Chinese-style Firearms in Dai Viet (Vietnam) The Archaeological Evidence

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"Only new implements are prized."
Le Thanh-tong (r. 1460-97) in 1464 *Dai Viet su ky toan thu*
(Complete Book of the Historical Record of Dai Viet)
(Tokyo: Tokyo Daigaku Toyo Bunka Kenkyujo, 1984-1986)

In previous research, I have discussed the spread of Chinese gunpowder technology to, and its impact on, mainland Southeast Asia, especially Dai Viet (Vietnam), from the late 14th to the early 16th centuries.[1] Some archaeological evidence and a few illustrations notwithstanding, my main sources so far have been written historical accounts. Thus, one may wonder with justification whether these written records are supported by archaeological evidence. In other words, if the Vietnamese learned about gunpowder technology from China, how do surviving firearms support this point? If the argument is that Chinese-style or Chinese-derived gunpowder technology affected the history of mainland Southeast Asia, and of Dai Viet in particular, then what did those firearms (guns and cannon) look like, and are they still extant?

This research aims at providing an answer to these questions. Moreover, it tries to estimate the percentage of Vietnamese troops that employed gunpowder weapons in the second half of the 15th century. In conjunction with some historical records, it mainly focuses on archaeological evidence: that is, firearms that have been unearthed in modern Vietnam and are now either held in museums and private collections, or are still circulating on the antiques market. The current research selects some representative firearms and discusses their typology, measurements (if available), inscriptions (if any), dates, and relationship with Chinese prototypes, as well as some other features. Due to the incomplete and imperfect information available, some conclusions can only be provisional. Nonetheless, these artifacts support the argument that relatively large quantities of Chinese-style firearms were manufactured in Vietnam during the 15th and 16th centuries.

The archaeological evidence presented in this paper is mainly based on two trips to Hanoi, Vietnam which I took in 2003 and 2008, and one trip to Nanning, Guangxi, China in 2008. I have also benefited from the assistance of antique dealers and private collectors who kindly allowed me to study their artifacts and shared their information with me. It has to be pointed out that even more Chinese-style firearms can probably be found in other places in Vietnam, such as Thanh Hoa, Ho Chi Minh City, and Cao Bang. These, however, will be explored in the future.

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I. THE CONTEXT

The context for 15th-century Vietnamese gunpowder technology has been spelt out in my 2006 article. Here I would like to add more information obtained through a closer look at Vietnamese historical sources. The 15th century was the most important period for the development of Chinese-style gunpowder technology in Dai Viet, and two Vietnamese kings made the most significant contributions in this regard. Although they faced different tasks in their lifetimes, both kings emphasized the need to develop the military, including gunpowder technology. The first was Le Loi or Le Thai To (r. 1428-1433), the leader of a Vietnamese rebellion against the Ming occupation and the founder of the late Le dynasty (1428-1788). Both before and after the withdrawal of Chinese troops, Le Loi on many occasions ordered the manufacture and repair of weapons and warships, reorganized and drilled the military (both army and navy), and tested military officers on both Chinese and Vietnamese military and political texts, including the Vu Kinh or *Wujing* 武经, most likely a reference to the *Wujing qishu* 武经七书, or seven classic Chinese military treatises), law codes (*phat lenh*), and "marvelous books" (*ky thu*; meaning unknown). For our purposes, the main outcome was that the Vietnamese manufactured and captured large quantities of gunpowder weapons. Hence, even before the Chinese finally withdrew, the Vietnamese side could boast, with justification, that their "firearms are piled up, and stores of gunpowder full."[2]

After Le Thai To, both Le Thai Tong (r. 1434-1442) and Le Nhan Tong (r. 1443-1459) repeatedly reviewed the military, ordered the drilling of troops, and even personally led the troops in battle against the Tai/Lao to the west and especially the Chams to the south.[3] However, it was the next Vietnamese king, Le Thanh Tong (r. 1460-1497) that outshone all other Vietnamese rulers. He created the golden age in Vietnamese history. (Even up until today, we have seen nothing like it). During this period, among many other achievements, the strongest Vietnamese military was built.

As the king of Dai Viet, Le Thanh Tong from the very beginning to the very end saw the importance of the military to the state. In the seventh month of 1460, after about only one month on the throne, Le Thanh Tong stressed that "whenever there is a state, there must be armaments and military provisions (*pham huu quoc gia tat huu vo bi*)"; he repeated this five years later. He ordered the distribution of battle formation schematics (*tran do*) among the troops, organized the military, drilled soldiers, training them to charge, use bows and arrows, understand commands and signals, and, in short, "ensure they never forget [the importance of] armaments and military provisions."[4] Five years later, in the eleventh month of 1465, Le Thanh Tong ordered the distribution of more battle formation manuals among the troops, including both naval battle formations (*trung hu*, *thuong son xa*, *man thien tinh*, *nhan hanh*, *lien chau*, *ngu doi*, *tam tai*, *hoanh that mon*, *yen nguyet*, etc.) and infantry battle formations (*truong co*, *tuong kich*, *ky binh*, etc.). In addition, he issued thirty-one articles governing naval battle commands, twenty-two on elephantry battle commands, twenty-seven on cavalry battle commands, and forty-two on capital infantry battle formations. Then, after repeating the words he had uttered five years before, he called upon all military officers across the country to use the agricultural slack season to train their troops based on the battle formation manuals; those who did not follow this order would be demoted or even fired.[5]

Soon thereafter, the chroniclers recorded a series of events related to the military. In the summer of 1466, Le Thanh-tong bureaucratized the military by reorganizing it. He replaced the "Ngu dao quan" (five circuit armies) with five *phu*, including "Trung quan phu" (Central Military Region, in charge of Thanh Hoa and Nghe An), "Dong quan phu" (Eastern Military Region, in charge of Nam Sach and An Bang), "Nam quan phu" (Southern Military Region, in charge of Thien Truong and Thuan Hoa), "Tay quan phu" (Western Military Region, in charge of Quoc Uy And Hung Hoa), and "Bac quan phu" (Northern Military Region, in charge of Bac Giang and Lang Son). Each *phu* had six *ve*, while each *ve* had five or six *so*. Three *ve* concern us here because their firearms are still extant today (see below). For example, "Chan uy" was one of the six *ve* of the Trung quan phu, while "Phan uy" belonged to Dong quan phu, and "Loi uy" to Tay quan phu.[6]

In the fourth month of 1467, Le Thanh Tong ordered high-ranking officials to teach soldiers to read books, presumably military treatises. On the

tenth day of the fifth month of 1467, he ordered the five *phu* troops to manufacture weapons. A soldier of the "Uy loi" (which should be "Loi uy," see below) *ve* even addressed the king about the inconsistency of this order, to the effect that "your majesty issued a new design and ordered the generals to manufacture military weapons [based on it], but now [your majesty] has changed to another design…" Though Le Thanh Tong summarily denied his inconsistency, this complaint at least shows he was very concerned with the models of weapons, including firearms.[7] This complaint also confirms Le Thanh Tong's words that "Only new implements are prized." From an entry for the sixteenth day of the third month of 1477, we learn that in the western part of the capital (Thang Long, modern Hanoi) there was a military training arena (*giao nghe truong*); it was most likely here that Le Thanh-tong spent sixteen days reviewing his troops in early 1479, no doubt preparing for Dai Viet's historic "long march" to the west (Lan Sang/Laos, Chiang Mai, and Burma) that occupied the next five or so years.[8] It was in this year (1479) that an arsenal of firearms, which stored sharp weapons, guns, gunpowder, and sulfur, among other things, was burned down when Le Thanh-tong was on his way to invade Ai-lao.[9] This suggests the abundant use of gunpowder weapons by the Dai Viet troops.

While the war in the west was still going on, and possibly because of the demands of this war, in the winter of 1481, in the southwestern part of the capital

> "A lake (or Hai tri) was dug; the circumference of the lake was 100 *ly* (*li* 里in Chinese), and in the middle of the lake was Thuy Ngoc palace (meaning "green jade palace"), while Giang Vo palace (meaning "military training palace") was built next to the lake, [and was used to] train and select soldiers and elephants."[10]

The famous *Ban Do Hong Duc* or "Map of the Hong Duc Era" (allegedly made in 1490, but certainly containing information from that period) shows that in the capital Thang Long (modern Hanoi), in the northwest direction of the Quoc Tu Giam and inside the city walls there is an elongated lake (running in a north-south direction); on its north bank is the Giang Vo palace.[11] This lake should be the one that was 100 *ly* in circumference. It is likely that not all the training was conducted inside the Giang Vo palace, as there must have been an open training arena just next to it. This is of tremendous significance, and it is understood much better now thanks to archaeological excavations undertaken during the second half of the 20th century, particularly in 1983-1984. These excavations resulted in two main kinds of discoveries: architecture and weapons. The architectural remains demonstrate that the Giang Vo palace was larger than the Great Ceremonial Hall in Van Mieu (the Temple of Literature) in Hanoi, and this suggests that the Dai Viet court, and Le Thanh Tong himself, attached tremendous importance to it.[12]

More spectacular was the discovery of weapons—thousands altogether, including firearms and cannon balls (see Figure 1 and below), in the Ngoc Khanh, Giang Vo, and Kim Ma area of Ba Dinh district in Hanoi, where the Giang Vo Arena was located. Nowadays the only traces that remain of the 15th-century training ground are Giang Vo Street and Giang Vo Lake (which is now separate from Ngoc Khanh Lake, although in the late 15th century they were connected and formed the 100-ly long lake mentioned above). Vietnamese archaeologists are exceptionally excited about the discovery:

> "The collection of Ngoc Khan weapons is one of the most precious collections ever discovered under the ground of Thang Long-Dong Kinh-Hanoi."
>
> "Without exaggeration or boasting, it is possible to say that there has never been such discovery so far; this is the most successful season that there has ever been, anywhere in the country."[13]

They also link the Giang Vo Arena to Vietnam's greatest center of learning, Quoc Tu Giam: "It was the greatest centre for training fighters in the country, and not far from it was Quoc Tu Giam, the greatest center for training cultural personalities. These two centers provided key talent for the nation."[14]

In late 1483, Le Thanh Tong ordered that weapons manufactured by the military *ve* and *su* (in the capital?) should only be repaired at the military depots (*kho vu khi*) to which they belonged, rather than at the military shops (*giai vu quan hang*) outside the city; violators would be exiled. This suggests that each military unit did manufacture its own weapons, and that outside the capital there were shops supplying materiel and repairing weapons for the military.

Figure 1: A sample of weapons found at the Giang Vo Arena, with a handgun (with the priming pan lid feature) and some cannon balls at the lower left-hand corner.
Photo courtesy: Institute of Archaeology, Vietnam Academy of Social Sciences.

In early 1486, Le Thanh Tong issued twenty seven articles on military affairs (*Quan vu Hong Duc*), and three years later, in 1489, another ninety-two articles on delivering military materials. In late 1492, probably because too many firearms were being manufactured, at every military depot a firearm depot (*kho hoa ky*) was set up. This suggests that for the previous sixty years, ever since the dynasty was established, but especially during the nearly thirty years that Le Thanh Tong was on the throne, so many firearms had been manufactured that they had to be stored separately. About two months before his death, in the eleventh month of 1496, Le Thanh Tong issued an edict to all military officers in which he continued to stress the need for qualified officers: only those who were qualified could keep their positions. He also emphasized the need for strict training (*huan luyen binh linh*, *nhat thiet phai chuyen tinh*); officers who failed to achieve this would be punished.[15]

The historical background of 16th- and 17th-century Dai Viet is omitted here, as it is discussed in detail in a separate publication.[16] Suffice it to say that from the 1530s to the 1670s the country was plagued with civil wars that pushed Dai Viet's military technology in general, and gunpowder technology in particular, to another high point. While overall more European-style firearms were probably manufactured and employed, Chinese-style ones continued to play a role.

II. THE ARTIFACTS

There are still many gaps in both the sources/artifacts and knowledge of Chinese-style firearms in Vietnam. Although this author has seen a certain number of firearms (or photographs of them), basically no archaeological reports are available. The *Hoang thanh Thang Long* is the only source that contains some important information on the firearms found at the Giang Vo Arena site. To make matters worse, my attempt to access the artifacts housed in the History Museum of Vietnam, the Hanoi Museum, and the Military History Museum in Hanoi was not realized (I was told during my 2008 trip to Hanoi that it would involve complicated procedures starting from the Ministry of Culture). Therefore, the reader will soon learn that for many firearms, even the most basic information (length, weight, caliber of bore and muzzle) is lacking. Although this is offset somewhat by kind, cooperative antique dealers who allowed me to

Figure 2: Five of the six handguns at the History Museum of Vietnam in Hanoi, three with a priming pan lid (number 1, 3 and 4 from left). Photo by author in 2003.

Figure 3: A closer view of one of the handguns in Figure 2 (LSb 18240?), with priming pan lid intact.

handle and measure their guns and cannon, many questions still remain. Moreover, nobody has so far done any research into the archaeological evidence of Chinese-style firearms in Vietnam. Despite all these shortcomings, in this section I will try to classify and discuss Chinese-style firearms based on the data I have collected.

In pre-modern times the terms for "gun" and "cannon" were not clearly distinguished, and were often interchangeable. The typical example in China is that of the terms *chong* 铳 (*sung* in Vietnamese) and *pao* 炮 (*phao*). This is also true of Vietnamese (for examples see below). Therefore, Joseph Needham proposed a distinction between bombards/cannon on the one hand, and handguns (by which he meant the British usage, referring to a gun that could be held in the hands, rather than a pistol) on the other; weight was the criterion by which the distinction was to be made. As an individual solider could carry a weight of about 20 pounds or 9.1 kg, anything below this weight is called a handgun, and anything above is a bombard or cannon.[17] While this system is quite scientific as well as convenient, in our examples, the weight of many firearms is not yet known. For some, even when we know their weight, we do not follow Needham completely. This is not simply because we also take into consideration the shape of the weapon; it is primarily because we are still at a very preliminary stage. For the time being, I have tentatively divided all the firearms into three categories: handguns, bombards, and cannon.

1. Handguns

These guns are listed in Table 1. All the Chinese and Chinese-style (such as Korean, Ryukyuan, and Vietnamese) firearms were muzzle-loading, hence all our artifacts are as well. They consist of three sections: barrel, vase-shaped powder chamber, and stock (at the end of which there is a hole into which a stick or handle can be inserted). One unique feature for some Vietnamese and Chinese firearms, both handguns and cannon, is the priming pan lid, which was probably a Vietnamese innovation that spread to China after the Ming invasion of Dai Viet in 1406-1407 (see below).[18] Among our twenty small handguns, at least six have this feature, and on three of them the lid is still intact (Figure 2). We will address this issue in greater detail below.

Guns in this group are indeed quite small, especially in terms of their weight, but also to some extent in terms of their length and bore. They range from circa 20cm ("circa" here and in Table 1 refers to the fact that I had to estimate the length while the pieces were behind a glass showcase; in this case it is very likely that I have underestimated) to nearly 40cm in length; 1.9kg to 3.0kg in weight; and 1.0cm to 2.5cm in the

Figure 4: Another handgun (Tom #3), with priming pan lid missing. Photo from Philip Tom.

Figure 5: Three handguns at the Military History Museum (Mili Mus #1-3). Photo courtesy: Military Museum of Vietnam.

Table 1: Handguns*

ID #	Length	Weight	Diameter of bore/muzzle	Dage and other information
LSb 10976	32cm	2.2kg	1.7cm/2.5cm	late 15th century
LSb 18232	13cm*	1.1kg*	missing	late 15th century
LSb 18233	16cm*	1.0kg*	missing	late 15th century
LSb 18234	22.5cm*	1.6kg*	1.5cm/4cm	late 15th century
LSb 18235	31cm	1.7kg	1.2cm/2.6cm	late 15th century
LSb 18236	29cm	1.8kg	2.1cm/2.5cm	late 15th century
LSb 18237	38cm	3.0kg	1.6cm/3.0cm	late 15th century
LSb 18238	37.5cm	2.3kg	1.7cm/2.8cm	late 15th century; priming pan lid intact
LSb 18239	38.5cm	3.4kg	2.4cm/4.5cm	late 15th century; priming pan lid missing
LSb 18240	37.5cm	2.3kg	1.5cm/2.8cm	late 15th century; priming pan lid intact; wooden handle still remained when found
LSb 18244	16.5cm*	1.2kg*	missing	late 15th century; broken
LSb 18251	23cm*	1.2kg*	1.3cm/2.6cm	late 15th century; broken
LSb 22266	36.3cm	2.5kg	1.7cm/2.7cm	late 15th century
LSb 24328 (O so 1)	38cm	3.3kg	1.6cm/2.9cm	late 15th century
O so 2	34.7cm	2.3kg	1.3cm/2.5cm	late 15th century
O so 3	34.3cm	2.0kg	1.5cm/2.8cm	late 15th century
84-NK-1	39cm	2.740kg	2.4cm/3.5cm	late 15th century
LSb 25498	31cm	2.0kg	1.2cm/2.5cm	late 15th century
Lumphun gun	35.8cm		2.5cm/?	late 15th century; priming pan lid missing
Mili Mus #1	29cm		1.4cm/2.5cm	16th-18th centuries
Mili Mus #2	29cm		1.4cm/2.5cm	16th-18th centuries
Mili Mus #3	29cm		1.4cm/2.5cm	16th-18th centuries
Tom #1	39.37cm		1.85cm	date unknown; priming pan lid intact
Tom #3	39.37cm		2.54cm/?	date unknown; priming pan lid missing
Rapoport #3	28cm	1.9kg	1.1cm/2.8cm	date unknown
Nanning #1	35cm	2.2kg	1.7cm/3.0cm	date unknown
Nanning #3	33cm	2.0kg	1.5cm/2.7m	date unknown; some dirt in barrel
Nanning #4	35cm	2.2kg	1.5cm/2.6cm	date unknown; some dirt in stock
Nanning #5	34.7cm	3.0kg	2.1cm/2.7cm	date unknown

* Nguyen Thi Don, "Suu tap vu khi thoi le o Ngoc Khanh (Ha Noi)" (Ph. D. dissertation, Institute of Archaeology, Hanoi, 2001); pp. 71, 91-96; *Hoang thanh Thang Long*, pp. 170, 173-174; *Co vat Viet Nam: Vietnamese antiquities* (Ha Noi: Bo van hoa-thong tin, Cuc bao ton bao tang, and Bao tang lich su Viet Nam, 2003), p. 119; information collected during my trips to Hanoi and Nanning in 2005 and 2008.

Figure 6: Vietnamese handguns and cannon at the Nanning antique market (from right to left: Nanning #1-5). Photo by author.

diameter of their bore (the diameter of the muzzle does not concern us here). Vietnamese archaeologists term this type of gun a "signal gun" or "order gun" (*sung lenh* in Vietnamese), and explain it by saying "[s]ignal guns are those are used to shoot flares ordering the troops to advance or withdraw, depending on the colour of the fire."[19] But this label needs to be reconsidered. First, we do not know what the basis is for this opinion; no contemporary records, to my knowledge at least, ever use the term "*sung lenh*" or describe a signal gun. Fifteenth and sixteenth Vietnamese accounts show that "*phao*" were often used for signaling (terms such as "*phao hieu*," "*hieu phap*," and "*hoa [phao] hieu*" appear in the records), but never mention "*sung lenh*," which may be a modern usage.[20]

Second, it seems that these small guns are labeled "*sung lenh*" primarily because they are small.[21] This logic, however, may not be valid. Whether small guns were used for signaling in training is not clear, but the above accounts demonstrate that in the field it was often cannon or *phao* that were used to signal (one imagines that a louder sound was needed if it was to be audible by a large number of troops). Also, information in Chinese may be of some help in illuminating this issue. Comparing the Vietnamese handguns to their early Chinese counterparts, they are strikingly similar in terms of their length, weight, diameter of bore, and even shape (see Figure 6A).[22] This is not at all surprising, because one established fact is that the Vietnamese learned from

Figure 6A: Earliest Chinese handgun in 1271, bronze, 34.6cm in length, 1.55kg in weight, and 1.60cm in the diameter of bore. Photo by Xinhua News Agency.

the Chinese and started to employ Chinese-style firearms as early as 1390.[23] However, the Chinese used these small handguns in combat, to kill the enemy.[24] In China as well as Korea, signal guns were called *xin pao* 信炮 which referred to either carton bombs (or maroons) or three-barreled guns.[25] But even these three-barreled guns were also employed in actual fighting, as shown in early 17th century pictorial evidence.[26] Therefore, we speculate that the handguns of Vietnamese origin were one of the earlier types of firearms in Vietnam, and were used to kill as well.

2. Bombards

If we follow Needham's criterion (firearms below 20 pounds or 9.1kg are "handguns"), firearms in this category should be classified as "handguns." Even though we only know the weight of Rapoport #2 (see Table 2), which weighs 6.3kg, the others in this category should not be too different from this. It is the shape of the pieces in this group that justifies their categorization.

This type of firearm also consists of three sections: barrel, gunpowder chamber, and stock. The most salient features are the much thicker body, the large round or vase-shaped gunpowder chamber, and the tendency for at least some of them to have a bigger muzzle and bore. Rapoport #2 is the only piece that this author has examined. The length of its barrel, chamber, and stock are roughly 21cm, 9.5cm, and 7cm respectively, with a large bore (5.0cm) and muzzle. The other two (LSb 22264 and LSb 19232 or 19233 [the source is inconsistent]) also seem to have large bores and muzzles. The ones that were on display at

Figure 7: Bombards (left: LSb 19241; right: LSb 19233) at the History Museum in Hanoi. The one on the right contains inscription in Chinese (see Table 4) and some are vaguely shown. Photo by author.

Figure 8: Bombard (Rapoport #2). Photo by author.

Table 2: Bombards

ID #	Length	Weight	Diameter of bore/ muzzle	Date
LSb 22264	38cm	6.8kg	5.0cm/8.0cm	late 15th century
LSb 22265	38.5cm	8.9kg	5.0cm/8.0cm	late 15th century
LSb 18241	c. 35cm		c. 1.0cm/c. 6.0cm	date unknown
Mili Mus #4				15th-17th centuries (from Thanh Hoa)
Mili Mus #5				15th-17th centuries (from Thanh Hoa)
LSb 19233	25cm		c. 1.5cm/7cm (muzzle?)	1774
LSb 18231	12.7cm (?)		?/3.1cm (muzzle?)	19th century
Rapoport #2	37cm	6.3kg	5cm/7.4cm	date unknown

Sources include: Nguyen Thi Don, "Suu tap vu khi," p. 91; *Co vat Viet Nam: Vietnamese Antiquities*, pp. 119, 120; information collected during my trips to Hanoi in 2005 and 2008.

Table 3: Cannon

ID #	Length	Weight	Diameter of bore/ muzzle	Date and other information
Hoang Thanh	120.5cm	>100kg	4.1cm/13cm	15th-17th centuries
LSb #?	c. 40cm		c. 6cm/c. 11cm	date unknown
Rapoport #1	71cm	20.15kg	4cm/6cm	16th century (?); priming pan lid missing
Tom #2	49.85cm		2.54cm/?	16th century (?); from Thanh Hoa; priming pan lid missing
Cannon SuperStore #1	51cm	5kg	4.3cm/6-7cm	16th century(?); from Thanh Hoa(?)
LSb 24329 (O so 4?)	52cm	15.3kg	2.7cm/5.8cm	late 15th century
Mili Mus #6	48cm		3.2/ 6.7cm	16th-18th centuries; from Thanh Hoa
Mili Mus #7	41cm		2.2/4.6cm	16th-18th centuries; from Thanh Hoa
Mili Mus #8	c. 40cm		c. 1.5cm/c. 4.0cm	15th-17th centuries; from Thanh Hoa
Mili Mus #9	c. 40cm		c. 1.5cm/c. 4.0cm	15th-17th centuries; from Thanh Hoa
Nanning #2	40.5cm	6.25kg	2.9/5.7cm	date unknown

Sources include: Nguyen Thi Don, "Suu tap vu khi," p. 92; information from my trips to Hanoi and Nanning in 2003 and 2008, my communication with Philip Tom, and the webpage of The Antique Cannon SuperStore.

Figure 9: The earliest Chinese bombard in 1298. Photo by Xinhua News agency.

the History Museum (LSb 18241 and LSb 18231) and the Military History Museum in 2003 (which were removed in 2008), however, seem to have smaller bores.

The prototype for, and origin of, this kind of Vietnamese bombard was most likely the Chinese bombard that appeared as early as 1298. In terms of shape and weight, the Vietnamese bombards are quite similar to the regular Chinese ones (others were quite large); the main difference is that the Chinese ones consistently have larger bores (hence they are called *wankou chong* 碗口铳 [bowl-sized muzzle cannon] or *zhankou chong* 盏口铳 [cup-sized muzzle cannon] in Chinese),[27] while some Vietnamese ones have smaller bores, as a result of the Vietnamese adaptation.

3. Cannon

Cannon are the last group of Chinese-style Vietnamese firearms. Again, by Needham's standards, some of the smaller pieces in Table 3 could easily be classified as "handguns." But again, we are taking into account the shape of the firearms in this group; more information on them will probably change our classification.

One feature common to this group is that most of them have rings on their body, both on the barrel and the stock (thus the terms ringed barrel or stock), which most handguns and bombards do not have. The purpose is clear: As most cannon are more powerful due to their longer barrel and larger bore, which can accommodate more gunpowder and larger cannon balls, they needed to be stronger than the smaller and less powerful firearms (handguns and bombards). Again, in this regard, the Chinese started to employ this technique as early as the mid-14th century, and from this time on many Chinese and Korean firearms also had this feature.[28] For example, one of earliest (if not the earliest) Chinese guns with this feature is dated 1351 (length 43.5cm, diameter of bore 3.0cm, and weight 4.75kg).[29]

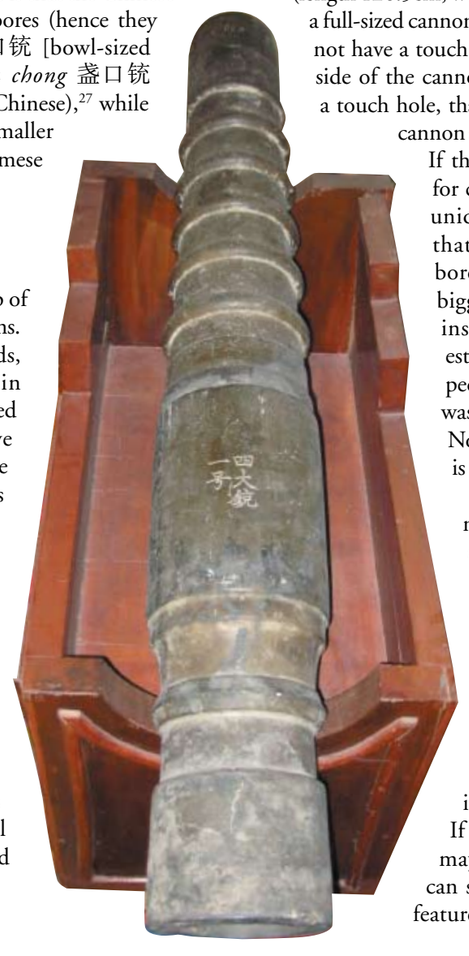

Figure 10: The Hoang Thanh (Imperial Citadel) cannon. Photo by author.

Below we discuss some Vietnamese cannon.

The Hoang Thanh (Imperial Citadel) cannon (Figure 10) was discovered in 2003 near a riverbank at the Hoang Thanh site.[30] Judging by its dimensions (length 120.5cm, weight over 100kg), this should be a full-sized cannon. But it is interesting that it does not have a touch hole (at least not on the upper side of the cannon). If indeed it does not have a touch hole, that means it did not function as cannon and never shot any cannonballs. If this is the case, it was only used for ceremonial purposes.[31] Another unique feature of this cannon is that it does not have a straight bore. At the muzzle, the bore is bigger (4.1cm), and gets smaller inside (about 1.5cm-2.0cm; an estimate, not measured). This very peculiar feature further suggests it was used for ceremonial purposes. Nonetheless, further investigation is needed.

Information on its date is not available either. Vietnamese archaeologist Bui Min Tri has noted that scholars believe it dates from either the 15th or the 17th century. The usage of "*dai sung*" (cannon) suggests it may have been made in the late 16th century, as this usage appears three times, in the years of 1592, 1593, and 1597, in the *Dai Viet suu ky toan thu*.[32] If this is the case, even though it may be a ceremonial cannon, it can still give us a good idea of the features of a 16th-century Vietnamese

Figure 11: Cannon at the History Museum (LSb #?) in Hanoi. Photo by author.

cannon. If it was indeed used for ceremonial purposes, it is an excellent demonstration of a particularly Southeast Asian feature: huge cannon were cast for symbolic reasons, not for practical use. This was especially true of maritime Southeast Asia, but also in mainland Southeast Asia. The nine gigantic cannon cast by the Vietnamese king Mihn Mang in the early 19th centuries are good examples. These, however, were tested for shooting just after they were cast.

We have even less information on the cannon at the History Museum of Vietnam in Hanoi (see Figures 11 and 12). This looks like a Chinese-style cannon (but the possibility that it is European-style cannot be disregarded), with a pair of trunnions at the very end. In some aspects (short body, c. 40cm, and large bore, c. 6.0cm) it resembles a bombard, but it does not have a vase-shaped chamber. Its closest Chinese counterparts are two c. 1377 cast-iron mortars or bombards (length 101.6cm, diameter of bore 21.6cm, over 150kg), each with two pairs of trunnions on the barrel.[33]

The next is a group of three cannon that are very similar in shape (Figure 13). They have slightly different lengths (from about 50cm to 71cm), weights (from about 5kg to 20.15kg), and diameters of bore (from 2.54cm to 4.0cm), but the striking similarity of their shape—they all have vase-shaped gunpowder

Figure 13: Three similar cannon (from top: Tom #2, Rapoport #1, and Cannon SuperStore #1). Photos by Philip Tom, author, and The Antique Cannon SuperStore respectively.

Figure 12: A view into the barrel of the cannon LSb #? (Figure 11). Photo by author.

chambers, and two of them have a priming pan lid, rings on the barrel and stock, a smooth section toward the muzzle, slightly thicker muzzle tip, and more importantly, nearly identical inscriptions (see the "Inscriptions" section below)—suggests convincingly that they are related. Fortunately, as Philip Tom (an expert on Asian swords) has said about what I am calling Tom #2:[34]

> "As far as provenance goes, the large hand cannon (with the "dai quoc" inscription) was obtained from a dealer in the US (actually it was an eBay buy of several years back) who got it from a "picker" in Hanoi who would only say that the gun was dug up in Thanh Hoa province. The piece has been lightly cleaned. Interesting that the central "bulge" area which is the powder chamber has evidence of smoothed-off "flashings" from the mold joints, but the forward part, and the raised rings, were finished on a lathe, and the fine tool marks from the turning are still visible under the green patina. Quality of workmanship is very high. There is organic material still in the socket in back (where the wooden handle once was) I suppose this could be carbon-dated. The shape of this gun is quite unique; I haven't seen it published in collections of finds in China. Another dealer sent me pictures of another, almost identical one to this, otherwise I have not seen any more."

The information that this cannon is from Thanh Hoa province is of great importance. Considering that all the firearms I saw displayed at the Military Museum in Hanoi in 2003 and 2008 (Mili Mus #1-9 in Tables 1-3) are also from Thanh Hoa, one is convinced Thanh Hoa must have been an important battlefield. Situating these discoveries in regard to Vietnamese history, the late 16th century was when the Mac repeatedly came down to Thanh Hoa to fight the Le/Trinh, and this is probably the context in which these weapons were used.[35] We have reason to believe that the other two (Rapoport #1, and Cannon SuperStore #1) may have also come from the Thanh Hoa area. Incidentally, the width of the gunpowder chamber of the thickest part of Rapoport #1 is 11.5cm, while its circumference 39cm.

Figure 15 Cannon at the Military Museum of Vietnam
(Mili Mus #6). Photo Courtesy: Military Museum of Vietnam

Figure 16 Cannon at the Military Museum of Vietnam (Mili Mus #7).
Photo Courtesy: Military Museum of Vietnam

The two small cannon at the Military Museum (Figure 14) are also from Thanh Hoa. The display label says they date from the 15th to 17th centuries. We speculate that they may also have been used in the Vietnamese civil war during the late 16th century. They are interesting because their shape is similar to those in Figure 13. Each one is mounted on a cart in the museum showcase, but we do not know if this kind of cart was used when they were in operation; nor do we know how much they weigh (they do not seem to be very heavy).

More photographs of Vietnamese cannon were sent to me after I finished the first draft of this paper. I include them here because of the high quality of the photos. The one in Figure 15 is similar to the ones in Figures 13 and 14 in style, especially in the rings on its barrel and stock. Its weight is unknown but it appears heavy. It was also discovered in Thanh Hoa. The ones in Figure 16 resemble the three handguns at the Military Museum (Mili Mus #1-3) and that in Figure 15 in their deep yellow color. They were discovered in Thanh Hoa as well.

So far we have not seen any big cannon from the 15th century, but this does not mean that they were not manufactured and employed in war. In 1960, 1,054 cannonballs were found at the Kim Ma-Cau Giay-La Thanh (called by farmers "Bai Dan," meaning "bullet field")[36] and twenty-eight more were found in 1983-1984, bringing the total to 1,082. Some others were found in other places such as Ngoc Ha, Quan Ngua, and Lang Ha, but the majority came from the Giang Vo Arena. The largest were 12cm in diameter and 700 grams in weight.[37] This suggests that there were many cannon, including large ones (large enough to take 12cm-diameter cannonballs). Vietnamese historical records have referred to cannon;[38] now we have archaeological evidence to support these references.

Lastly in this section, a few words on the priming pan feature. I have dealt with this issue elsewhere,

Figure 14: Two small cannon at the Military Museum in Hanoi (Mili Mus #8 and #9). Notice small white cannon balls are also displayed. Photo by author.

Figure 17: Cannon balls discovered at the Giang Vo Arena. Photo courtesy: Institute of Archaeology, Vietnam Academy of Social Sciences.

Figure 18: A priming pan lid on a 15th century Vietnamese handgun (LSb #18238).
Photo by author.

and, building on Li Bin's argument, have suggested that it was a Vietnamese invention borrowed by the Chinese after 1410.[39] Now we have seen more Vietnamese handguns and cannon with this feature, which further reinforces the Vietnamese contribution to gunpowder technology. Though they all differ slightly, there is no doubt that the origin and the principle of this device was the same (see Figures 18-23). It was intended to prevent the fuse, the touch hole, and the gunpowder in the chamber from getting wet in the rain.[40] The Vietnamese probably invented this technique shortly after they acquired Chinese firearms, that is, between 1390 and 1406. Indeed, heavy and frequent rainfall in Vietnam must have quickly pushed the Vietnamese to this innovation. The Chinese soon learned about it during their invasion of Dai Viet in 1406-1407.

Interestingly, it also seems that both the Vietnamese and Chinese abandoned use of this feature at about the same time, that is, in the late 16th century. In addition to the one shown in Figures 21 and 22, which probably dates from around the early 16th century (1531?), I have seen another Chinese handgun with this feature at the "Exhibition of Military Fortification Culture" at the Desheng Men, Beijing. It was made in 1544, and the artifact was on loan from the Capital Museum of Beijing. To my knowledge, one of the last Chinese cannon to have this feature was a 1574 cannon currently on display at the Military Museum of China in Beijing (Figure 23). If we believe the two Vietnamese cannon in Figure 13 (Tom #2 and Rapoport #1) to be from the 16th century, then this may have been the last time the Vietnamese employed this technique. After this, we no longer see it in Vietnam. This is most likely because European-style firearms started to gain currency in both Vietnam and China, and the priming pan lid, which was characteristic of the Sino-Vietnamese firearms, did not fit the new weapons.

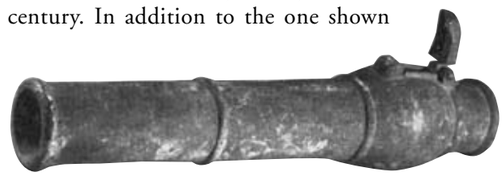

Figure 19: A Chinese handgun of 1415 (soon after the Chinese had learned the technique from the Vietnamese) with priming pan lid. Reprinted from Cheng and Zhong, *Zhongguo gudai bingqi tuji*, p. 231.

Figure 20: A closer view of the priming pan on the Rapoport #1 cannon.
Outside priming pan: length 6.0cm, width 8cm; inside smaller groove: length 3.2cm; width 0.9cm.

Figure 21: A Chinese cannon with priming pan lid (lid missing) is mistakenly placed into a Portuguese-style cannon (Frankish culverin, or "Folangji" 佛朗机 in Chinese) as culasse ("zipao" 子炮in Chinese) of 1531 at the Capital Museum in Beijing.
Photo by author.

4. Inscriptions

Unlike Chinese and Korean firearms, which are almost always inscribed with the year they were made (and even sometimes the name of the gunsmith), the Vietnamese firearms are, with one exception, completely silent regarding their age. This naturally causes us much trouble in determining the dates of

Figure 22: A closer view of the priming pan of the cannon in Figure 18.
Photo by author.

Figure 23: The 1574 Chinese cannon in the Military Museum of China in Beijing having a priming pan lid.
Photo by author.

Table 4: Inscriptions on Vietnamese Firearms

Serial #	Inscription: Original Chinese (Vietnamese and English translation)
LSb 18232	震威一百二十三号 (Chan uy nhat bach nhi thap tam hieu; Chan uy [*ve*] #123)
LSb 18233	震威前所五百九十四号 (Chan uy tien *so* nhat thien ngu bach cuu thap tu hieu; Chan uy Front So #594)
LSb 18237	震字二千六百十四号 (Chan tu nhi thien luc bach thap tu hieu; Character "Chan" #2,614)
LSb 18238	震威右所一千二十三号 (Chan uy huu so nhat thien nhi thap tam hieu; Chan uy Right So #1,023)
LSb 18240	震威卫操练 (Chan uy ve thao luyen; Chan uy *ve training*)
LSb 18239	奋威前所八百三十三号 (Phan uy tien so bat bach tam thap tam hieu; Phan uy front so #833) 奋字…十...号 (Phan tu…thap…hieu; Character "phan" …#10…)
LSb 18244	奋威前所一千五百十六号 (Phan uy tien so nhat thien ngu bach thap luc hieu; Phan uy Front So #1,516)
LSb 22264	奋字七百三十号 (Phan tu that bach tam thap hieu; Character "phan" #730) 奋威中所二百三十一号 (Phan uy trung so nhi bach tam thap nhat hieu; Phan uy Middle So #231)
LSb 24328	雷威左所二百六十号 (Loi uy ta so nhi bach luc thap hieu; Loi uy Left So #260)
Lumphun gun	雷威前所一千… 十号 (Loi uy tien so nhat thien…thap hieu; Loi uy Front *So* #1,?10)
84-NK-1	工字三百十七号 (Cong tu tam bvach thap that hieu; character "cong" #317)
Hoang Thanh	四大铳一号 (tu dai sung nhat hieu; #1 of the four cannon)
Tom #2	大国 (dai quoc; great country)
Cannonstore	大国 (dai quoc; great country)
Rapoport #1	大 (dai; great)
Rapoport #2	...千?壹佰柒拾陆?号 (…thien? nhat bach that Thap luc hieu; #...1,176)
Nanning #4	河雷右 (Ha loi huu; Ha loi Right)
Mili Mus #1	列 (column)
Mili Mus #2	霜 (frost)
LSb 19233	奉随平南，夏甲午岁，奉放官钱，铸叁炮器，供奉上赐, 永佑乡里香火威声, 安乐世世。铜贰拾壹镒叁两，称药八钱。 (Phung tuy binh nam, ha Giap Ngo tue, phung phong quan tien, chu tam phao khi, cung phung thuong tu, vinh huu huong ly, huong hoa uy thanh, an lac the the. Dong nhi thap nhat dat tam lang, xung duoc bat tien). "In obedience to the order of pacifying the south, in the summer of the Giap Ngo year, official fund was disbursed to cast three cannon, [thus to] make offerings to what the Emperor has bestowed,to protect forever the ancestral cult and prestige of the countryfolks, [may they] be peaceful and happy generation after generation." The bronze used amounted to 21 *dat* 3 *lang* , [each cannon] utilizes 8 *tien* of gunpowder.

Sources include *Hoang thanh Thang Long*, pp. 170, 173-174; *Co vat Viet Nam: Vietnamese Antiquities*, p. 120 (#183); information from my trips to Hanoi and Nanning in 2003 and 2008.

Figure 24: Inscription on two Vietnamese handguns (left: LSb 18240; right: LSb 18244).

these firearms. However, some Vietnamese firearms do have some inscriptions which, in conjunction with written records, can help us to ascertain their ages. For those firearms that have no inscription, archaeological evidence may still give us enough information to speculate about their dates.

Table 4 provides all the original inscriptions in Chinese that I have seen so far, with their translations into Vietnamese and English. From LSb 18232 to 84-NK-1, there are altogether eleven firearms, mostly handguns, that have inscriptions; the inscriptions contain the names of the military units, the serial number, or, in most cases, both. (I have not seen all the guns or all original inscriptions in Chinese characters; hence some of them are based on the Vietnamese and English translations). With the exception of the Lumphun gun, the other ten guns are from the Giang Vo Arena; thus it should be certain that they date from the late 15th century, when Le Thanh Tong was on the throne. The names of the military units, including "Chan uy," "Phan uy," and "Loi uy," also suggest that these weapons are from the late 15th century (around the 1460s-1470s) because these units were created during that time.[41] In addition, the historical records mentioned above also confirm that among these military units, for example, Loi uy *ve* manufactured weapons in 1467 (see above).

For example, Vietnamese chronicles mention that among the troops that were invading Dai Viet's neighbors in the west (Ailao, Lan Sang, as far as Burma) in 1479 was an important military unit called "Phan uy".[42] Hence the three guns in Table 4 with this name (LSb 18239, LSb 18244, and LSb 22264) should have something to do with this unit. As discussed below, the Lumphun gun was employed by the Loi uy *ve* in their invasion of the western counties. In addition, we have five guns that belonged to the Chan uy *ve*. One imagines that almost all these guns (plus 84-NK-1) could have been used by these military units in their training for the westward invasion before early 1479 when Le Thanh Tong spent more than two weeks reviewing Vietnam's ever- strong military. Vietnamese archaeologists Do Van Ninh and Nguyen Thi Don conclude that, based on the names of the military units, three out of the five military *phu* were allowed to train their soldiers at the Giang Vo Arena.[43] But this cannot be a definitive conclusion, as the artifacts comprise too small a fraction of the total, and we still know too little about them. Probably other *phu* were also training their troops here, but their weapons (at least those inscribed with the names of their units) did not survive.

Inscriptions can also help correct some errors in the chronicles. For example, the *Dai Viet su ky toan thu* for the year 1467 records "Uy loi *ve*," but inscriptions on the LSb 24328 and the Lumphun gun say "Loi uy."[44] Therefore, the former must be an error. Furthermore, a 17th century account, which should have derived its information from the 15th century, also says "Loi uy."[45] Moreover, since the Loi uy *ve* was ordered by Le Thanh Tong to manufacture weapons (see above), the two guns (LSb 24328 and Lumphun gun) with this name on them must have been manufactured by this unit around this time (1467).

The Lumphun gun is extremely interesting and hence deserves more attention. This is the one 15th-century gun found outside Vietnam, or more precisely speaking, outside the Giang Vo Arena. It was discovered in northern Thailand (in the Chiang Mai area) and has been kept at the Hariphunchai Museum since the 1970s. Thai scholar Samran Wongsapha wrote a short paper on it, but mistakenly identified it as a Chinese gun based on its inscription in "Chinese" and its similarity to Chinese guns.[46] But an understanding of the historical context, namely the Vietnamese invasion of the Nan-Chiang Mai area in 1479-1484, should suggest the possibility that it is Vietnamese.[47] A look at its "Chinese" inscription provides more clues. First, the name 雷威前所 (Loi uy tien so) reveals its real identity immediately. Second, a comparison of the calligraphic style on the gun with inscriptions on other Vietnamese guns demonstrates a striking similarity between them (Figures 24 and 25). They are of the Weibei 魏碑 style, which refers to the style of inscriptions during China's Northern Dynasties period (386-581). This style is simple, natural, calm, robust, and square-shaped, reflecting the great confidence and vigor of Le Thanh Tong's time. The term

Figure 25: Though a bit blurry, the style of the inscription on the Lamphun handgun is still clearly visible. Photo from Samran Wongsapha's article.

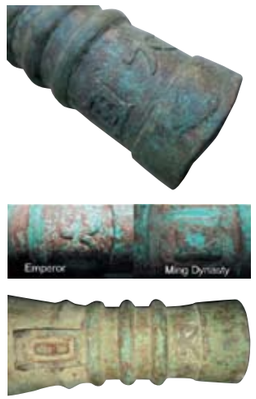

Figure 26: Similar inscriptions on three cannon (Tom #2, Rapoport #1, and Cannon SuperStore #1).It reads "*dai quoc*" but is mistakenly labeled by antique deales as "Ming dynasty empeor"). Photos by Philip Tom, author, and The Antique Cannon SuperStore.

tiejin 鉄劲 (meaning "iron-like robustness"), employed by a late Qing coin collector to describe the calligraphy on the copper cash issued during Le Thanh Tong's first reign (Quang Thuan, 1460-1469), can also be used aptly to describe the inscriptions on the guns of the same period.[48] As a matter of fact, other Vietnamese inscriptions, especially of this period (the late 15th century), are also of the same style.[49] It is not surprising for a gun of the Loi uy *ve* to have survived until today in northern Thailand, because it belonged to the Tay quan phu, which was based in the western part of Vietnam, and which undoubtedly played a pivotal role in the westward expeditions of the Vietnamese army.

More importantly, from the serial numbers on the guns we know that relatively large numbers of firearms were manufactured in late 15th-century Dai Viet.[50] Adding these up (123+594+2,614+1,023+1+833+1,516+730+231+260+1,?10+317) we get about 9,252, or close to 10,000.[51] If we break them down by military unit, we get 4,535 for the Chan uy *ve*, 3,310 for the Phan uy *ve*, about 1,270 for the Loi uy *ve*, and 317 for the unit identified by the character "cong." These numbers, though extremely imperfect, do allow us to make some progress in solving another problem: namely, estimating the percentage of Vietnamese soldiers who used firearms. Using the Chan uy *ve* as an example, if we divide its total cache of 4,535 firearms (which involves no double numbers) among its 12,000 soldiers (if we follow the principle that each *ve* had 12,000 soldiers), we obtain 38%. In other words, in this *ve*, around 38% of soldiers employed firearms.[52]

If we tentatively believe that this 38% was representative of the whole Vietnamese military (all troops of the five *phu*) in the 1460s-1480s,[53] then Dai Viet was on a par with Ming China in terms of how many of its troops used firearms, as we have learned that about one third of Chinese troops in 1466 were equipped with gunpowder weapons.[54] Thirty-eight percent of the total military strength of Dai Viet (which we have estimated as 260,000, see note 6) would be 98,800. This would qualify Dai Viet as a small "gunpowder empire," and to make it powerful enough to subdue its enemies including Chams and Tai-Lao groups.

We should be clear that the artifacts we have seen represent a very small percentage of the actual total, which was very likely to be much bigger. It should also be pointed that we have only seen and therefore discussed handguns and bombards, not yet cannon, for the 15th century. Vietnamese chronicles often mention cannon and certain numbers of them were no doubt manufactured. For example, at the "Workshop of Military Equipment" in the Dai Viet Ministry of Works (*cong bo*), there were "cannon-making craftsmen" as well as "powerful gun/cannon-making craftsmen".[55] As mentioned above, here *phao* and *sung* were not clearly defined; sung could also refer to cannon.

Comparing the inscriptions on the first eleven guns with those of the later ones, one notices an interesting difference. The former follow certain rules to systematically record the military units and serial numbers; in addition, their excellent craftsmanship and the graceful, confident inscriptions on their barrels, reflect a well-organized, highly efficient and effective military system, and, by extension, a sophisticated governmental organization. As John Whitmore has demonstrated in detail, this description fits Le Thanh Tong's style extremely well.[56]

Many of the Chinese-style firearms of the 16th to the 18th centuries have no inscriptions on them, but those that do demonstrate much greater irregularity, inconsistency, and disorder. First, the systematic way of cataloging most firearms (we are still not sure if every single one was inscribed with the name of its military unit and a serial number) that was used in the 15th century was gone. Only one bombard, of unknown date, Rapoport #2 (...千?壹佰柒拾陆?号 ...thien? nhat bach that Thap luc hieu; #...1,176), keeps this tradition, but the gun is of mediocre quality (the Nanning guns are also of low quality and seem to belong to this period). The Hoang Thanh cannon only contains five Chinese characters, "四大铳一号" (tu dai sung nhat hieu; #1 of the four big cannon). The cannon itself is of high quality (although it may not have functioned, see above), but the inscription is rather terse. It informs us, however, that three others were made, and that the term "dai sung" refers to cannon.

Figure 27 The Chinese character on Mili Mus #1-2. Photo courtesy: Military Museum of Vietnam.

A good example of the irregularity, inconsistency, and disorder of gunpowder weaponry in this later period is in the three cannon in Figures 13 and 26. As discussed above, they should have been made at roughly the same time and have come from the same region; they were even made by the same gunsmith. But two of them are inscribed with the term "dai quoc (great country)," while the third only has one word, "dai." There is no other information on them. The Chinese character on each of Mili Mus #1 and #2 (Figure 27) seems to be inscribed at random. They are not on the same place on each gun, and the writing is of very low quality.

The last inscription on LSb 19233 is quite interesting. Its content suggests that it was made by order of the eunuch Hoang Ngu Phuc. In 1774, the Le king gave Hoang Ngu Phuc the title "binh nam thuong tuong quan" (The South-Pacifying General), and ordered him to lead troops in a march to the south.[57] Knowing this, we may surmise that the bombards ("*phao*") may have been manufactured by Hoang Ngu Phuc. This bombard is unique because it not only contains a lengthy inscription, but also a date which points to 1774—very unusual among Chinese-style Vietnamese firearms.

CONCLUDING REMARKS

Based on the foregoing discussion we can draw several conclusions. First, regarding the issue of who borrowed gunpowder technology from whom between Vietnam and China, written sources and historical context have shown already it was Vietnam who borrowed from China, although Vietnam also made some innovations. Now through using relatively rich (but still imperfect) archaeological data, we see more clearly that for every Vietnamese type of firearm there was a Chinese prototype. If we take the handgun and bombard as examples, we see that although the archaeological findings certainly contain gaps (for example, the appearance of Vietnamese firearms in archaeological record is rather late), it does show that the earliest Chinese handguns predated Vietnamese handguns by about 195 years (if we take 1466 for Dai Viet), while in China bombards were forged 168 years earlier than in Vietnam.

Secondly, although archaeological findings are still scarce and future discoveries will better illuminate the picture, we still can conclude at this stage that early as the late 15th century the Vietnamese state already employed large quantities of firearms in their wars. The estimated percentage of firearm-holding soldiers (38%, or 98,800 soldiers) may be inaccurate, but it at least suggests the wide use of gunpowder weapons, and would also qualify Dai Viet as a small "gunpowder empire." The coincidence between written and archaeological sources proves the reliability of the chronicles. The hard archaeological evidence substantiates the argument we have already made elsewhere, which is that gunpowder technology did have significant effects on Vietnamese and mainland Southeast Asian history.

Thirdly, based on all the archaeological evidence we have seen, Chinese-style firearms date mainly from the 15th and 16th centuries. Those labeled by Vietnamese archaeologists as dating from the "15-17th centuries" or "16th-18th centuries" should thus correspond to the earlier dates in those ranges rather than the later. If this is indeed the case, it is not particularly surprising, for from the 17th century on, European-style firearms started to be much more influential (though so far in the archaeological record we have seen more European-style cannon than guns, including matchlocks and flintlocks). RC

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NOTES

1 Sun Laichen, "Chinese Gunpowder Technology and Dai Viet: c. 1390-1497," in Nhung Tuyet Tran and Anthony Reid, eds., *Viet Nam: Borderless Histories* (Madison, Wisconsin: University of Wisconsin Press, 2006), pp. 72-120; idem, "Chinese Military Technology Transfers and the Emergence of Northern Mainland Southeast Asia, c. 1390-1527," *Journal of Southeast Asian Studies* 34, 3 (2003): 495-517.

2 *Dai Viet su ky toan thu* 大越史记全书 (Complete book of the historical record of Dai Viet) (Tokyo: Tokyo Daigaku Toyo Bunka Kenkyujo, 1984-1986) (henceforth as *Toan thu*), pp. 525, 532-533, 540, 557, 558, 561; Sun Laichen, "Chinese Gunpowder Technology," pp. 84-89, 115n. 89.

3 *Toan thu*, pp. 570, 574, 583, 584, 586, 589, 590, 591, 593, 594, 599, 600, 604, 605, 610, 612, 625.

4 Ibid., p. 641.

5 Ibid., p. 654.

6 *Toan thu*, p. 656; *Thien nam du ha tap* 天南余暇录 (photocopy of Yamamoto Tatsuro's copy), vol. 1, pp. 37a-41a; Phan Huy Chu, *Lich trieu hien chuong loai chi* 钦定越史通鉴纲目 (Categorized collection of official documents of consecutive dynasties) (Toyo Bunko, X-2-38), "Binh che chi," vol. 39, which gives slightly different names of some regions; *Kham dinh Viet su thong giam cuong muc* (The text and commentary of the complete mirror of Vietnamese history as ordered by the emperor) (henceforth as *Cuong muc*), vol. 20, pp. 2a-6a; John K. Whitmore, "The Development of Le Government in Fifteenth Century Vietnam" (Ph. D. dissertation, Cornell University, 1968), pp. 184-185; *Ban quan che dien le* 本官制典例 (Han-Nom Institute, #A56) (17th century work but contains 15th-century information), vol. 5, [pp. 115-119]; Vien khao co hoc, *Hoang thanh Thang Long* (Ha Noi: Nha xuat ban Van hoa thong tin, 2006), pp. 154-155. There is a substantial discrepancy regarding the number of soldiers in one *ve*. The *Thien nam du ha tap* states (*Ban quan che dien le* echos) that each *ve* had 12,000 soldiers and each *so* 2,400, and that Dai Viet military forces totaled 315,000; but the *cuong muc* says each *so* had 400 soldiers (this is probably a mistake for "2,400"). The authors of the *Hoang thanh Thang Long* probably follows the *cuong muc*, saying that each *so* had 600 soldiers, and thus the Trung Quan phu had only 12,400 soldiers). The *Thien nam du ha tap*, a contemporary source, should be more reliable. Vietnamese sources claim that 260,000, 180,000, and 300,000 Vietnamese troops were mobilized in 1470 and two times in 1479, respectively, in the Champa and Tai-Lao campaigns (*Toan thu*, pp. 679, 709, 710). Phan Huy Chu (vol. 39) not only endorses these figures but also provides explanations. We still need to come up with a relatively accurate number for the Dai Viet's military forces during the reign of Le Thanh Tong. Tentatively let us take the middle figure of 260,000 as the total strength of Dai Viet's military forces, as compared to a total estimated population of 4,372,500 of Dai Viet in 1490 (as estimated by Li Tana in *The Nguyen Cochinchina: Southern Vietnam in the Seventeenth and Eighteenth Centuries* [Ithaca: Cornell SEAP, 1998], p. 171, Table 4).

7 *Toan thu*, p. 664; John K. Whitmore, "The Development of Le Government in Fifteenth Century Vietnam", p. 194.

8 Sun Laichen, "Chinese Gunpowder Technology," pp. 102-104. The Vietnamese spent much time and money on this large-scale campaign. According to a version of the Nan Chronicle, "The phraya of the Kaeo was offended and spent 3 years preparing for an attack on Lan Sang and Lan Na. He sent a large army under 130 *sing müang* ['tigers' or élite] commanders, which was deployed widely" (translated by Kennon Breazeale; personal communication, March 19, 2004). The bibliographical information of this chronicle is as follows: Saratsawatdi Ongsakun, editor, *Phün müang nan chabap wat phra koet* [A Chronicle of Nan: The Phra Koet Monastery Version] (Bangkok: Khrong-kan nangsü wicha-kan nai khrüa amarin [Academic Texts of the Amarin Group], BE 2539 [1996].

9 *Tay nam bien tai luc* (Record of the frontier passes to the west and south), p. 31a; *Toan thu*, vol. 2, p. 710; *Thien nam*, "governmental organization," pp. 17a, 73a; Nguyen Ngoc Huy and Ta Van Tai, *The Le Code, Law in Traditional Vietnam: A Comparative Sino-Vietnamese Legal Study with Historical-Juridical Analysis and Annotations* (Athens, Ohio: Ohio University Press, 1987), vol. 2, p. 161.

10 *Toan thu*, p. 716; Vien khao co hoc, *Hoang thanh Thang Long*, p. 170, quoting the *Kham dinh Viet su thong giam cuong muc* (The text and commentary of the complete mirror of Vietnamese history as ordered by the emperor).

11 *Ban Do Hong Duc*, copy of the Toyo Bunko. The *Hoang thanh Thang Long* (p. 197) also contains a photocopy.

12 Vien khao co hoc, *Hoang thanh Thang Long*, pp. 166, 169-170.

13 Ibid., pp. 162, 170. This discovery probably can only be rivaled by the excavation at the Hoang Thanh in 2003.

14 Ibid., p. 174.

15 *Toan thu*, 663, 664, 702, 706, 716, 718, 728, 735, 740, 745.

16 Sun Laichen, "Vietnamese Guns and China, c. 1527-1680s" (forthcoming).

17 Joseph Needham, *Science and Civilisation in China*, vol. 5, "Chemistry and Chemical Technology;" pt. 7, "Military Technology; the Gunpowder Epic" (Cambridge: Cambridge University Press, 1986), p. 292n.a. This categorization "handgun" coincides with the Chinese terminology "*shou (ba) chong* 手(把)铳." See Zhong Shaoyi 钟少异, "Zhongguo qingtong chongpao zongxu 中国青铜铳炮总叙," *Zhongguo lishi wenwu* 中国历史文物2 (2002): 19.

18 For details see Sun Laichen, "Chinese Gunpowder Technology," pp. 91, 93. This feature never diffused to Korea or Ryukyu.

19 Vien khao co hoc, *Hoang thanh Thang Long*, pp. 170, 173-174 (quote on p. 173); Nguyen Thi Don, "Suu tap vu khi," pp. 71-72, 90-97; *Co vat Viet Nam: Vietnamese antiquities*, p. 119; labels at the History Museum and the Military History Museum in Hanoi.

20 TT, 684, 839, 876, 887, 888, 896. In addition, bells, drums, and horns were occasionally used as signals (pp. 888, 890). However, the records from the 17th, 18th, and 19th centuries still remain to be consulted.

21 The two larger firearms (Mili Mus #6-7 in Table 3), which belong more properly to the "cannon" category, are also labeled "*sung lenh*."

22 Needham, *Science and Civilisation in China*, vol. 5, pt. 7, pp. 290, 293; Zhong Shaoyi, "Zhongguo qingtong," p. 20, Table 1. The Chinese handgun shown in Figure 5 was discovered in Ningxia in 2004. See (http://www.nx.xinhuanet.com/newscenter/2004-06/09/content_2278435.htm; http://www.cnlnsq.com/forum/redirect.php?tid=5525&goto=lastpost).

23 Sun Laichen, "Chinese Gunpowder Technology," pp. 73, 75-77; idem, "Chinese Military Technology Transfers," pp.

24 Needham, *Science and Civilisation in China*, vol. 5, pt. 7, pp. 293-294, 304-307.

25 Ibid., pp. 169, 331-332.

26 Cheng Dong 成东 and Zhong Shaoyi, *Zhongguo gudai bingqi tuji* 中国古代兵器图集 (Beijing: Jiefangjun Chubanshe, 1990), p. 234.

27 Zhong Shaoyi, Qimude Daoerji 齐木德道尔吉, Yan Hong 砚鸿, Wang Zhaochun 王兆春, Yang Hong 杨泓, "Neimenggu xin faxian Yuandai tong huochong jiqi yiyi 内蒙古新发现元代铜火铳及其意义," *Wenwu* 文物 11 (2004); "Neimenggu faxian shijie zuizao huopao—Yuandai tong huochong 内蒙古发现世界最早火炮--元代铜火铳" (http://tech.163.com/04/0810/09/0TDQLGMR00091544.html); Needham, *Science and Civilisation in China*, vol. 5, pt. 7, pp. 297-303; Zhong Shaoyi, "Zhongguo qingtong," p. 20, Table 2.

28 Needham, *Science and Civilisation in China*, vol. 5, pt. 7, pp. 300-338.

29 Ibid., pp. 290, 301 (two photos with rings clearly shown).

30 Vien khao co hoc, *Hoang thanh Thang Long*, p. 28

31 When I mentioned this cannon, Vietnam archaeologist Nishimura Masanari immediately told me that it did not function.

32 Vol. 3, pp. 890, 899, 911.

33 Needham, *Science and Civilisation in China*, vol. 5, pt. 7, pp. 291-292, 303.

34 Personal communication, April 7, 2008

35 See my forthcoming article "Vietnamese Guns and China."

36 Vu Duong Luan has shown me some stone cannonballs he collected from "Bai Dan" (the same name as the one in the Giang Vo Arena), Ha Lu citadel, Hoa An disctrict, Cao Bang. They are perhaps from the 16th century when the Mac were active there. They are 7cm, 6.5cm, 5.5cm, 4.5cm, 4.3cm, 4.0cm, 3.5cm in diameter, respectively. This suggests that there may be many other artifacts related to gunpowder technology in Cao Bang.

37 Vien khao co hoc, *Hoang thanh Thang Long*, pp. 164, 177-178.

38 For example, Le Thanh Tong mentions "thunder-cannon" in a poem he composed on his way to conquer Champa in 1471 (Sun Laichen, "Chinese Gunpowder Technology," p. 100).

39 Sun Laichen, "Chinese Gunpowder Technology," p. 91.

40 An 18th-century record provides more support for this argument. In 1740, the Qing court noticed a problem in Yunnan and Guizhou: wet weather impacted the effective use of bows and arrows by Qing soliders (Qinding Da Qing huidian shili, junqi, vol. 710, bingbu 169, in Fang Guoyu 方国瑜, *Yunnan shiliao congkan* 云南史料丛刊 [Kunming: Yunnan Daxue Chubanshe, 2001], vol. 8, p. 294). This shows how wet weather in South China (with a climate similar to that of northern Vietnam) affected the performance of weapons.

41 *Toan thu*, p. 656; *Thien nam du ha tap*, pp. 37b, 38b, 40a; Vien khao co hoc, *Hoang thanh Thang Long*, pp. 154-155. See also *Ban guan che dtien le*, vol. 5.

42 *Toan thu,* p. 709.

43 Vien khao co hoc, *Hoang thanh Thang Long*, p. 174.

44 *Toan thu*, p. 664. This is also confirmed by the Thien nam du ha tap, p. 40a. For another example that archaeological evidence corrects written records, see Vien khao co hoc, *Hoang thanh Thang Long*, p. 155.

45 *Ban quan che dien le*, vol. 5.

46 "Pu'n san samai boran thi Lamphun (An ancient musket in Lamphun)," Sinlapakon 20, 3 (1976): 64-66. I thank Kennon Breazeale and Volker Grabosky for making available to me an English excerpt and translation of this article.

47 Sun Laichen, "Chinese Gunpowder Technology," pp. 102-103.

48 Yunnan Sheng Qianbi Yanjiuhui 云南省钱币研究会 and Guangxi Qianbi Xuehui 广西钱币学会, *Yuenan lishi huobi* 越南历史货币 (Beijing: Zhongguo Jinrong Chubanshe, 1993), p. 31. For more comments on the calligraphic style on Le Thanh Tong's coins, see R. Allan Barker, *The Historical Cash Coins of Vietnam: Vietnam's Imperial History as Seen Through its Currency, Part I: Official and Semi-Official Coins* (Singapore: R. Allan Barker, 2004), pp. 119-125.

49 Vien khao co hoc, *Hoang thanh Thang Long*, pp. 17, 48, 52, 144, 148, 151, 152, 157.

50 Chinese specialists on Chinese firearms treat the numbers on them as serial numbers. See Wang Zhaochun 王兆春, *Zhongguo huoqi shi* 中国火器史 (Beiing: Junshi Kexue Chubanshe, 1991), pp. 101-102; Liu Xu 刘旭, *Zhongguo gudai huoyao huoqi shi* 中国古代火药火器史 (Zhengzhou: Daxiang Chubanshe, 2004), p. 74.

51 One still does not know what to make of the double numbers on one gun. For example, on LSb 18239 it says "Phan uy front so #833" and "Character "phan"…#10…," while on LSb 22264 "Character "phan" #730" and "Phan uy Middle So #231." Not having seen the original Chinese characters, or not having been able to see them clearly, I am less entitled to make the connections (see below for an interpretation). Tentatively, I have added the two numbers together, considering that first, they do not make a big difference, and second, many more firearms did not survive to this day, meaning that the total number of firearms we have estimated is on the extremely conservative side.

52 There is another way to compute these percentages, that is, using the numbers of the *so* unit. We are still not clear about the connections between the guns with certain character ("tu 字", for example, "chan" or "phan"), and those with the name of a specific unit (such as "Chan uy Front So," "Chan uy Right So," and "Phan uy Front So," etc). One possibility is that the former refers to the serial number of the whole *ve*, and the latter the serial number of each *so*. However, while this reasoning works for LSb 22264 (the number for the *so* is 231, while the *ve* is 730), it may not work for LSb 18239 if the number for the *so* is larger than that of the *ve* (but we still have to see the actual inscription to know the answer). Let us take LSb 18244 (Phan uy Front So #1,516), a pure number for a *so* (as well as the highest number for a *so*), as an example. Each *so* had 2,400 soldiers, hence if 1,516 guns were made, then the percentage was 63%. But we still have to be very cautious in interpreting this number; for certain *so* may have specialized in firearms (in other words, in these *so*, every solider would have used firearms)—although sources are not clear on this, if it were the case, our numbers would be meaningless. If so, we could not extrapolate to the whole Dai Viet military. .

53 This 38% is almost twice as much as our previous estimate (20%), which was based on the names of the military units containing words such as "sung" (gun or canon) or "hoa ky" (firearm), and which now proves to be very a very low estimate as well as methodologically problematic (Sun, "Chinese Gunpowder Technology," p. 95). This discrepancy also demonstrates the limitation of the written sources and the value of archaeological evidence, even though the latter cannot solve all the problems with textual sources

54 Sun Laichen, "Chinese Military Technology Transfers," p. 498.

55 *Thien nam du ha tap*, pp. 86a, 87a-b (cf. 26b); *Ban quan che dien le*, vol. 2. Related to gunpowder technology, at the Ministry of Works (in the Equipment Workshop, not the Military Equipment Workshop), there were "saltpeter-making craftsmen," who were responsible for manufacturing saltpeter for military and non-military uses, while "fireworks crafters" under the "Directorate for Imperial Accouterments" was responsible for making fireworks (*Thien nam du ha tap*, pp. 86b, 87a, 89a).

56 John K. Whitmore, "The Development of Le Government;" idem, *Transforming Dai Viet, Politics and Confucianism in the Fifteenth Century*, chapter 5 (MS).

57 *Toan thu*, p. 1179 (see also pp. 1181-1182), I thank Takashi Hasuda for helping me decipher the date of this inscription, and hence of the weapon.