmingham: Palladium Press, 2006), 30; Needham, et al., *Science and Civilisation in China*, 425–9; Brown, Firearms in Colonial America, 24.

[34] Codex 1390, Erlangen University Library, as cited in Greener, *The Gun*, 53; Brown, *Firearms in Colonial America*, 24.

[35] Then and now, guns are named after the type of lock: matchlocks refer to guns that use matches, flintlocks to flints and wheellocks to those with friction wheels. A. R. Hall, "Military Technology," in *A History of Technology, Volume Iii: From the Renaissance to the Industrial Revolution, C.1500-C.1750*, ed. Charles Singer, and Richard Raper (Oxford: Oxford Univ. Press, 1954), 354-56.

[36] There is a tombstone that describes Merz as not only a master gunsmith but also an expert on geometry and mathematics. Leng, "Social Character," 108; Greener, *The Gun*, 211.

[37] Codex Germanicus 599, Bavarian State Library, Munich, Germany, as cited in Brown, *Firearms in Colonial America*, 26. For discussion on the same drawing, see Henry Phillips, *The History and Chronology of Gunpowder and Gunpowder Weapons (c.1000 to 1850)* (Chennai: Notion Press, 2016), 190–1; Daehnhardt, Espingareda Feiticeira, 72.

[38] Pollard, *A History of Firearms*, 31–2. Daernhardth further distinguishes two types of sear matchlocks, namely the "15th century Nuremberg Matchlock" that originated similar mechanisms in Turkey, Persia, India and China and the European "serpentine gun" that became the standard European arm from the late 16th century. The rationale is that they likely had different ancestors, as shown in the difference in the direction of their hammer: the "15th century Nuremberg Matchlock" has a forward-acting hammer (as depicted in Martin Merz's manuscript) while the "serpentine gun" had a backward-acting hammer (as shown in Zeugbucher illustrations). Nonetheless, Zeugbucher also shows models with the forward-acting hammer, and the distinction is more confusing than useful. Taking after other historians, I herewith use the term–sear matchlock–to refer to both types. Essentially, they shared the same lock system, with the characteristic spring that kept the hammer away from the pan–whichever direction it may have been. Daehnhardt, *Espingareda Feiticeira*, 66.

[39] Claude Blair, *European and American Arms: c.1100–1850* (London: B.T. Batsford, 1964), 42; Daehnhardt, *Espingareda Feiticeira*, 56–60. The popularity of the sear matchlock had in part to do with its technical advantages: 1) it safeguarded the hammer from the pan and prevented untimely fire, 2) the hammer rose up automatically after firing, and 3) given the time lapse between the trigger pull and the ignition, the gunner could change his aim if needed. Further, in the case of Europe, the sear matchlock was also made "much cheaper and so simple that it could easily be repaired even in the field." This no doubt contributed to the prevalence of the sear matchlocks until the end of the 17th century.

[40] Rainer Daernhardth argues persuasively that the snap matchlock with the screwed breech plug was first born in the region of Pilsen, Bohemia. His strongest pieces of evidence are that 1) Pilsen is the only place where there are complete samples of such models, 2) Bills-of-sale from Portugal show that Bohemian gunsmiths were already producing thousands of snap matchlocks by the early 1500s, and 3) There is a Nuremberg prototype (stored in the Castle of Osterstein, Near Gera), which suggests the transmission of the technology to Bohemia where the screwed breech plug was added. For more, see Daehnhardt, Espingareda Feiticeira, 49–55, 76–80. Other candidates are in Italy such as Brescia and Gardone but production started there later. Marco Morin, and Robert Held, *Beretta: La Dinastia Industriale Piuì Antica al Mondo* (Chiasso, Switzerland: Acquafresca editrice, 1980).

[41] Early snap matchlock, c.1500. West Bohemian Museum, Czech Republic. An early specimen with a button trigger behind the lock plate. The box at the bottom of the stock was for storing bullets, matches and other accessories.

[42] Daehnhardt, *Espingareda Feiticeira*, 66.

[43] Ibid., 51.

[44] Hoff, "Late Firearms," 10.

[45] Blair, *European and American Arms*, 42; Hoff, "Late Firearms," 10.

[46] Contrary to the view that snap matchlocks were already in decline by the first half of the 16th century, guns salvaged from an English warship sunk in 1545 showed that they were still relevant then. Furnished with tubular sights and quality Venetian barrels, these guns were military matchlocks for Henry VIII (1491–1547) of England who purchased thousands of them from Italy. Guy M. Wilson, "Some Important Snap Matchlock Guns," *Canadian Journal of Arms Collecting* 26, no. 1 (1988). For more on Italian gun manufacture, see relevant pages in Morin, and Held, *Beretta.*

[47] Daehnhardt, *Espingareda Feiticeira*, 58-59.

[48] Hoff, "Late Firearms," 12-13.

[49] Daehnhardt mentions in passing that this material transfer is proven by bills-of-sale from the time of King Manual I. Rainer Daehnhardt, "First Steps Towards an Introduction Into the Study of Early Gunmaking in the Portuguese World, 1450-1650," *Bulletin of the Portuguese Academy of Antique Arms* 1, no. 1 (1997). According to my research–and thanks to the help of Roger Lee de Jesus, I learned that these original sources no longer exist. We know, however, there were bills-of-sale from 1549 that led Frei Luís de Sousa (1555–1632) to write the purchase in the *Anais de D. João III*, and fortunately, a 19th century historian–who still had access to the original sources–then appended the sources to the Anais. See Luís De Sousa, and Alexandre Herculano, *Annaes De Elrei Dom João Terceiro* (Lisboa: Typ. da Sociedade propagadora dos conhecimentos uteis, 1844), 423: Por carta de 13 de Setembro manda Sua Alteza comprar a Frandes tres mil cossoletes com seus braçnys, escarcelas, gorjays e celadas, e tres mil arcabuzes de Bohemia.

[50] This was possible thanks to the court's welcoming policy towards German gunsmiths. As Gregor M. Metzig put it, "[u]nder Manuel I, from 1498 to 1520, the names of 36 German and Dutch cannoneers can be found in the chancellery registers of the crown. The majority of them came from southern German imperial cities and the contiguous territories in Swabia, Bavaria, and Bohemia." Gregor M. Metzig, "Guns in Paradise: German and Dutch Artillerymen in the Portuguese Empire (1415-1640)," *An. Hist. Alem-Mar Anais de Historia de Alem-Mar* 12 (2011), 66.

[51] This move was empowered by the papal granting of exclusive privilege to navigate and evangelize the West African territories. Ibid., 61.

[52] Gregor M. Metzig, "Corals, Brass and Firearms. Material Commodities in Cultural Interactions Between Edo and Portuguese in Benin Around 1500," in *Material Culture in Modern Diplomacy From the 15th to the 20th Century*, ed. Harriet Rudolph (Berlin, Boston: De Gruyter, 2016), 51; Suzanne Blier, "Imaging Otherness in Ivory: African portrayals of the Portuguese ca. 1492," *Art bulletin* (1993).

[53] By 1504, the first Portuguese base in Asia was established in Cochin, a port on the southwest coast of India. The real turn of events, however, occurred five years later, when a momentous naval battle took place around the Island of Diu, India. Responding to an earlier attack, the Portuguese retaliated and defeated the defenders of Diu, a coalition headed by the Egyptian Mamluks that also included the Sultanate of Gujarat, the Zamorin of Calicut, as well as a motley group of Ottoman, Venetian, Nubian, and Ethiopian mercenaries. The anti-Portuguese coalition sought to defend its control over the traditional spice route, which passed through the Red Sea and the Persian Gulf. Yet, the battle ended with Portuguese victory, thanks reportedly to their deployment of a variety of cannon and handguns.

[54] Wolfgang Knabe, and Dieter Noli, *Die Versunkenen Schätze Der Bom Jesus: Sensationsfund Eines Indienseglers Aus Der Frühzeit Des Welthandels* (Berlin: Nicolaische Verlagsbuchhandlung, 2012), 196–7; Alves, Francisco J. S., "The 16th century Portuguese shipwreck of Oranjemund, Namibia" Report on the Missions Carried out by the Portuguese Team in 2008 and 2009 (2011).

[55] Alongside the letters, Albuquerque even sent samples of Goan firearms to King Manuel and a local master gunsmith to work in the Lisbon arsenal–an important case of 'reverse' transmission. Afonso De Albuquerque, Raymundo Antonio De Bulhão Pato, and Henrique Lopes De Mendonça, *Cartas De Affonso De Albuquerque, Seguidas De Documentos Que as Elucidam* [Letters of Afonso De Albuquerque, Followed By Documents That Elucidate Them] (Lisboa: Typographia da Academia Real das Sciencias, 1884), 1513/12/1, 1:28: "mamdo tambem a vos alteza hum ofyciall dos de Goa, que fazem tam boas espyngardas como as de Boemea e asy lavradas com perafuso." Also see Daehnhardt, *Espingareda Feiticeira*, 38.

[56] De Albuquerque, et. al., *Cartas de Affonso de Albuquerque*, 1513/12/4: "bombardas e espingardas, as quaes se fazem de ferro em Goa milhores que has dalemanha." Also see Daehnhardt, *Espingareda Feiticeira*, 39.

[57] Turkish barrels with twist-forging (or "Damascus twist pattern") were famous in Europe and they proved so robust that German and Eastern European gunmakers would mount them (i.e., either export barrels or booty) on their own stocks. The technique spread eastward to Persia and India, reaching Goa. For more on twist-forging, see Robert. Elgood, *Firearms of the Islamic World in the Tareq Rajab Museum, Kuwait* (London; New York: I.B. Tauris, 1995), 46–7, 60, 118–20, 179–80. The technique emerged into writing in 16th century Mughal India: "They flatten iron, and twist it round obliquely in form of a roll, so that the folds get longer at every twist; they then join the folds, not edge to edge, but so as to allow them to lie one over the other, and heat them gradually in the fire." See relevant pages in Abū al-Faẓl ibn Mubārak, The *Ā'īn-i Akbarī* آئین اکبری[Administration of Emperor Akbar], trans. H. Blochmann, et al. (Calcutta: [Royal] Asiatic Society of Bengal, 1927–1949). For more on gun-making traditions of Turkey and Central Asia, see Robert Elgood, *Islamic Arms and Armour* (London: Scholar Press, 1979).

[58] The precocity of Goan artisanship can be attributed to Turkish influence. Other European accounts from the period show that Goa, which was under the rule of the Adil Shahi dynasty (1490–1686), had received Ottoman gunners who fled after their defeat at Diu. These men then "resettled in Goa with the help of Muslim merchants who financed the building of shipyards and plants for the manufacture of iron and copper ordnance." When the Portuguese arrived, Goa already had "large houses which the Turks used as armories…and a great number of metal guns, and a large quantity of gunpowder, saltpetre and utensils used in the making of these, and an enormous quantity of all kinds of weapons." Richard M. Eaton, "'Kiss My Foot,' Said the King: Firearms, Diplomacy, and the Battle for Raichur, 1520," *Modern Asian Studies* 43, no. 01 (2008), 298. Also see Daehnhardt, *Espingareda Feiticeira*, 37.

[59] There are very few handguns left from Portuguese Goa. This matchlock is the only firmly datable one: it was presented to the Saxon Elector Christian I by Francesco I de Medici, Grand Duke of Toscana, in 1587 and recorded in the Dresden Armory's (Rüstkammer) inventory in 1606. Dresden Armory, R74/18. Beside it, a four-barrel Goan pistol survived in the Jaipur armory, whose barrel is similarly inlaid. There is also a related gun in Bikaner yet without the barrel. The Dresden gun is little known even amongst arms scholars Robert Elgood, *Arms & Armour At the Jaipur Court: The Royal Collection* (New Delhi, India: Niyogi Books, 2015), 246–9.

[60] While unaware of this rare material evidence, Eaton has rightfully recognized that Goans at this time made the "latest hybrid matchlocks" Eaton, "'Kiss My Foot'," 305.

[61] For instance, bombardier Rüdiger von Geldern prepared gunpowder and artillery for Albuquerque. For more on foreign mercenaries in Portuguese Asia, see Metzig, "Guns in Paradise," 74.

[62] Philip Tom to the author.

[63] For more on the inlaid patterns, see Elgood, *Arms & Armour at the Jaipur Court*, 249.

[64] In 1511, when Afonso led his fleet to conquer Malacca, many of his men were still armed with crossbows rather than muskets. However, by the next decade, there was an abundance of guns to be found in Portuguese hands: the Goa Arsenal was producing in large quantities, and its gunsmiths were also at work in Diu, Hormuz and Colombo. Daehnhardt, *Espingareda Feiticeira*, 34–6.

[65] There is very little scholarship on the istingar. Pollard, *A History of Firearms*, 264, 462; Elgood, *Firearms of the Islamic World*, 187–9; Wan Mohd Dasuki Wan Hasbullah, and Siti Radziah Mustafa, "Manuskrip Ilmu Bedil Sebagai Sumber Etnosejarah Teknologi Senjata Api Melayu [Malay Manuscripts on Firearms as an Ethnohistorical Source of Malay Firearms Technology]," *Kemanusiaan: The Asian Journal of Humanities* 21, no. 1 (2014). In the absence of good textual sources, historians have misunderstood Malay gunmakers. Michael Charney, for instance, argued that the potentates of Southeast Asia were not as keen on domesticating the new matchlock technology as they were in receiving foreign gifts of arms and casting large, awe-inspiring cannon for display. Michael W. Charney, *Southeast Asian Warfare*, 1300–1900 (Leiden; Boston: Brill, 2004), 51–61. Contrary to Charney, the material archive suggests that there was an early Malay adoption of matchlocks. Namely, there are two major groupings of locks (and lock assembly) on Malay muskets still in existence: 1) an archaic design with a single-leaf spring and serpentine bolts anchored directly on the stock via a cross-pin on the left side, and 2) another with a double-leaf spring and serpentine mounted on the lock-plate. The latter corresponds with the Luso-Goan technology described above with the Dresden gun. The former is material proof of an early adoption: the combination of these archaic traits exists in pre-Goan European specimens, but not in any object from East Asia; thus rather than being transmitted first from Goa to Japan, and then back to Southeast Asia, the Portuguese espingarda was translated into the Malay *istingar* sometime in the early 1500s.

[66] Tom Philip to the author. In handling Malay matchlocks, one cannot help but notice that their locks operate quite ponderously. Allowance can be made for loss of tension in the brass–a non-springy material to begin with–after centuries of use and neglect, but it is hard to think that they could be much snappier when they were new. An interesting compromise is seen in Vietnamese locks–their serpentines and plates are typically of brass, but the springs are steel (sometimes plated with copper). The Japanese persisted in an all-brass lock construction despite their skill in working iron and tempering steel because they were influenced not just by Luso-Goan technology but by Southeast Asians.

[67] Malay guns also retained most of the technical traits found in the Goan gun, including the double-leaf spring and the screwed breech plug.

[68] Lidin, *Tanegashima*, 1-26.

[69] Ibid., 4-5, 91, 97, 142n27.

[70] Based on available Japanese sources, Lidin concludes as follows: "the helical technique was developed twice in Japan in connection with the teppō. The first screw was made on Tanegashima by Yaita Kinbee Kiyosada with the help of the Portuguese smith; the second by Jirō no Suke at Kunitomo without the help of the Portuguese." Ibid., 174n13.

[71] For details on the Japanese teppō, see Sugawa Shigeo 須川薫雄, *Nihon no hinawajū* 日本の火縄銃 [The Japanese Matchlock] (Tokyo: Kōgei Shuppan, 1989); Kokuritsu Rekishi Minzoku Hakubutsukan 国立歴史民俗博物館, *Rekishi no naka no teppō denrai: Tanegashima kara Boshin Sensō made* 歴史のなかの鉄炮伝来：種子島から戊辰戦争まで [The introduction of guns in Japanese history: from Tanegashima to the Boshin War] (Chiba-ken Sakura-shi: Kokuritsu Rekishi Minzoku Hakubutsukan, 2006).

[72] In fact, historians of Japan have been divided on this issue of "first transmission," some arguing that the first teppō was based on an "European" gun, and others allowing the possibility of a "Southeast Asian" transmission. For more, see debate between Murai Shōsuke and Udagawa Takehisa in footnote 15. This debate, however, is futile: the snap matchlock arrived through various routes, directly from Portuguese outposts (including Malacca) as well as independently through mariners and wakō corsairs that frequented Southeast Asia (like the crew members of the Chinese junk in Tanegashima). For new Japanese scholarship that recognizes this properly, see Nakajima Yoshiaki 中島楽章, "1540 nendai no Higashi-Ajia kaīki to seiōshiki kaki 1540年代の東アジア海域と西欧式火器 [East Asian Seas in the 1540s and Western Firearms]," *in Nanban, Kōmō, Tōjin: 16, 17-seiki no Higashi Ajia kaiiki* 南蛮・紅毛・唐人：一六・一七世紀の東アジア海域 [Southern Barbarians, Red-Haired Barbarians, and the Chinese: East Asian Seas in the 16th and 17th centuries] (Kyoto: Shibunkaku Shuppan, 2013), 147–59. The fact that Southeast Asia played a role is also shown by the material choice of brass by Japanese matchlock makers (and while we will not have space here to elaborate, the style of lock and trigger on the early teppō still stored in Tanegashima).

[73] Of course, there is a possibility that Bungo got its guns from Tanegashima. For instance, there was reportedly a certain Itō Hachirō who learned his skills directly from Tanegashima by 1557. But circumstantial evidence puts Portuguese presence in Bungo at least a decade earlier. Indeed, there is evidence of Portuguese who stayed there for years, and while a Bungo technician reportedly went to Tanegashima to learn, there is high likelihood that the technology was transmitted without "Tanegahsima being the intermediary." Lidin, *Tanegashima*, 5. This finds support in other indications that Portuguese merchants arrived there by 1546 at the latest, at least one of them even staying for years. Ibid., 25, 107.

[74] Tōgō was an enterprising lord and he obtained matchlocks in the 1540s from trade with the wakō in the pirate den of Shuangyu as well as acquisitions from conflicts. Nakajima, *"1540 nendai no Higashi-Ajia,"* 147–59.

[75] The Chinese had already encountered muskets well before the Portuguese arrival in Japan, but had not perfected its manufacture until after 1548. This enigma is captured by Ming scholar Zheng Ruozeng (鄭若曾, 1505–1580) who noted that muskets were introduced into China twice (in the southern region): first, "a long time ago" and again, in 1548. Zheng Ruozeng 鄭若曾, *Chou hai tu bian: Shi san juan* 籌海圖編: 十三卷 [Illustrated Book on Maritime Defence: 13 fascicles] (Beijing: Guo jia tu shu guan chu ban she 國家圖書館出版社, 2013 [originally 1548]), v. 5: 鳥鎗之製, 自西番流入中國, 其來遠矣, 然造者多未盡其妙. 嘉靖二十七年, 都御史朱紈遣都指揮盧鏜破雙嶼, 獲番酋善銃者, 命義士馬憲製器, 李槐製藥, 因得其傳, 而造作比西番尤爲精絶云. Japanese historian Tomio Hora sees the result of this early transmission to China as the "old style musket" (*kyūshiki chōjū* 旧式鳥銃) or "imitation musket" (*mogi chōjū* 模擬鳥銃), which was cast in bronze rather than iron-forged. Tomio hypothesized this based on the small victory guns in Chosŏn as well as on Portuguese and Chinese sources that described Ming muskets serviced during the East Asian War. Tomio Hora 洞富雄, *Teppō: denrai to sono eikyō* 鉄砲: 伝来とその影響 [The Musket: Transmission and its Influence] (Kyoto: Shibunkaku Shuppan, 1991), 276–82, 342–3. For what is potentially a 16th century source on how to manufacture this early Chinese musket, see Ibid., 277.

[76] Zheng, *Chou hai tu bian*, v. 5: 獲番酋善銃者.

[77] Ibid., v. 5: 而造作比西番尤爲精絶云. On details for identifying the "barbarian chief" as Shinshiro, see Nakajima, *"1540 nendai no Higashi-Ajia,"* 154. Also see Tomio, *Teppō*, 275; Sun Laichen, "The Military Implication of Zhu Wan's Coastal Campaigns in Southeastern China," in *Early Modern East Asia: War, Commerce, and Cultural Exchange: Essays in Honor of John E. Wills, Jr*, ed. Kenneth Swope, Tonio Andrade, and John E Wills (Abingdon, Oxon: Routledge, 2018), 127.

[78] Chang Xiuming 常修銘, "Shiliu shiji Dongya haiyu huoqi jiaoliu shi yanjiu 16-17 世紀東亞海域火器交流史研究 [History of Firearms Exchanges in 16th-17th century Maritime East Asia]" (PhD diss., National Qinghua University, 2016), 25–31.

[79] Lidin, *Tanegashima*, 108.

[80] Ibid.

[81] Although one Chinese crew member was captured in the process, the junk escaped. Nakajima, *"1540 nendai no Higashi-Ajia,"* 115–30.

[82] This Chinese model was considered novel because it shot metal pellets, but its value was underrecognized due to inaccuracy owing to the lack of appropriate gunpowder. *Myŏngjong sillok*, 1545/11/3: 唐人亦有能解銃筒者, 通事亦傳習大綱. 然非箭矢也, 乃鐵丸也, 請令該司匠人等傳習; 1545/11/8: 軍器寺提調啓曰: "今日唐人處傳習火砲, 放于慕華館, 別無猛烈之氣, 立標四十步而放之, 皆不中. 我國之砲, 一中防楯而還退. 唐人等云: '中原用杉木灰, 故迅烈, 而此以柳木灰, 故不至猛發.'云. 且其器械鈍甚, 不如我國之砲."

[83] Ibid., 1554/12/18: 倭人信長所造銃筒, 制度雖精, 而藥穴入火不易, 發丸不猛. 其言曰: '藥不良故也, 明年更來試之' 云.厚待還送事, 請令禮曹議定; 1555/5/21: 倭人平長親所持來銃筒, 至爲精巧, 所劑火藥, 亦猛烈. 不可不賞. 請從其願, 以授堂上何如. We still have the appointment letter sent to Hira Nagachika (平長親, fl. 1554). For more, see Han Munjong 한문종, *Chosŏn chŏngi hyanghwa, sujik Waein yŏn'gu* 조선전기 향화 수직 왜인 연구 [Immigrant and Officially Appointed Japanese in the Early Chosŏn] (Kukhak Charyowŏn, 2001), 104.

[84] Kim Tŏkchin 김덕진, "1587nyŏn Sonjukto waebyŏn'gwa Imjinwaeran 1587 년 손죽도 왜변과 임진왜란 [The 1587 Incident at Sonchuk Island and the Japanese Invasion]," *Tongbuk Asea ch'ongnon* 29 (2010), 271, 274.

[85] This is a well-known incident, often cited as the first introduction of muskets to Korea. *Sŏnjo sujŏng sillok*, 1589/7/1: 義智等獻孔雀一雙, 鳥銃數件, 命放孔雀于南陽海島, 藏鳥銃于軍器寺. 我國之有鳥銃, 始此.

[86] In this early stage, there was a diversity of terms used in the Chosŏn archives to refer to the new gunpowder weaponry encountered. Kim Tŏkchin sees metal pellet guns as muskets with good reason. Kim, "1587nyŏn Sonjukto," 271, 274. Regarding the episodes in 1554 and 1555, Udagawa Takehisa thinks that the guns brought by the Japanese at this time could not have been muskets. Tomio Hora, however, argues to the contrary, as he is aware of the small victory cannons in Korea. I agree with Tomio and go further in the next chapter. Tomio, *Teppō*, 346–7.

[87] The special make cannon *(pyŏljoja ch'ongt'ong)* was made by artisan Pui (富已, n.d.) in 1587. It is a cast bronze barrel, octagonal in shape, with inscriptions around the breech: 'In the 3rd month of 1591, special make [cannon], 17 kŭn and 6 *ryang in weight*, by artisan Pui, [uses] 1 medium size bullet or 20 small ones.' Chungwi yŏkpak 204, Seoul Museum of History, Seoul, South Korea.

[88] For more see Hyeok Hweon Kang, "Crafting Knowledge: Artisan, Officer, and the Culture of Making in Chosŏn Korea, 1392–1910" (PhD diss., Harvard University, 2020).