Project Number: JLS-0053

THE GLOBAL HISTORY OF THE SWORD

An Interactive Qualifying Project Report

submitted to the Faculty

of the

WORCESTER POLYTECHNIC INSTITUTE

in partial fulfillment of the requirement for the

Degree of Bachelor of Science

by

Christopher A. Bass

Jessica L. Copp

Stacy Haponik

Meghan E. Labounty

Brett M. Levasseur

Date: April 18, 2007

1. History
2. Swords
3. Museum virtual exhibit

Professor Jeffrey L. Forgeng, Major Advisor

Abstract

This project created a website with updated information and photographs of selected swords from the Higgins Armory Museum, along with a database of the museum's sword collection and background information on the swords and their context. The project also created an extensive background research document on the regions, history, and technology behind the swords in the Higgins collection. Finally, a searchable bibliography was created so that any subsequent groups will have an easier, more effective tool for finding relevant books.

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I. Introduction (Meghan Labounty)

The Higgins Armory Museum of Worcester Massachusetts contains one of the best collections of weapons and armor in the United States. The museum has artifacts from all over the world going back to some of man's earliest attempts of constructing the tools of hunting and war. For this project we researched the history of the sword, focusing our studies toward Europe, Africa, and Asia, and covering from the ancient world to the modern era. Our project focuses on how different people in different time periods made swords, designed them, and used them.

For the final project we created a website containing descriptions and photographs of selected museum artifacts. Within each of our individual areas we chose a dozen swords that we wanted to have a closer look at and further document. From that dozen we then chose four that we wanted to discuss in depth on the website. Each of the artifact pages are listed by region and time period. A brief history of the type of sword and a specific description are given and are embellished with detailed photographs of the different sword parts.

The website is intended for high school and college students who wish to learn more about the artifacts contained in Higgins Armory Museum. The background contained within the site is enough to provide a great starting point for anybody looking to research swords more heavily.

As well as the website we also wrote a final project report containing explicit information on the various regions and a more diverse background to the artifacts. Within the final report, a general history of an area is given along with research on the types of swords produced and manufactured during that period. The material within the report is more comprehensive than the website and is good for further learning about individual sword types.

Global regions

During the years before the Common Era many of the sword designs used in Western Eurasia followed an original Greek style. During this period, change is found in the types of metals used to make the sword. Also, the sword was not the primary combat weapon, taking second place to the spear. During the Medieval period we find much more diversity in sword designs and manufacture, each designed to fit a particular need. The swords of this period took on a greater role in combat, symbolism, and prestige.

During the early modern era, from 1500 to 1800, sword design became more universalized and consistent throughout Europe. With swords no longer varying by region, the most important aspect of the evolution of the sword became the types of common swords and their role in society. The two most common swords of the time period were the rapier and the smallsword. Not only were swords used in military contexts, but particular sword types evolved from combat weapons to symbols of status.

In recent centuries, advances in ranged combat and shifts in tactics have lessened the effectiveness of swords in the hands of infantry. However, cavalry wielding backswords and slashing swords were still useful against the slow-loading firearms of the 19th century. In this

period, military sabers, as well as various reproduction, ceremonial, and hunting swords are prevalent.

The Middle East and Northern Africa developed their own styles of sword, distinct from those of Europe. These styles featured a mixture of curved blades and straight blades. The style of the Islamic blades influenced those of Southern Asia and Africa.

South Asian blades exhibit some unique features. Some, called pata, are a combination of sword and armor. Others are broader at the tip than at the base, lending them an axe-like appearance. Still others show clear signs of Islamic influence, in their style and ornamentation.

Sub-Saharan Africa also developed swords. While the swords of Islam and India were primarily for warfare, African swords were a mixture of ritual and function. African swords also exhibit a wider variety of forms than swords from any other part of the world.

Asia can be broken up into three major areas: Japan, China, and Southeast Asia. When Asian cultures were first emerging, China and Japan were closely tied together and heavily influenced by each other. This was also the case for the countries in Southeast Asia. Later, Japan turned inward and became more isolated from the rest of the world. They developed their own culture and with this, swords that were unlike any elsewhere in the world. China was creating swords very early, and was probably the first area in Asia to do so. There are Chinese swords in the Higgins Armory that date back to 1123 B.C. E. In Southeast Asia, Borneo and Malaysia were very similar in the types of swords that they produced, and were heavily influenced by each other as well as Indonesia. The Philippines, being an island chain, were able to keep their own style which differed from the rest of Asia. Unlike Europe where swords were generally the same, Asia has varying types and processes within each region.

Categorizing swords

The basic intent and physics of swordsmanship remained fairly consistent throughout the centuries and regions, but the actual techniques varied among cultures and periods as a result of the differences in blade design and purpose. A sword can be defined as a weapon of various forms that generally consists of a long straight or slightly curved blade with one or both sides sharpened and one end terminating in a point and the other in a hilt or some form of handle. It was used for many purposes including but not limited to military, social and ceremonial uses and it was often worn as a symbol of one's status.

Although there are some differences in form between the three main sword types, there are a few features that hold true to all swords. The hilt is common to all sword types. The hilt is often comprised of three separate parts, the pommel, grip and some form of guard. The pommel is located at the end of the sword and acts as a counterbalance to the weight of the blade. The grip is where the user holds the weapon, and the guard can be gripped by the user for comfort, but it most importantly protects the user's hand from an opponent's sword.

The blade is also common to all sword types. The blade is comprised of two parts, the forte and the foible, and depending on the particular design of the sword it can have a fuller, edge, central ridge and point. The forte is the half of the blade closest to the hilt and the foible is the half closest to the point. The fuller is contained within the forte and is the channel that usually runs along the center of the blade, although some swords can have multiple fullers that are not constrained to the center of the blade and others may not have a fuller at all. The edge is the side of the blade that is sharpened and the point is the sharp tip of the blade. Although there are some exceptions, most blades will conform to one of three characteristic types: straight, curved or concave-curved.

A straight-bladed sword fundamentally consists of a blade with one or two edges for striking and cutting, a point for thrusting, and a hilt for gripping. A straight-bladed sword served both as a cutting and thrusting weapon.

A curved bladed sword consists of a blade with one edge, typically on the outside of the curve. The center of balance of the weapon, due to the shape of the blade, made this an ideal weapon for slashing since the user could effortlessly handle the sword due to its distribution of mass in the blade.

The third type of sword is a concave-curved sword, where the underside of the curve is edged rather than the outer. An example is the axe shaped kora of Nepal. Another exception is the kopis, a single-edged weapon developed around 500 B.C.E with a slight s-shape with a cutting edge used in Greece and in Italy. It was used for heavy hacking or chopping and was devastating in hand-to-hand combat since it was utilized to hack rather that thrust or cut. Compared to a straight or curved sword, the concave-curved sword can deliver a stronger blow and is therefore a more forceful weapon.

(Kopis swords)

Evolution

In order to gain an understanding of how swords have changed with time, it is useful to make an analogy to the biological world. In biology, evolution is the change in the inherited characteristics or traits of a population of organisms. One process that is important to the continuation of evolution is natural selection. Every organism has traits which may be

genetically beneficial to its well-being. If these traits increase the evolutionary reproduction of an organism, they will be more likely to survive in a population. With time, natural selection leads to adaptation for an organism which is the gradual accumulation of beneficial traits and the preservation of existing ones resulting in the organisms' ability to become better suited to the environment.

Differing environments and mutations within a population may cause different populations of organisms to develop in divergent directions. Enough divergence between populations can eventually cause speciation, which is the emergence of two distinct types of organisms from the same origin.

Although a sword is not an organism, its ever-changing components can be described through biological evolution. Going back to ancient times, it is clear that the sword derived from a few common types that were simple yet served a common purpose. As humans became more knowledgeable of their environment, swords became more sophisticated in order to better complete the required tasks. In order for diversification of swords to occur, sword makers and clients had to distinguish between which design was most successful and for which occasion. If a client needed a ceremonial sword, it would be much different than a sword made for fighting because of the differences in environment between a ceremonial setting and a battlefield. As stronger materials were discovered and the techniques for making a sword were refined, more efficient weapons were created. And often the creation of a new type of sword was an accident. The process in which is sword is made is very complex, and simple changes in the temperature of the forge will cause differing outcomes and thus different types of swords. Like an organism, the sword has changed with time to better suit its environment, through human choice, experimentation and naturally by accident.

As is the situation with natural selection in the biological world, if a type of sword was successful, its production continued and subtle changes were made to it in order to improve its design. In other words, its beneficial traits were improved upon to create a stronger and more reliable product. The general form of a sword adapted with time, preserving the design parts that proved to be beneficial and improving upon the areas that were not as useful. However, if a type of sword was not practical, it would no longer be created and its design would not be passed down to future generations of sword smiths. As in biology, an organism that is unable to adapt to its changing environment will eventually fail to exist.

There are many factors that govern selection. A sword will continue to exist if there is confidence in its design by either the client or the sword maker. To the client, a valuable sword was one that worked and was environmentally specific to its type. For example, if it was a ceremonial sword in order for it to be considered effective it would have to be light and fairly small so that it could be carried with ease. It also would have to be decorated to show the status of either the event or the person carrying it. However, if the client needed a sword for the battlefield in order for it to be effective, it would have to be far different from the ceremonial sword. It would need to be larger and heavier so that there could be ample force behind attacks. Since its purpose was not specifically to be worn, there would be less importance on the esthetic design and more emphasis on the strength of the materials used and the design as en effective weapon. Swords that found their own niche and fulfilled their purpose were the swords that tended to evolve as the environment continued to change.

As the environment evolved with time, new sword types were created to be used in different settings. An important factor that drove design and style was personal taste. The emergence of different cultures throughout the world caused different types of swords to be

produced all having varying designs from region to region. Because there was such a difference between the people in these areas, speciation of swords developed. For example, different sword types emerged because of the differing religions. For a period of time in Europe the cruciform sword was popular while in the Islamic world curved swords were popular. Both swords were effective in their cultural settings and each had popular symbolic significance which ensured the persistence of their design. The speciation of the sword between different cultures and areas also caused it to be created for a variety of purposes. While the initial use of the sword was solely as a weapon, from the differing cultures emerged different uses. Swords began to be produced for costume and ceremonial purposes. The decorative swords, which were often worn, took the work of many expertly trained craftsmen and were very expensive and time consuming to make. The prestige of owning such a weapon was so great that the sword became a high symbol of status and form of show.

Through studying the history of the sword on a global scale we not only gain an understanding of the evolution of the sword through the ages, but a strong insight to the types of people that used such weapons and the course of their daily lives.

II. The First Swords (Brett Levasseur)

1. History of Greece and Rome

While Greece was originally inhabited by a people referred to by scholars as the Aegean these were not the people that we think of as the Greeks. Greece did include many different cultures that merged together, the main group of people that became the Greeks were the Indo-Europeans. It is believed that the Indo-European migration took place before the twelfth century B.C.E. or possibly before the second half of the sixteenth century B.C.E. While the Indo-Europeans did bring their own group of languages to Greece it is believed that the original language of the Aegean's remained very influential. Names of places and of objects like plants, metals and others in Greece are pre-Indo-European. This shows that while the Indo-Europeans became the Greeks that we know of the indigenous Aegean people did have an affect on the new immigrants (Bengtson, p. 4 - 7).

The first major civilization to contribute to the development of the Greeks was the Minoan civilization based on the island of Crete. The Minoan culture did not experience any major wars and so its people were peaceful and spent time on the arts such as pottery making. The Minoan culture made its greatest contribution to the Greeks in the field of religion. The Minoan people had a high cultural regard for women that became the basis for the worship of the

Greek goddess Athena. The Minoan civilization eventually fell apart, probably from the damage of constant earthquakes (Bengtson, 1988). However, one of the civilizations that the Minoans influenced was the next great civilization of Greece, the Mycenaeans. Unlike the Minoans, the Mycenaeans developed a love for war and a heroic ideal. The great epic poems of Homer such as the *Iliad* and the *Odyssey* were stories of the Mycenaeans (Bengtson, p. 12, 13).

The next step that helped to form the people of Greece was the Great Migration before the year 1200 B.C.E., which also coincided with the changing from the Bronze Age to the Iron Age (Bengston, 1988). This migration brought the next major culture that would assimilate into the Greeks, the Dorians (Bengston, 1988). Other groups that migrated into Greece were the North-West Greeks and later, during the Aegean Migration, the Ionians. From 1100 to 800 B.C.E Greece went through a dark age. After this dark period the Greeks began to colonize, with its people settling everywhere, "from Spain to Caucasus, and from southern Russia to Egypt". With this the Greeks began to spread their ideas and culture into areas that they had not reached before (Bengston, p. 24, 39).

During the eighth and seventh centuries B.C.E. Greece also began to develop the polis or city-state. These city-states did not first develop in Greece but in their colonies on Asia Minor. Instead of Greece unifying under a single rule, there were hundreds of city-states that had control of their city and the surrounding rural areas. Most states had a limited foreign policy; whenever a prolonged foreign effort was needed it required the alliance of multiple city-states. Two of the most famous city-states in Greece were Sparta and Athens (Bengston, p. 27, 44, 45).

Sparta was a militaristic nation that brought all of the surrounding regions under their control. The Spartans sought to keep power and control over conquered territories, so they developed the greatest soldiers in Greece. Boys were taken from their parents at age seven to

begin their education and military training. Sparta did not participate in many of the cultural aspects of life that many other Greeks did. The Spartan form of government had two kings who shared power, the Council of Elders (comprised of 30 members including the two kings), and the military assembly or Apella. By the sixth century a secret service, expulsion of foreigners, and prohibition on certain kinds of currency like gold and silver made Sparta a police state (Bengston, p.66 - 69).

Athens in contrast was an aristocratic state where the power of both government and religion rested with the nobility. The nobility got much of their power and wealth from being landowners. The farmers and wage earners hence found themselves dependent on the landowners for their livelihoods. The codification of the laws in Athens by Dracon around 624 B.C.E. started to improve the status of the majority of the people and change the political setup of Athens. Not too long after this, other leaders changed the laws to free people enslaved by debt, limit the amount of land a person could own, and other laws that helped to take power away from the aristocrats. These actions changed the very economic and social makeup of Athens. Now more people could own land instead of just the noble families. In this way power in Athens fell to the people who controlled the most land and not necessarily those from noble families, making Athens a timocracy. At this time most other Greek city-states were patriarchal aristocracies (Bengston, p. 69 - 74).

Like the Greeks the Romans were also made up primarily not of the indigenous population of Italy but by the migration of the Indo-Europeans (Robinson, 1965). In these early settlements the people first grouped their homes into villages; these eventually became towns; then became cities. The Etruscans were another cultural group that made their own home in Northern Italy around the tenth or ninth century B.C.E., away from the Indo-Europeans that

would become the Latins. The Etruscans came in contact with the Greeks who had established colonies in Italy and copied both their form of writing and their military equipment. Evidence of structures such as aqueducts and sewers suggests that the Etruscans were excellent organizers. The Etruscans then started to move south, taking over territory as they went until they arrived at the city of Rome that the Latins had established (Robinson, p. 7, 11, 12).

The Etruscans did not have to conquer Rome since the people of Rome appointed Etruscans as their rulers around the sixth century B.C.E. The Etruscans helped Romans to grow and become more powerful with their organizational abilities. However, the Etruscan rule became tyrannical and the Romans forced out their Etruscan rulers. The Etruscans then attempted to retake Rome, but in the end were not successful and forced to leave Rome in 496 B.C.E. (Robinson, p. 19, 25, 26).

Rome soon began to expand its power and take control of Italy. It became standard practice that once Rome took control of an area it would leave the local government in place to run the area as it did before. This way the people of these areas could still live their lives as they had previously, though now they were a part of Rome. However, some of the inhabitants of Italy had no real towns or cities but tribes. Those that seemed radically different or alien to the Roman people like the northern Etruscans, whose speech was considered “outlandish”, were just made military allies. Rome only expected these people to provide military support in Roman efforts and little else (Robinson, p. 59 - 62).

In 391 B.C.E. the people to the north of Italy in Gaul known as both the Celts or the Gauls began to invade Italy. The population of Rome was forced to evacuate the city except for a small contingent in the Capitol that fended off the invaders for seven months. The Gauls ultimately accepted a gold payment to leave Rome in 390 B.C.E. After this many of the people

Rome had brought under its control began to launch raids against the crippled power such as the Etruscans, even the Gauls returned. However, Rome managed to fend them off and regain all that it had lost by around 350 B.C.E. (Robinson, p. 37, 62, 65).

Rome's power would drastically change after the Punic Wars. The Punic empire and Rome were two of the most powerful empires on the Western Mediterranean at this time and both fought for dominance in the region. There were three different Punic Wars; the first was originally between Carthage (now in present day Tunisia) and the Greeks. However, in 264 B.C.E. the Greeks requested Roman assistance in the war. The Second Punic War around 202 B.C.E. changed everything. The defeat of Carthage gave Rome complete control of the seas; giving Rome the ability to freely move its troops not just through Italy but also to other nations of the Mediterranean. Whereas all the territories that once made up Rome had a great deal of freedom, they were now brought under strict control, and all of Rome became one (Robinson, p. 88, 132, 134, 135).

Through successive wars Rome came to control lands in Africa, Spain, Greece, Asia Minor, and even Gaul. However, eventually Rome began to decline in power. With all the territory Rome gained it needed a very large and active armory to keep all of its territories under control, which only hurt the Empire's overall strength. Many other economic and social factors contributed to a decline in Rome's power. In the fourth century C.E. Rome went through many political problems, with rulers dividing up portions of the empire to be ruled separately. Soon the empire was completely split into a western and eastern half. The western half of the Roman Empire effectively ended in the fifth century C.E., and by the seventh century C.E. little about the western and eastern parts of the former Roman empire were distinctly Roman anymore (Frank, p. 565 - 576).

2. Ancient Swords

The first swords to develop in Europe show versatility and innovation. From stone to bronze and then to iron new materials were found to be better in weapon making. Also the designs of swords developed to meet different combat needs. The weapons of ancient Europe would form the foundation for the weapons of Europe in the Medieval period.

The Bronze Age was the first period in history when people started to regular use metals to create different products, including weapons. During the development of these types of metals it was discovered that copper alloys, such as tin-bronze, would form harder metals, especially when hot-forged (Coe, p. 9).

Minoan swords that are believed to date from the 17th century have hilt plates ornamented with sheet gold. The entire weapon is around 39 in / 100 cm in length. They have a narrow profile, high steeped central reinforcements or midribs and a smaller tang. These swords also use two rivets to attach the hilt to the blade. This design is not very strong since the only thing holding the blade to the hilt are just these two rivets. In regular combat a sword would be exposed to multiple bursts of force from string opponent, with only two rivets it is likely that the force could break one or both rivets (Coe, p. 12).

While the Mycenaean's used the sword, also called a pakana, as a secondary weapon, they still produced multiple types to fit their needs. One of these swords is known as the Type A. This type of sword has rounded shoulders, short tangs and pronounced midribs. This sword is believed to have been influenced by the Minoans. The Type A sword was mainly a thrusting weapon. (Grguric, p. 15). Another sword used by the Mycenaean's was the Type B. There are not as many examples of this type of sword as compared to the Type A. These blades have

square pointed shoulders, longer tangs and a shorter blade. The metal of the shoulder is hammered up into a flange in order to retain the hilt plates; rivets further secure these plates. It is believed that this sword could have been developed from the flanged dagger or have been influenced by swords of the near east (Grguric, p. 15). A variant on the Type B sword was the horned thrusting sword, which got its name from its pointed shoulders that had been extended to form horns (Grguric, p. 16).

Swords after around 1400 B.C.E. had a flanged hilt type. They sometimes had a pommel or a T-shaped tang terminal to a knob of ivory, stone, or wood. The swords in this later period of Mycenaean history have broader blades, are 12 – 16 in / 30 – 40 cm long that tapered sharply towards the tip. The shoulders were square-flanged with a straight-flanged hilt with an integral T-shaped pommel. This type of sword was used more for slashing instead of thrusting (Grguric, p. 16).

During the later Mycenaean period (around 1200 B.C.E.) we see a grip-tongue design of sword (described below). The grip-tongue sword became the standard long sword of Greece (Coe, p. 20).

Many of these first metal swords are copied in design but in flint stone all over Europe. Later, half way through the Bronze Age, the rapier type sword, like the Type A, was most common sword of Western Europe. One problem faced was that swords that used rivets to attach the hilt and the blade would break easily. The answer was to cast the blade and hilt in one piece. Rivets were then used at the hilt and shoulders to hold the hilt plates in place. These advancements happened in the Mid Bronze Age and lead to the creation of the Grip-Tongue sword (Coe, p. 14, 15).

Also known as flange-hilted or Type 2, the Grip-Tongue sword had a long blade, which swelled into a triangular shoulder with a tongue-like grip at the end. Rivets would be used to hold the hilt plates to the shoulder and the tongue portion of the sword. The base of the tongue grip would protrude out to make the pommel.

Other swords developed with a broad leaf design where the blade swelled out into the shape of a broad leaf for extra weight at the end of the sword providing added power to blows (Coe, p. 16).

Around the coasts of Britain, France, and Iberia, a sword with a carp-tongue blade shape was developed. The lower portion of this long, stout, and straight-edged blade would taper to a sudden point. For many of the blades made during this time period the upper few inches were milled so another sword would not slide upwards on the blade in a fight. Many of the European swords are decorated with incised lines, usually concentric arcs forming geometric patterns. The grip-tongue type of sword was used all over Europe in the late Bronze Age in nations like the Ukraine, Romania, Ireland, Spain, Sweden, and Italy.

(<http://www.angloantiquities.com/332/11a.jpg> 11/5/2006).

The metal hilted sword was also developed around the Mid Bronze Age in Europe since it was developed after the grip-tongue sword. It was designed after the grip-tongue sword but was manufactured differently. A tube of metal with an elliptical cross section was cast onto the upper part of the blade so that it would merge with the triangular shoulder. The grip ended with the metal swelling into a disk often with a circular knob, button or bowl. This was meant to stop the sword from slipping out of ones hand. These grips could be designed with incised geometric patterns, usually running spirals arranged in bands between raised ribs.

The overcastting technique of taking the metal from the blade and casting it to the metal for the hilt was a great technical advancement over riveting since it made the entire weapon more durable. Bellow is a grip-tongue type of sword that has a metal hilt. (Coe, p. 16, 17).

(Coe, p. 16).

There were some people who used iron during the Bronze Age but iron did not become widely used until after around 1200 B.C.E. Some of the first places to use iron were Syria, Palestine, Cyprus, and Greece. Iron was not used much in Europe until the late Bronze Age, and it was not completely adopted until around the year 700 B.C.E.. Iron holds advantages over copper in that it is more abundant, it is more evenly distributed, and it can be forged into much harder and sharper weapons than bronze. The first iron swords in Greece were still made on the same design as the bronze swords used before. It was more difficult to work with iron since if could not be cast like copper. To make an iron weapon the iron was reduced to ore with slag that would be beaten out before it could be forged. The smelting process was done with charcoal. During smelting carbon would get into the iron and make some of it steel, and hence make the metal harder. However this could not be controlled. The process developed was that a block of metal would start to develop steel in it; the smith then had to beat the metal into strips, plait it, reheat it until white hot, and then repeat until the metal was consistently hard (Coe, p. 17, 20).

The Celtic sword of around 700 to 600 B.C.E. was based on bronze ones used before, except with a longer and heavier design and more elaborate pommels of a roughly conical form. To the Celts owning a sword was a sign of warrior status (Coe, p. 18).

Later between 500 and 100 B.C.E. swords made of iron and steel were pattern welded by forging strips of different metal together. These swords were long and double-edged, straight-sided, and

slender with a long narrow tang. A series of mountings were fitted onto the tang in bronze, probably with organic materials in-between (Coe, p. 18).

The spatha sword, which was used during the Gallic war, had a blade of 26 – 28 in /65 – 70 cm long with a short point. This is a long slashing weapon used by the Celtic cavalry (Coe, 1989). Some of these blades could be 24 1/2 or 25 inches in length (62 and 63 cm) or have a width of 1 1/4 in / cm. Others were 32 in / 80 cm long and 1 1/2 in / 4 cm wide (Coe, p. 28).

(Coe, p. 28).

(<http://images.google.com/imgres?imgurl=http://www.deltin.net/2040.hi.jpg&imgrefurl=http://www.deltin.net/2040.htm&h=597&w=448&sz=23&hl=en&start=27&tbnid=2WUCeyjaTOe8IM:&tbnh=135&tbnw=101&prev=/images%3Fq%3DSpatha%26start%3D18%26ndsp%3D18%26svnum%3D10%26hl%3Den%26lr%3D%26client%3Dsafari%26rls%3Den%26sa%3DN> 11/5/2006).

By the end of the 9th century all weapons were being made of iron. The grip-tongue sword that was developed in Europe was brought to Greece and evolved into the hoplite sword. This sword, which was made in Greeks Classical Period, had a double edged blade that originally was about 24 in / 60 cm in length, the width of the blade decreased just below the hilt and then widened gradually, reaching its maximum width at just over two thirds of the way down, the blade then tapering to its point. The tang of this sword was flat and similar to the Bronze Age grip-tongue sword, being a complete cross-section of the hilt. The grip would have

two pieces of bone or wood around the tang and then be covered totally or partially with a thin piece of metal. By the time of Alexander the Great the blade on the hoplite sword had decreased to only 16 – 18 in / 40 – 45 cm.

The hoplite sword was designed for slashing but it could also cut and thrust. The Greeks spread this sword around as they colonized different areas (Coe, p. 20, 21, 22).

(Coe, p. 20).

The kopis sword that was developed around 500 B.C.E. was a single-edged weapon with a slight s-shape with a cutting edge used in Greece and in Italy.

The kopis was used for heavy hacking or chopping. This type of sword was devastating in hand-to-hand combat since it would be used to hack at opponents rather than just stabbing or cutting them. In Greece cavalry mostly used the kopis. This sword evolved into a slimmer saber that was adopted by the Spanish and made into the falcata sword. Early versions of the kopis had an entire weapon length of 24 in / 61 cm (Coe, p. 22).

(Coe, p. 22)

Before the Etruscans or the Romans inhabited Italy there were many different swords used, though the grip-tongue swords of both iron and bronze were the standard. Some other swords were short with multiple lines following the blade edges with a grip profile to fit a person's hand and a T-shaped pommel. They also had metal hilted swords, some with the disk pommel but more with an antenna-like pommel, one of these swords can be seen bellow (Coe, p. 18).

 (Coe, p. 23).

In the 7th century B.C.E. as the Etruscans were forming all weapons in Italy were being made of iron. It is believed that the straight bladed sword was originally set aside in favor of a

curved blade sword, but it is hard to tell since iron weapons do not survive as well as ones made of bronze. The Etruscan version of the kopis sword was 24 in / 60 cm in length and the blade reached its broadest point at three-fourths of the way down.

The people of Italy also adopted the hoplite sword and around the 5th century B.C.E. The hoplite and the kopis were the main swords in Italy (Coe, p. 18, 22).

Romans adopted the Gladius or Spanish sword around the 3rd century B.C.E.; this was a short thrusting type of sword. However the sword could break while cutting or hacking (Coe, p. 24).

 (Coe, p. 25).

Another Roman sword was the mainz-type. These were the swords used during the time of Caesar. The blade of the sword was 20 – 24 in / 50 – 60 cm long and 2 – 2 1/2 in / 5 – 6 cm width. The width of the sword increased slightly before tapering to the tip.

One of the advantages of the Mainz-Type of sword was that its long point could pierce mail (Coe, p. 27).

3. Medieval Europe

Between the fifth and ninth centuries C.E. many different people were invading the Mediterranean constantly. The once great and powerful Roman empire in both its halves, the western empire centered around Rome and its eastern half centered around Constantinople, were being forced to defend themselves from Muslims, Lombards, Slavs, Huns, Ostrogoths, and others (Holmes, p. 1 – 22). These were not the only problems to occur during this time period

either. Plagues that first broke out in 542 C.E. did not subside for two centuries. Between the fourth and eighth centuries climate changes caused a reduction in agricultural production. (Holmes, p. 22)

Rome's once vast empire had left many of its citizens scattered across Europe among the people that the Romans had conquered. Different migrations brought new people to various parts of Europe; the Romans in northern Europe came under the rule of the people that once fought both against them and alongside of them as mercenaries. The Goths, Burgundians, Vandals and Franks all brought Roman citizens into their societies. The integration of the Romans and these other Europeans was more easily accepted as many of these different people converted to Christianity, the religion of the Romans (Previté-Orton, p. 129). The northwestern section of Europe, including modern-day England, Belgium, Germany, Switzerland and Austria, became Germanic in language and culture (Holmes, p. 60).

As Rome's resources weakened they could no longer protect their colonies in Britain. In 408 C.E. the Romans decided to give the people of Britain the right to arm so that they could defend themselves. The people of Britain had enemies in the form of the Picts to the north, Irish to the west, and various German tribes from the mainland. Different groups began to invade Britain around the fifth century C.E. and by the tenth century C.E. Germanic people like the Angles, Saxons, Jutes, Frisians had gained control of modern England (Holmes, p. 62, 63). For the rest of Europe, by the end of the sixth century the Bavarians moved to the upper Danube, the Lombards to Italy, the Slavs to the Balkan provinces of the Roman Empire and west into Bohemia and Moravia (Holmes, p. 67).

Many of the people of Europe began to convert to Christianity, for various reasons. The religion was well organized, with a network of bishops distributed across Christian areas giving a

link to Rome and the Pope. Converts were also won over because Christianity offered eternal salvation. As the religion grew, anyone who converted was brought into a much larger and closer community than they may have been part of before (Holmes, p. 39). By 900 C.E. Gaul, Germany, Britain, and Ireland all were Catholic and had governments that enforced Christianity. Along with religion, Christianity also brought aspects of Rome to these civilizations, such as Roman ideas of law and government. (Holmes, p. 68).

While both the western and eastern portions of the former Roman Empire had been Christian, they began to develop different ideas on their religion and on their views towards the world. The western group of Christians centered on Rome was interested in expanding their power and converting the people of Europe to Christianity. Those Christians in the east, centered on Constantinople, felt that they were the true Romans and therefore superior. They spent less time attempting to convert those around them and instead spent more time defending Europe form the eastern front of Islamic expansion. In order to gain power the Catholic Church in Rome needed to gain more people who would follow the Pope. In 774 C.E., after the Lombards had invaded Italy, the Pope convinced the Frankish King Charles to come to Italy and remove the Lombards. Once this was done a papal state was created from which the Catholic Church would exert a great deal of power. The Pope then crowned Charles emperor in the year 800 C.E. in the hope that this would strengthen the Pope's control over Charles. This act also showed that the Church wanted to extend its power in the west while ignoring the interests of the east and the Byzantine Empire. Those people of Byzantine who felt they were the true Romans were alienated by seeing the Pope crown someone, who to them was a barbarian, as the emperor of what was Rome (Holmes, p. 20). By1050 C.E. the developing differences between the Catholic Church and the Christians of the Byzantine Empire became great enough that a schism occurred.

The people of Byzantium broke away from the Catholic Church and eventually became the Eastern Orthodox Church (Holmes, p. 45).

Events like the coronation of Charles as Emperor by the Pope shifted the power base in the European world from the Mediterranean to the north. By the tenth century the linguistic and ethnic profile of Europe began to settle into the regions that make up modern Europe (Holmes, p. 61). The kingdoms of Europe that did not have a great deal of sustained conflict did not become very powerful, like the Irish, Saxons, or Scandinavians. Anglo–Saxon kings and Frankish kings did have many conflicts and their kingdoms grew in power (Holmes, p. 78).

All of the migration that occurred over Europe had broken up many of the tribal groups that once held the political power. In their place kings, lords, and other war leaders would gather military forces to enforce their power. The leaders did have to keep control over their military, so they would pay them either in money or in land in exchange for military service. In order to have the resources needed to keep a powerful army, the leaders had to engage in war to gain new land and more money (Holmes, p. 79). Europe developed a feudal system where a lord would grant land to a vassal in exchange for military service, payment of dues, and obedience to the lord's rule. One of the smallest groups of soldiers that made up the medieval army and yet one of the most important was the knight. Knights would wear heavy armor that would normally make them slow; however, once mounted and with a spear they became a powerful force in battle. They were also heavily trained in not just fighting but tactics. An army with an effective group of knights had an advantage in battles (Holmes, 117). The common people were reduced to peasantry since they had to work for the landowners to live, and had to live by their rules (Holmes, p. 120).

4. Medieval Swords up to 1300 C.E.

Swords of the Middle Ages did not just continue to develop on their ancient predecessors but also developed greater significance to the culture of Medieval Europe. The Vikings valued their swords above all other weapons and would give them names.
Swords even took up a new role outside of combat for ceremonial purposes.

While there was variety in sword design during the Middle Ages, the majority of swords that were developed were related to the spatha sword used by the Celts and the Romans. This sword became popular because it was a single-handed double-edged sword that could be used on horseback. For the foot soldier, the one-handed sword could be used in combination with a shield. Since the medieval soldier was already equipped with armor and a shield, swords of this period developed into offensive weapons with little defensive capability. (Coe, p. 30, Jean-Denis, p. 82, Blair, p. 1).

The usual length of swords during this period was 35 to 40 inches (88.9 to 101.6 cm) total length. The majority of swords were mostly used for cutting and slashing, rarely as thrusting weapons, though they could be. Blades all over Europe were generally broad and flat with a slight tapering towards the tip. (Blair, p. 2, Edged, p.27).

One of the only defensive features on the swords was the development of the quillon. The quillons were a crossbar that separated the blade from the hilt. This bar would guard the user's hand from attacks. As time went on the crossguard became longer, thinner, and would sometimes droop towards the point of the blade; the curved quillon is common in thirteenth century swords (Blair, p. 1, Coe, p. 32, 36).

While most swords retained a similar design to one another, one of the elements that did change was the pommel. The pommel was a piece at the end of the hilt that was used to

counterbalance the blade. At different points different pommel designs became popular, but this does not mean that pommels of other types could not be used. During the early eighth century, pommels generally were made of oval plates held together by four pins. A wedge shaped cap would then be placed on the pommel (Jean-Denis, p. 82) (Coe, p. 32).

(Coe, p. 32).

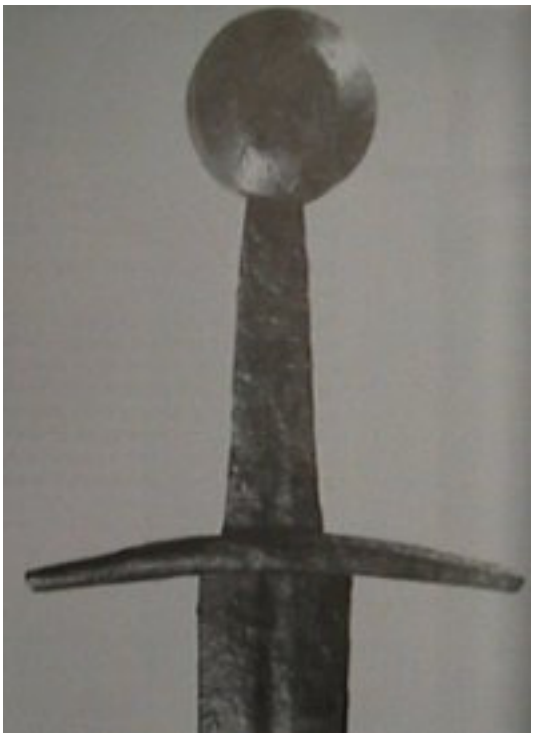
Other pommels developed later in the eighth and ninth century, including a design that was divided vertically into many segments (Coe, p. 32).

(Pierce p. 72).

By the eleventh century the pommels started to have a Brazil-nut shape (Coe, p. 36).

(Coe, p. 28).

Around the year 1100 the wheel-shaped pommel was also introduced and eventually became the normal pommel type throughout Europe (Coe, p. 38).



(Pierce, p. 135).

During the medieval period swords began to develop more cultural significance. Some swords were made as gifts for rulers or had ceremonial roles. These swords were very decorative and were often refurbished in order to keep them looking new as they were kept for many years to fulfill their ceremonial roles. Examples of regalia swords include the Sword of Charlemagne and the Sword of St Maurice (Coe, p. 35 – 36).

The Sword of Charlemagne resembles Islamic designs and was probably made in Russia or Eastern Europe in the ninth century. This sword was different from many of the time in Europe since it had an angled tang and its blade is single-

edged with a slight curve. The sword is overlaid with copper decorated dragons and can be seen bellow.


(Coe, p. 36).

The Sword of St. Maurice was a ceremonial sword used at the coronations of German emperors. This sword has a gilded iron pommel shaped like a Brazil-nut, engraved with Latin inscriptions. The blade is marked with a cross within a circle. The Sword of St. Maurice is shown bellow. (Coe, p. 36).

(Coe, p. 37).

Medieval swords are often categorized by the Oakeshott sword types. These are double-edged single-handed swords that come in a few typical forms.

An example of the Oakeshott Type XI was discovered in Finland. It dates from the late eleventh to early twelfth centuries. Its blade is 81.7 cm long and the entire weapon's length is 97.5 cm. The blade also has a narrow fuller on both sides that runs to within a few centimeters of the tip of the blade.

(Pierce, p. 134).

An example of the Oakeshott Type Xa was discovered in Finland. It dates from the late tenth to the mid eleventh centuries. Its blade length is 84.9 cm long and the entire weapons length is 98.3 cm. The blade has a narrow fuller that runs down to within 14 cm of the tip.

(Pierce, p. 132).

The seax sword was typically a Scandinavian type of weapon, though it was also used in other areas further south and originated from the first to third centuries C.E. Unlike the majority of weapons of this period the seax was a single-edged weapon. It had a point set at a distinct angle to the blade. Earlier versions of this sword had a grip formed with plaques riveted through the tang; later versions have grips that just fit over the tang. The following picture is the blade of a seax from Sittingbourne, Kent, UK (Coe, p. 32).

 (Coe, p. 33).

The falchion is another single-edged weapon that was popular in the thirteenth century. This sword was broad and cleaver-shaped with a straight back. The blade also has a channel or fuller running down it. In illustrated examples from Europe this weapon appears to be associated with pagans. The following falchion is probably an English version from 1257 – 72 C.E. (Coe, p. 38).

 (Edge, p. 89)

5. Medieval Swords from 1300 – 1500 C.E.

Some of the greatest innovations that took place in sword design of the late Middle Ages occurred not with the blade but with the swords hilt. With new tactics and styles needed to fight new armor and other needs the sword hilt began to see great innovation that would proceed into the Renaissance of Europe.

By the end of the thirteenth century the Europeans begin to use plate armor, which makes cutting and slashing weapons ineffective. Swords now needed to develop into better thrusting weapons so that they could penetrate the new armor. The length of sword blades began to increase to an average of around 50 in / 125 cm (Coe, p. 39). Blades were broad, double-edged, and had a sharp point. Single-edged weapons were still used though not in as many numbers as the double edged. In order to compensate for the longer blades, the hilts were made longer so that both hands could be used to hold the sword. Pommels were made heavier, and we see more metal pommels in use, though some examples of rock and crystal pommels are known (Coe, p. 39).

Some of the new types of swords that fit this style are the hand-and-a-half swords, also known as bastard swords. These weapons were so named because they were primarily meant for one hand, but the hilt was long enough so that two hands could be used on the sword for a more powerful attack. The hand-and-a-half swords were first developed in the mid twelfth century, but became very popular in the fourteenth and fifteenth centuries.

(HAM 1199)

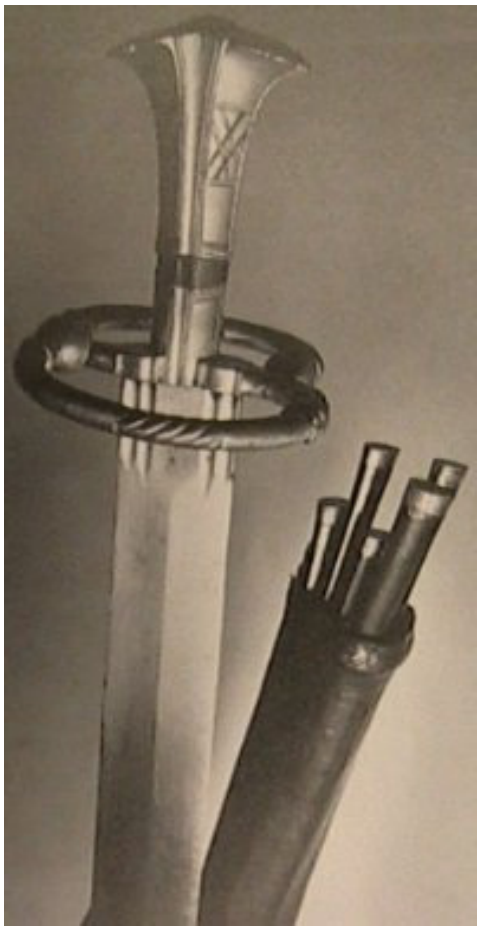
Other examples of swords of this longer cruciform type (long blades with hilts and quillons that make the sword look like a cross) include two-handed swords and bearing swords. The hand-and-a-half sword could be used with one hand; the two-handed sword needed two hands to properly wield it. Two-handed swords were even longer than the common swords. These swords were up to 72 inches or more in length and would weigh between five and eight pounds. The two-handed sword was first developed in the second quarter of the fourteenth century C.E. (Blair, p. 2, Coe, p. 48).

 (HAM 2964.2)

The bearing sword on the other hand was not meant for combat. This sword was first developed in the fourteenth century C.E. and was used during ceremonies or would be carried with ceremonial dress. It was commonly an oversized version of the two-handed sword (Coe, p. 41).

(HAM 1901)

While the blades of swords did see some changes during this time period, the greatest amount of change came to the hilts of swords. While some hilts grew in length to allow two hands, other hilts began to develop guards for the hand. One of the more unique new designs for the quillons on the sword came from the German Katzbalger (meaning brawler) that was favored by German mercenaries in the late fifteenth century C.E. This single edged sword was unique in that its quillons were bent into an S shape (Coe, p. 47).



(Edge, p. 148)

While the quillons of the katzbalger were unique, other hilts began to adopt comparable designs to protect the hand.

While the katzbalger kept the entire hand away from the blade other combat styles required the hand to be against the blade. One hilt design to accommodate this was the forefinger ring. A portion of the quillon was split and curved towards the blade so the user could have their finger above the quillon and still have it protected. Swords and art work depicting swords show that these hooks were first used on single edged cutting swords from the mid to late

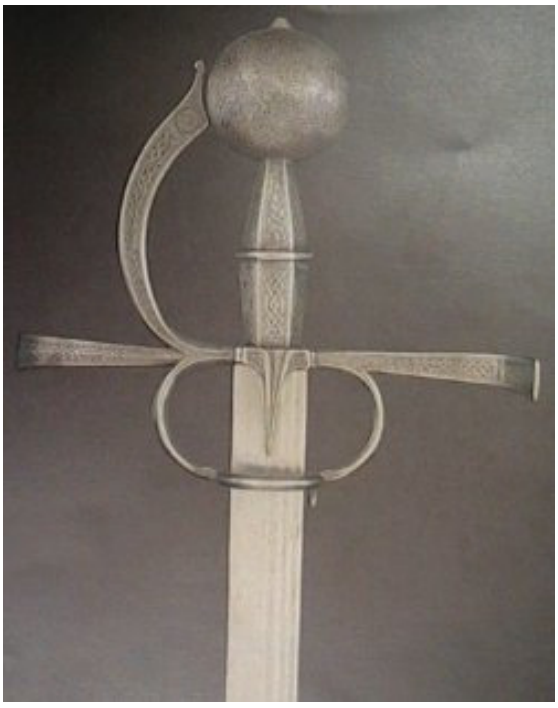
fifteenth century C.E. Later in the sixteenth century C.E. this design appears on straight and double-edged weapons (Coe, p. 45). While the hook helped to protect the hand from other swords, the user's own sword would have the bottom part of the blade near the hilt unsharpened so that the finger may rest upon it. This unsharpened area is referred to as a ricasso and appears to have been in use since the mid twelfth century C.E. suggesting swordsmen were slipping a finger onto the blade even before the development of the finger ring. Other blades had a portion of the metal cut out in the shape of a crescent for the finger (Coe, p. 45).

To protect the rest of the hand the quillon was also curved down to the hilt. This feature was first seen on the falchion and other cutting types of swords from the late fourteenth and early fifteenth centuries C.E. (Coe, p. 46). A forefinger hook, knuckle guard, and ricasso can all be seen in the following photo.


(Coe, p. 42)

The sword shown above is a Venetian broadsword with a knucklebow and a finger ring, made around 1450 C.E. (Coe, p. 42, 45).

Around 1450 C.E. knuckle guards were combined with two forefinger hooks that were placed on opposite sides of the blade. Around 1475 C.E. the knuckle guard was combined with the two hooks (Coe, p. 46).


(Coe, p. 47)

After this development the ends of the hooks were fitted with transverse lugs or a short curved bar that went horizontally between the two hooks; this became known as a side ring. Also as seen in the picture above the knuckle guard evolved from being a bent quillon to being a new piece of metal that came from the quillon. Late in the 1400's another guard was included on hilts that could be another side ring, a post, or a short block that would come out horizontally from the outer face of the quillon block. This was meant to protect the back of the hand. Many of the first swords to develop these hilts were those used by infantry and other lightly armored soldiers. Those in plate armor had their hands already covered and did not need guards for their hands.

The new designs for hilts would eventually evolve into the swept-hilt swords developed during the Renaissance (Coe, p. 46, 47).

As for pommels, the wheel design remained in use through the sixteenth century. Some of the new designs to be developed included the triangular or wedge-shaped pommels that had the narrow end near the grip were developed in the fourteenth century. Around 1400 the pear-shaped and faceted pommels were also introduced. With these advancements in sword design the medieval period ends and the Renaissance begins.

6. Manufacture of the Medieval Sword

One thing that all swords of the medieval period shared was the material used to make them. The primary metal used to make these swords was wrought iron, which is a more pure form of iron compared to the iron ore that it was extracted from that contained other materials (Gogan, p. 11, 12). Some of the reasons why wrought iron was valuable in making weapons is that it is resistant to corrosion, malleable enough to shape into different designs, and soft enough to be cut (Gogan, p. 28).

Wrought Iron was produced by taking iron ore and heating it in a charcoal fire to a temperature of over 500° C. Air would also be blown into the furnace during this process either with the aid of a bellows, a device that could expand to collect air and contract to release it, or using a natural draft. What was produced from this process was a spongy mass of iron mixed with slag, the stony waste that is separated from metals. This was then worked while hot to squeeze out most of the slag (Davidson, p. 16).

Sword blades need to be strong and sharp to be of any real use. That is why blades were also given an outer layer of steel to make the exterior of the blade hard, and to let it hold a sharp

edge. With an outer layer of steel the sword was a strong weapon, and the inner layer of wrought iron made it resistant to fractures (Edge, p. 26).

Steel is a form of iron that has had carbon absorbed into it. This process, known as carburization, makes the metal hard and strong. Medieval sword did this by heating wrought iron using a carbonaceous material, which was usually charcoal. The carbon that was normally in the charcoal passed into the wrought iron. In some cases, such as with weapons, the metal workers may have given their finial product a hard surface of steel, this was accomplished by heating the metal once more and quenching it in a cool material like water. The cold quenching material made the metal cool down faster than it normally would giving the metal different properties than if it cooled down gradually. When the metal is cooled down rapidly the carbon and iron in the metal that form cementite, which is a hard and brittle iron carbide, is crystallized and remains stable. If the metal were allowed to cool down slowly the carbon and iron would separate. During the medieval time period metal workers did not realize that it was the carbon in the charcoal they used that made the metal hard. Instead they believed that the process was made successful by the type of liquid used to cool the blade (Gogan, p. 14).

While the quenching process did make the metal harder it also made it more brittle. In order to reduce the brittleness of the metal while maintaining its hardness it would go through the annealing process. Annealing is when metal is raised to a red heat and then allowed to slowly cool over time. This is done after the blade has been quenched and it allows the cementite crystals to disperse into a less regular arrangement. It is this arrangement of the cementite crystals that creates the brittleness of the metal (Davidson, p. 18).

The sword makers of northwest Europe who did not have access to better quality ores after the fifth century C.E. had to use limonite, which was a mineral consisting of hydrous ferric

oxides. These were referred to as bog ores because they were collected from lake bottoms and marshlands. The high phosphorus content of these ores allowed them to be reduced at low temperatures, but the process created a soft and impure iron. It was up to the sword smith to determine what parts of this metal were worth keeping using in their swords, and which portions were worthless. One of the ways smiths could find the better metal in their ores was a method use by the Celts. The Celts would burry their iron in the ground before they would re-forge it. Burring the metal made the softest portions of it would be eaten away by rust. The sword smith was then left with the harder portions of iron that would be used to make swords (Davidson, p. 17).

The major manufacturing process that was used from Dark Ages until around 1050 C.E. was pattern-welding, which is believed to have been developed by Celtic sword makers. This process of sword making could use both good and poor quality iron, allowing good quality blades to be produced even when good iron was hard to find. A pattern-welded blade was made in multiple parts. A centre bar was made from several thin rods of wrought iron that were hardened in a charcoal fire that made the surface of the wrought iron turn into steel. The rods were then heated until red hot, and then twisted together and hammer-welded at white heat to forge the centre bar together. Then two ‘v’ shaped pieces of steel that formed the edges of the blade were placed on either end of a centre bar and were hammer-welded into place. The way in which the twisting of the metal and the forging process was done would determine the pattern that would be formed inside the blade. If the blade were to have a fuller (as many of the earlier blades did) then the blade would be forged with a shallow hollow. Once the blade had taken its final shape it would be heated and quenched to make an outer skin of hard steel, then annealed to reduce the brittleness. The blade could then be treated with acid to bring out the design created

by the pattern-forging process. Through the pattern-welding process less than 1 % of the blade would contain carbon. After 1050 C.E. when new mines were established the metal workers gained access to better quality iron ores allowed smiths to create blades by carefully heating and hammering them into shape. The good quality ore already gave these blades a good steel content. These blades could also then be quenched and annealed like the pattern-welded blades, but they did not need the mix and match of metals that this old process required (Edge, p. 25, 26, Davidson, p. 17, 25).

Evidence suggests that pattern-welded swords were not made in too many places. Some locations that seem to be likely locations where these swords were produced include Rhineland in present day Germany, Noricum in present day Austria, and around the Pyrenees mountains that boarder France and Spain. There is no evidence that these swords were ever made in England or Scandinavia. While England and Scandinavia did not seem to make the blades it does appear that they imported blades and hen added to their construction. Evidence of this includes pattern-welded blades with Anglo-Saxon or Scandinavian hilt designs (Davidson, p. 34, 52).

In some cases the metal of the blades would be decorated with additional metals. Viking blades were often decorated with thick silver inlay covered with different designs. This was accomplished by hammering thin strips of gold, silver, copper, or whatever the plating material was onto the surface of the iron blade that had had designs already cut into it. The metal that was used for plating was softer than the iron and so it was forced into the cut designs on the blade (Pierce, p. 5, 6).

While sword blades were apparently shipped all over Europe it appears that once they reached their destination they would be given a hilt design that fit the local style. Some hilts have been found inscribed with the names of the hilt makers, which suggests that at least around the

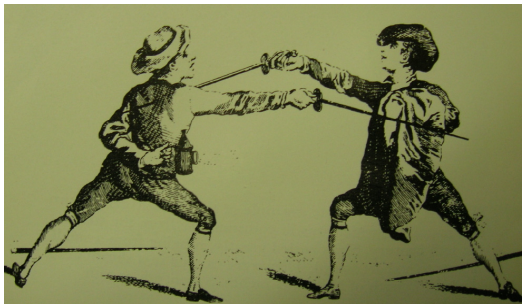
ninth and tenth centuries C.E. that there were organized groups of hilt-makers. Also since a sword would last longer that the hilts they were given it was common to take old swords and place new hilts on them. While some hilts were practical others were very decorative. It is not uncommon that swords meant especially for decorative purposes would have gold and precious stones placed on the hilt. While the center of the hilt need a good grip to be held this left the guard and the pommel to receive decoration as described in the separate sections on swords (Davidson p. 52, 62).

III. Swords from Early Modern Europe 1500-1800 (Meghan Labounty)

1. Rapiers

The late 15th century through the first quarter of the 16th century was the period in which the rapier was evolving from popular swords of the Middle Ages (North 19). There is some historical uncertainty as to when the rapier came into being, and its form and style were developing throughout Western Europe at different times. The earliest reference to the rapier was a sword used for cutting, and the origins of the traditional rapier can be traced back to Spain where it first appeared in the mid 15th century as the "espada ropera" or "dress sword" (Wilkinson 18). As the use of the rapier became popular throughout Europe, its style and form became more uniform.

The chief purpose of the rapier was as a civilian sidearm. However, as swordplay became more fashionable in the mid 16th century, its use became more recreational resulting in a rise in the popularity of schooling from renowned Italian fencing masters (Coe 56). Instruction in the art of fencing became a required part of the education of a young nobleman who would learn of weaponry which included the use of an auxiliary item, such as a dagger, cloak, or glove covered in mail so that in opponent's blade could be grasped or thrust aside (Wilkinson 19). Often these fencing masters were in high demand and published fencing manuals describing the different techniques and strategies necessary for fencing.



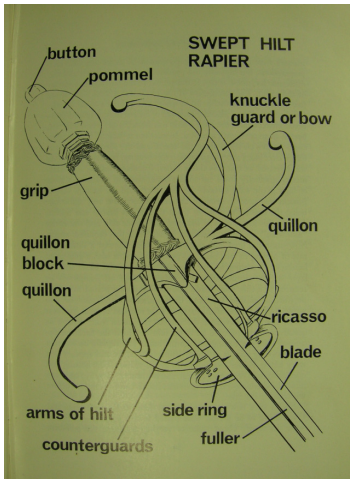
Throughout the 1500s, there were many influential manuals pertaining to rapier techniques. The earliest of these was the *Opera Nova* by Achille Marozzo of Bologna, published in 1536. It was the first widely recognized fencing reference and its contents showed the earliest break with the free-wheeling single combat tradition of the Middle Ages (Coe 56). As well as its information on dueling practices, it discussed the importance of the thrust and its equal importance to the cut. The *Opera Nova* also placed great emphasis on the positioning and posture of the duelers. It was stressed that the opponents should face each other squarely and that the attacker should lead with his right foot (Coe 56).

Camillo Agrippa's *Trattato di Scienza d'Arme e un Dialogo en Detta Materia*, published in 1553, also discussed the importance of posture and form. There were four "on-guard" poses defined, which always placed the right foot first. Agrippa also emphasized the thrust over the cut as a quicker and more effective attack. The *Trattato di Scienza d'Arme* was the first work to suggest that the left arm should be held to the rear and up, similar to the posture used in modern fencing; however this stance was not common until the rise of the French school in the 17th century (Coe 56).

By the mid 16th century the civilian rapier had taken on a distinct form from the dueling rapier which was the form used for swordplay taught by the Italian masters. Civilian rapiers of the time were fitted with slender blades designed specifically for thrusting, unlike its dueling predecessors that were made for cutting as well as thrusting (Coe 48). The average length of the

civilian rapier was c.37-40''. Although the civilian rapier had a general form that was consistent through the 15th century, there were often new styles of hilts and varying designs regarding blade structure and length that became popular in Western Europe.

By the second half of the 16th century the rapier had a distinctive form which all following trends built upon. The swept-hilt rapier, deriving from the late 1400s was one of the earliest popular designs. The swept-hilt rapier had a ring sometimes found in conjunction with a second side ring mounted on the quillon block, while the hilts of these rapiers sprouted systems of transverse bars and branches which passed from the root of the quillon to the knuckle guard in opposite directions to the arms of the hilt (Coe 48).



These transverse bars were what gave the rapier its "swept-hilt" name. And as with any weapon, the design of the rapier changed to keep up with the needs and tastes of its users. By the mid 16th century, a sword with long, slender, and straight quillons with re-curved finials was fashionable, the arms of the hilt were found to sometimes be supported by side double rings, and often both rings were filled with a pierced plate (Coe 49). By 1575-1600, rapiers sometimes had pierced plates between the two branches of its transverse inner guard. There could also be a solid plate in the side rings, and the arms of the hilt had knobs, loops, or curved extensions (Coe 49).

HAM 1785.1 Spanish swept hilt rapier (18th century)

HAM 697 European swept hilt rapier (1650)

The swept-hilt rapier was popular from the late 1500s until the mid 17th century, and there were many variations to its basic form. In 1600 a version of the earlier rapier evolved with s-shaped bars, a single long quillon, and a downward facing blade with outer oval guards (Coe 58). Another sword that followed the swept-hilt theme that can be traced back to the 1500s had two quillons on each side and was popular during the 17th century. As the 17th century progressed the double quillons were replaced by a single quillon (Coe 59).

The most typical rapier of the 1600s was the cup hilt rapier. Originating in Spain or Italy around 1610, the design of the cup hilt rapier was soon adopted by other European countries (Coe 62). Widely used because of its defensive properties, the cup hilt rapier provided additional protection to the user's hand by placing a solid plate between the bars which was often pierced with designs (Coe 62). By 1620 this plate was a common feature on all cup hilted rapiers and it was often the fashion to fit large, solid fluted shells between the bars and to then fill the bars with a pierced plate. This led to further protection against thrusting and cutting and by 1630 the entire hand was protected.

HAM 1802.1 Spanish cup hilt rapier (1650-1675)

HAM 3035 Spanish cup hilt rapier (late 1600s)

In England, the cup hilt rapier was slightly modified from the types that had originated in Italy or Spain. The English swords had a pierced cup guard linked to more guards or a scallop shell (Coe 62). Although the cup hilted rapier remained popular in Spain and parts of Europe until the end of the 18th century, other European countries replaced the weapon with lighter swords more specific to civilian purposes (Wilkinson 21).

One leading force in the replacement of rapiers with shorter and lighter swords was the "Academie d'Armes" in Paris. In 1567, Charles IX established the Academie d'Armes, which became the dominant school of fencing in the 17th century (Coe 57). Over the following hundred years, the Academie d'Armes saw many different variations to the dueling blade and sword as new ideas and designs came into practice. A shorter blade was developed for fencing and by 1630, a transitional rapier with two shells, no knucklebow, and two arms was in use, partially replacing the traditional rapier which was the previously preferred sword for fencing (Wilkinson 21). This shorter, lighter and more maneuverable sword was the forerunner of the smallsword.

The light rapier, a type of transitional rapier, became popular throughout Europe in the mid 17th century. The light rapier had a cross guard with large terminals, a small ring set in the center of the quillons, and a pommel that matched the quillon terminal (Coe 65). This sword proved to be more useful to the changing needs of the European people because it allowed for

better mobility and control than the rapiers of the previous centuries. Since the blade of the light rapier was considerably shorter and cut down from the one and a half meter long blade of the traditional rapier, it was easier to carry and handle (Coe 66). Another sword very similar to the light rapier was the scarf sword. This weapon, like its predecessor, had a shorter blade, however it was solely for show, which was why the surviving scarf sword hilts are decorated with gold and ivory and delicately chiseled and pierced steel (Coe 65).

The scarf sword hilt was a style that was manufactured through the first quarter of the 18th century. The design for the scarf sword style hilt was so simple that the knucklebow construction only provided limited surface area for decoration. The grips were often made of steel which was often chiseled and gilded (Coe 69). The grip of German and French scarf swords were often porcelain or enamel and the blade was fitted to the sword was narrow and flat rather than hollow-ground (Coe 70).

HAM 633 European Scarf sword (mid 17th century)

The shortening of the sword blades and the transition from traditional rapier to light rapier ushered in a new era of weapon design. Although the rapier eventually went out of fashion in the late 17th century, it cannot be ignored that it paved the way for the new class of smallswords (North 31).

2. Smallswords

By the last quarter of the 17th century, the smallsword had acquired its basic form, evolving from the scarf sword and light rapier of the 1600s, the smallsword can be defined as a weapon having a shell guard made as a separate element, with the blade passing through an aperture in its center and a quillon block that acts as a sleeve to hold the shell guard against the blade (Coe 66). With a blade 30'' in length, smallswords had two small, flat shells, a knucklebow, and a rear quillon often curved horizontally with an ovoid or urn shaped pommel (Wilkinson 19).

The earliest smallswords date from about 1635, however they were not common until 1660. Smallswords of the earliest form had simple, attenuated forward quillons and two arms that sprung from the quillon block and curved to meet the shells (Wilkinson 19). The absence of the knucklebow, which was found on later smallswords, indicates an early date.

Because the smallsword originated from the rapier, early versions did not have blades that were specific to the weapon. Early smallswords were fitted with narrow rapier blades that had been considerably shortened, or with light, double-edged blades supplied by Solingen cutlers (Coe 69). By 1660, when smallswords became more fashionable, a new type of blade was developed. German cutlers began making hollow-ground triangular section blades to be fitted specifically on smallswords, which combined strength and lightness (Coe 69). The earliest types of smallswords were intended for cutting and thrusting and have wide edges, especially at the forte. However, the edges were usually very weak and would crack and split easily (Coe 69).

By the late 1600s, the smallsword was the most popular civilian and officer sword throughout Europe. On smallswords dating just before 1700, the arms of the hilt were quite large

and the knucklebow was straight with a central component. The hilt of the smallsword was often decorated with an indented molding or figurative design (Coe 68). Pommels came in an array of designs, the most common being pear-shaped, globular, or facetted, and ornament varied with figurative and abstract design being popular (Coe 68).

A special subset of the smallsword from the 1700s had a narrower blade that was used only for the thrust. The blade itself was wide at the forte and then thinned sharply a third of the length of the blade to a thinner section tapering off to a narrower thrusting point a third of the length of the blade also known as the "Colichemarde" (Wilkinson 20). It was designed to give strength at the top of the blade for parrying an opponent's blade, yet it still allowed for quick use of the point. The name "Colichemarde" derived from that of Johann Phillip, Count von Konigsmark, a Swedish solider of fortune that was killed in a duel in 1686 (Coe 70).

HAM 3259 German "Colichemarde" (1760-1780)

HAM 638 German "Colichemarde" (18th century)

Civilian smallswords tended to be lighter and more decorative, while military smallswords or traveling swords were heavier and more solidly constructed. Many military smallswords were made of cast brass and were sometimes simply gilded or silvered. Swords dating from the 18th century were often plain, the shells having substantial raised rims, and the brass hilts cast in relief decoration (Coe 69). Because these swords were used in military contexts, the surviving heavy hilts were fitted with substantial blades and are visibly scarred from battle (Coe 69).

By the second quarter of the 18th century the design for the military smallsword differed from that of the civilian smallsword. The pommel of the military smallsword still retained its large arms, yet there was a growing tendency for the pommel to be pear-shaped and for the knucklebow to be shaped in a broad curve (Coe 69). Smallswords of this period often had ornately decorated hilts. German and French hilt makers of the 1740s developed a new style of decoration in which the surface of the hilt was chiseled away to leave the ornament in relief, the design was then filled in with foil which was matted with a fine punch (Coe 69).

HAM 1997.01 French Smallsword (1722-1726)

Although the smallsword once served a purpose, by 1765 the weapon was purely for decoration (Wilkinson 20). The blades of these elegant swords were often creatively decorated with strapwork and figurative design. Since the smallsword was considered a piece of jewelry, much effort and work went into its design (Coe 70). Despite the popularity of the smallsword and that trend of wearing the weapon to show status and wealth, the practice of wearing the sword in public began to slowly decline by the early 1700s and its use was limited to court dress and other special occasions (North 31).

HAM 3057 German Smallsword (1800)

HAM 639 French Smallsword (1780)

3. Military Swords

Political rivalries and religious schism in Early Modern Europe resulted in many military campaigns. There were wars between Emperors and Princes in 16th-17th century Germany, civil wars in 16th-17th century France, the Thirty Years War (1618-1648), and a series of pan-European wars from the time of Louis XIV until the French Revolution (Sactorph 324). These conflicts and the frequency with which they occurred stimulated an increase in the number and types of swords available in early modern Europe (Wilkinson 21). There were also many regional variations to European swords during this time.

Military swords, having a more utilitarian purpose than civilian swords of the time, were often less decorated than their civilian counterparts. These swords often had simpler guards which lacked intricate bars and arms, and were initially fashioned with cruciform style guards. However, by the mid 16th century, cross-like guards were out of style, and by the late 16th century, military swords had rings mounted on one or both sides of the quillons which were curved to a greater or lesser degree (Wilkinson 20).

HAM 3461 German infantry smallsword (1800)

The largest military sword was the traditional two-handed sword, which was in use through the 16th century and had a simple cross guard, often arched, and had one or two side rings. The blade of the two-handed sword had a long leather covered ricasso with two projecting lugs above so the user could bring one hand forward if necessary (Blair 6). The Scottish version of the two-handed sword has been referred to as the "true Scottish Claymore" and was used throughout the 16th century and into the late 17th century. It had long straight quillons that sloped up at an angle and usually terminated in pierced quatrefoils. In the 17th century the "true Claymore" had an arched cross and in the center there was a large solid shell bent down to protect the hand (Blair 6). Although the two-handed sword had been quite popular during the Middle Ages, its use greatly declined over the 1500s and was limited to ceremonial use by 1600.

HAM 2484 German Two-handed sword (1580)

HAM 2964.1 German Two-handed sword (1575)

The earliest basket hilted swords appeared by 1600 and were so named because the user's entire hand was protected by a leather lined cage of bars. Although the basket hilts varied by region their main design was the same. The blades of the basket hilted swords were generally

heavy and double-edged of regulation form. By the 18th century military swords had basket hilts ranging from s-shaped hilts with scrolling bars set side by side to complete cages formed of solid plates linked together with square piercings (Coe 86). The amount of metal necessary to completely protect the hand in combat greatly encouraged attention to detail and produced hilts with plates ornately decorated. This led to a fine quality of basket hilts that were produced for officers and by the 18th century some officers were carrying basket hilted swords with silver hilts (Coe 86). There were many reasons as to the popularity of the basket hilted sword with the military of early modern Europe. The extra large guard offered much needed additional protection to the hand of the user and although it was favored over other swords of the time period it was not the first weapon that protected the beholder. The hilt designs on many military swords were adaptations of earlier styles.

HAM 1979.04.06 German Basket hilted rapier (1575-1660)

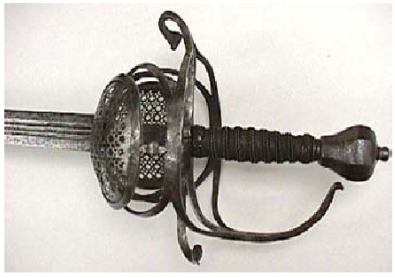
The "Schiavona" was introduced in the second half of the 16th century of Italian or German origin, and was in use until the 18th century. Having evolved from the basket hilted sword, it was popular because it protected the user's hand with its cage-like basket of narrow bars (Coe 74). Schiavona's of the late 16th and early 17th century have simpler hilts than older forms, oftentimes found with three curved guards on one side of the hilt and a shield-shaped pommel made of cast brass (Coe 74). Despite their usefulness and protection Schiavona's were

elaborately decorated, many having florid baskets and pommels of brass that are of characteristic shape (Wilkinson 24).

HAM 1828 Italian Schiavona (1650-1700)

HAM 1829 German Schiavona (mid 17th century)

Another popular sword design of the late 16th century was the placement of solid shells on the guard as additional hand protection. This design could be classified as a "shell" guard sword and around 1570, sword smiths began replacing complicated loops and bars with more simple and purposeful metal shells (Wilkinson 20). This particular modification had become very popular in Northern Europe by the 1620s. Swords were being produced with large bowl shaped guards, and they were referred to as "Pappenheimers" after Gottfried Heinrich Pappenheimer, an officer during the Thirty Years War (Wilkinson 20).



HAM 604 European "Pappenheimer" (1625-1650)

The "Bilbo" was a Spanish sword that was another "shell" guard sword closely related to the "Pappenheimer". The "Bilbo" had a guard formed by two deep shells bent towards the grip with a knucklebow, arms, and quillon. It was usually fitted with a two-edged broadsword blade

and it was in use as a Spanish munitions sword until the 19th century (Reid 143). This sword was similar to the basket hilted sword because of how it covered the hand (North 10). The cup hilt derived directly from the cup hilt rapier of the previous century. Although the cup hilt sword was long and ungraceful it was often of very good quality (Coe 88).

HAM 671 Bilbo (1610)

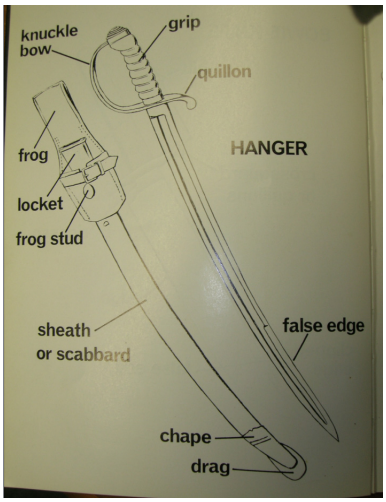
HAM 1803.1 Bilbo-hilted rapier (mid 17th century)

The broad or backsword was any sword with a broad straight blade, and by the late 17th century it applied to a heavy basket-hilted or military sword. Composed of a series of linked bars completely protecting the hand and a solid triangular-shaped plate on the right, it was often accompanied by long, straight or vertically curved quillons and one arm with its tip linked to the base of the rear quillon by a diagonal loop on one or both sides of the blade (Blair 9). Despite their overall similarities, the primary difference between the broadsword and the backsword was that the backsword had a single-edged blade, while the broadsword had a double-edged blade (Blair 9). Although there were regional variations, the broad and backsword retained the same standard design.

HAM 2050 Spanish Broadsword (18th-early 19th century)

HAM 2066 Spanish Broadsword (1740)

During the last quarter of the 1600s, English cavalry developed a sword with a region-specific hilt design. The hilt had a substantial shell-shaped guard linked to a thick knuckleguard by twin bars and a large globular pommel. The blade was straight and broad, usually double-edged, with a pronounced central ridge (Coe 84). Since these swords were for military use, they had plain brass hilts, although in some cases the hilt was cast with designs usually of classical motifs. The durability and usefulness of these English cavalry swords was very good and they continued to be in use to the last quarter of the 18th century.



The hanger was a sword that was popular for both military and civilian use in the 17th century and was widely carried, especially in England. The hanger had strongly curved quillons to which a small shell was sometimes attached, and it also had a short and curved blade (Coe 78). The general design for the hanger was uniform throughout Europe with slight regional variations,

however the part of the hanger that greatly differed by region was the hilt. In England the hilts were often made of iron with a pommel in the shape of a bird or animal head (Coe 78). Some brass hilts survive from the last quarter of the 16th century, but silver hilts came into production from the 1660s on. Because the hanger was widely worn, the hilt of the hanger was often extravagantly decorated since it was seen when walking or traveling. There were hilts that were fitted with grips of ivory or bone and mounted with agates and semi precious stones. There shells were also often decorated and many depict portraits or busts of William and Mary, patriotic motifs, or classical figures (Coe 79).

HAM 265.a European hanger (1700s)

HAM 668 German hanger (late 1700s)

There was also a type of short hanger with a brass hilt, which was carried by infantry in Germany, France, and Scandinavia (Coe 85). In Germany the short hanger retained the thumb ring and side bar like that of the Walloon and by the 18th century it was standard to incorporate a small side plate into the hanger hilts in Germany and Scandinavia (Coe 85).

HAM 605 European "Walloon" hilt sword (1650-1700)

Towards the end of the 18th century and the beginning of the Napoleonic era, officers began to favor swords that offered more protection. In the late 1700s the military tended to exclusively use light hangers with relatively short blades since they proved to be more maneuverable (Coe 90). These hangers had blades that could be curved or straight and some even had grips of ivory cut in swirling designs. Despite their decoration they proved to be very useful in the military context.

The cavalry saber was inspired by Turkish and Persian design and came into existence by the second quarter of the 18th century. It had a knucklebow that extended to the crossguard on the pommel and a strengthening plate along the back edge of the grip (Coe 86). The blade of the saber was flat, curved and single edged with a series of channels at the back of the blade. By mid 18th century the necessary lightness and strength was achieved by forming a single channel down the center of the back of the blade which became the standard make of the cavalry saber (Coe 86). This design was widely adopted in France and Germany because it proved very easy to mass produce and replicate due to its simple design. Despite its widespread use across Europe, different regional variations did develop. German troops adopted the cavalry saber but preferred heart-shaped shells extending back along the knucklebow which served as better protection to the user's hand (Coe 86). Even though there were regional variations, by 1752, the standard cavalry saber form was a sword in which the blade was longer and narrower with a stirrup hilt, named such because of its similarity to the saddle stirrup, long quillons and a wooden scabbard with brass mounts (Coe 86).

HAM 267.a English saber (late 17th early 18th century)

HAM 2070 Austrian Saber (1700s)

4. Hunting Swords

The hunting sword was very popular in early modern Europe. The earliest specialized hunting swords appeared during the 14th century, worn as a side arm when hunting big game. These swords evolved from a particular form of the shortsword, which was a scaled down version of the "cruciform" or "war sword". It was a straight single-edged weapon with a flat knife-like grip and a knuckleguard (Coe 54). The blade of the hunting sword or hanger was very stiff and was often triangular, square, or octagonal in cross-sections (Coe 58). The hanger became widespread through the 15th century and remained popular into the late 18th century.

HAM 117 German hunting sword (1700-1750)

HAM 624 French hunting sword (1765-1770)

Another variant type was the English hanger. It was very similar in design to the traditional hunting sword and it also served the same purposes. The English hanger was popular

in the 17th century and followed the hanger design; however it had a short slightly curved blade, a staghorn hilt, and knucklebow ending in a down-drooping quillon. The shell guard on the English hanger was not always fitted, or welded to the blade, and it had a flat bonnet pommel (Blackmore 26). Throughout the 1600s, hangers had ornately decorated brass or silver hilts, but by the late 17th century, the hilts were widely made of iron (Blackmore 26).

HAM 3076.1 Hunting hanger (early 18th century)

HAM 344.a English hanger (late 1700s early 1800s)

A very different type of hangers was the "boar sword". The boar sword was introduced in the first half of the 15th century and it had a triangular, square or octagonal blade known as an "estoc" or "tuck" in Britain (Blackmore 7). Blades of this type were commonly used by knights for fighting on foot, but their thrusting powers greatly assisted with hunting. The "estoc" style blade was strong enough to withstand the significant impact of a heavy animal better than the broad blade, despite its failure to inflict a large wound (Blackmore 7). The common design of the boar sword was to have the upper part of the shaft blunted, leading into a round, square, triangular, or hexagonal section (Blackmore 7). The blades were produced long and short. The average length of a boar sword was 1.5 meters and the blade frequently had a saw tooth pattern on the back edge and had a wide spear-like a wide spear-like point and a cross bar to prevent an animal from running up the blade (North 36). Although the longer boar swords were used, the

shorter boar sword was better suited for hunting and was frequently used throughout Early Modern Europe.

HAM 3261 Italian Boar sword (1500-1525)

5. Sword Manufacture

The ideal sword blade required a certain degree of hardness for a sharp edge and a degree of flexibility with a lack of brittleness. In order to achieve both hardness and flexibility, blade makers used either quality high or low carbon steel, while many other blade makers compromised. Two such compromises included using composite steel in order to retain hardness and flexibility, while other blade makers combined the two steels to keep the best qualities of both metals (Wilkinson 50).

Large numbers of blades were exported from Italian and German centers to be hilted by local craftsmen (Wilkinson 50). The primary centers for blade making were Solingen and Ruhr. Solingen blades were very highly regarded for their fine quality and were widely exported as far as Africa and India (Coe 82). The cutlers from Toledo in Spain also had a high blade-making reputation during the Period. Despite their mastery of sword making, the substantial reason for their success had to do with the types of materials they were using and their natural occurrence in the Spanish ground (Art 59).

As the popularity of Solingen blades grew, the craftsmen from the town looked to set up factories elsewhere. Some moved to Hunslow, London, where a factory was established in the 1630s, while others went to other centers throughout Europe or stayed in Solingen (Wilkinson 57). The Hunslow factory and sword mills established at Shotley Bridge in county Durham were staffed by Solingen craftsmen and German cutlers. Despite the great opportunity presented by the establishment of a blade making factory, the Hunslow factory was for sale by 1724, and closed by 1832 (Wilkinson 58).

Although there were many different centers for blade making, the method of manufacturing the blades was almost universal. Sword blades were constructed from billets of steel that were cut to the required length (Coe 82). The steel rods were then fed through water powered rolling mills until the rods were correctly shaped. The blades were then ground on large grinding wheels, where the craftsman would lay on the ground in front of the wheel and hold the blade against it. The blade was then annealed to induce softness, therefore relieving internal stress, refining the structure and improving the steels natural properties. The two phases of the annealing process, the first being the recovery phase, which results in softening the metal through the removal of defects and the internal stresses within the steel that they cause. The second phase is recrystallization where new grains nucleate and grow to replace those deformed by internal stresses. To anneal the steel, blade makers would substantially heat the steel blade until it was glowing for a substantial amount of time and then allow it to cool slowly (Art). The final steps in the blade making process included preparing the sword for use and decoration. Blades were polished on large grinding wheels and given a final shine on wooden wheels (Wilkinson 58).

A fine sword was the work of many skilled craftsmen, who had each produced a separate part, which meant a sword could be produced within a short amount of time (Coe 82). Besides the blade makers, there were craftsmen in charge of shaping and decorating the hilt. Hilts of steel, brass, and silver required expert handling and filing and scraping (Wilkinson 58). After the blade and the hilt were complete, the sword was often ornately decorated. Decoration was a symbol of status to those who could afford it and many swords were etched, engraved, enameled, carved, chiseled, inlayed, encrusted, gilded, silvered, or cast in bronze or silver (Coe 57). Etching was a common decoration which involved covering the blade with paint or wax which was then scratched into a pattern or design before placing the blade into a bath of acid (Wilkinson 58). The unprotected areas of the blade, where the paint or wax had been scratched off, were attacked by the acid which left a slightly raised pattern. After the blade and hilt were decorated semi-precious and precious stones, bone, ivory, horn, and tooled leather could further adorn the hilt by encrusting and inlaying.

The task of completing such a hilt required the best craftsmen and jewelers, and designs were sometimes created by leading craftsmen of the period. Artists such as Albrecht Durer, Hans Burgkmair, Urs Graf, Giulio Romano, Parmigianino and Hans Holbein designed fine arms for the greatest rulers and patrons of Early Modern Europe (Coe 57). In other cases, goldsmiths were responsible for the design. Goldsmiths such as Erasmus Hornick, Pierre Woerlot, Antoine Jacquard, and Etienne Delaune produced creative designs for swords that have survived into modern times (North 14).

IV. Modern European and American Swords (Chris Bass)

1. European and American History

The majority of Europe has relatively flat land, enjoys rich, fertile farming ground containing lots of fossil fuels, and has many rivers that carry minerals from the Alpine Mountains.

Northern Europe has terrain that is rich in deposits of metallic minerals.

Southern Europe contains the majority of the Alpine mountain ranges. These regions are prone to earthquakes but are well protected and have direct access to the Mediterranean Sea.

Many major bodies of water pierce the European landscape: The Mediterranean Sea and Atlantic Ocean are the most obvious, but the Danube, Rhine, Rhone, Seine, Loire, and Garonne Rivers make water travel useful throughout most of the continent.

In European history, the 1800s mark the tail end of the Industrial Revolution. Developed during this time were many advances in transportation, crafting, and weapons, among other advances that ultimately drove Europe from being an agricultural society to one based on manufacturing and production. The waterwheels and windmills of before were improved with beveled gears and later altered to eventually lead into turbines and steam-engines. These allowed for more efficient power production, to run more complex machinery in places that would not be feasible for the use of older power sources. Various improvements were also made to lathes and other industrial machining tools, allowing for more precise metalcrafting without direct human interaction. In 1837, the electric telegraph was designed, allowing distant places a near-instantaneous form of communication.

Along with this, solid roads were developed, with which research was done that culminated in Joseph Cagnot designing the first successful steam-powered wagon. This was

followed by the steam-powered boat, which fared much better than the car version. The suspension bridge was also created during this period, the first of which was opened in 1826. The popularity of the steam-powered railroad car, another example of steam-power being used for transporting people and goods across long distances, may in part be because it was much harder to pave ground than it was to lay railroad ties.

Advancements were also made in artillery, with longer-ranged rifled guns and cannons, as well as in the chemical industry.

The far eastern United States, bordering the Atlantic Ocean, was the first place settled by the Americans from Europe, and is thus the most densely settled and industrialized part of the country. The Appalachian Mountains form a line of sorts, separating the Atlantic coast from the rest of the United States. West of the Appalachians lies the Mississippi River, a major form of transport in this region, which flows from Michigan all the way down to the Gulf of Mexico. However, until the set of 29 flood gates were completed, it was impossible to travel the whole path because of elevation changes. Nevertheless, even before these gates were created, there were many projects to clear out the river of debris and shallow areas to aid with travel where it was possible, so the river was still used as a means of transport, even after the railroad system was developed. The Great Plains lie west of the Mississippi River. This region has always been technologically less developed than the coastline regions, but has much stronger agriculture.

Elevation raises towards the West, ending in another mountain range, the Rocky Mountains. The Rocky Mountains are a fairly mild mountain range, with many valleys and paths through them, but they are still time-consuming to cross by land as they cover most of the western United States. Especially in the past, this was compounded in the winter, because

although the summers in this area are fairly warm and dry, the winter skies pick up water from the surrounding regions and drop it as snow, slowing down travel further.

The Pacific Coast, the area west of these mountains, is covered in dense vegetation fed by rain from the Pacific.

As it was only beginning in the early 1800's, the American Industrial Revolution was primarily a combination of industry building on European past advances and research towards mass production and transportation. At this time, machines were used for specialized purposes, with the more detailed parts still often being hand-crafted. This period progressed towards total mechanization, culminating in the first Ford assembly line, in which every part that was to be assembled together was assembled solely by machine.

Part interchangeability within a project (the ability to refit, say, the hilt of a sword with another hilt of the same model, without altering the tang or hilt) was a key to mass-production: if a company could not make a machine that made the part the same way every time, then the parts would still have to be hand-worked to fit each other in the final product.

Merritt Roe Smith claimed in his work "Military Entrepreneurship" that the United States Ordnance Department was a major force in spreading the use of machine-made parts in the production of small arms in the 1850's, by spreading knowledge of the required technology for mass production and integrating it as a requirement into their production contracts. Although this department worked with firearm productions, the technology and processes of mass machining quickly spread to other fields.

By 1913 Henry Ford and his Ford Motor Company had figured out part interchangeability and machine production well enough that on April 1, 1913 he began the use of the moving assembly line, incorporating it into most of Ford's productions within 18 months.

Within the next few years many other industries incorporated the same methodologies, rapidly increasing the speed of machine production across the board. This innovation would lead to the increase in mass-production that is so pronounced in the present day world economy.

This period eventually led to America (and because of a similar situation at the same time, Germany) matching England as the main technologically advanced countries (Until the end of World War II, when Japan finally industrialized and joined them)

Although by the early 1800s close-range infantry were already completely replaced by musket, carbine, and rifle-wielding soldiers, this time period arguably marked the pinnacle of the military use of cavalry in the Western contexts. In this period the Napoleonic Wars in Europe and the Civil War in America both occurred in a short span; these wars displayed a majority of the modern uses for cavalry forces in military.

At this time, Napoleon Bonaparte was well entrenched in attempting to establish a French empire in Europe, with Britain and other European nations attempting to stop him.

Napoleon's tactics at this time combined quick infantry and artillery movements coupled with a large cavalry force, plus a combination of intelligence and counterintelligence tactics to know his enemies' movements while concealing his own.

Napoleon's infantry formations were based off of Roman patterns, based around delivering maximum force at the flanks, and fighting in tight columns rather than the wide single or double-line rows of the British. This allowed the battalion to move and turn more quickly, as well as offering advantages in hilly terrain. It did mean that only the first two lines could fire at the same time, reducing firepower, but the column could move and reform much more quickly, putting its firepower where most needed. The column could also splinter at the flanks to provide skirmishers without changing the attacking main lines. (Dupuy 155, 156).

The Industrial Revolution occurring at the time also released many workers from lives of farm duty, increasing the number of civilians that were available for various sorts of work, including joining the military. This meant that these speed tactics performed by the French were combined with a greatly increased army size, earning the name “horde tactics”. (Dupuy 156)

Napoleon also believed in a strong artillery force, himself being a former artillery officer. His forces would often use large batteries of artillery fire directed into enemy formations before applying other troops, this served the dual purpose of thinning out the lines of the enemy as well as causing unrest in the remaining troops, further opening the formations in preparation for the French infantry or cavalry to attack. They also implemented a small number of artillery whose entire crew rode on horseback, acting as dragoons with cannons attached. This, combined with training for quick deploying and firing of the cannons, allowed the French to have artillery that moved nearly as fast as the cavalry themselves.

The Napoleonic Cavalry consisted of about a sixth of Napoleon’s force. All of the major uses of cavalry in this time period were accounted for in his troops: light scouting cavalry, used to report troop movements and gather information that would be tactically useful later on, light attack cavalry (Chasseurs-à-Cheval), used for skirmishing the enemy, pursuing fleeing troops, and disrupting formations, and heavy cavalry, used as shock troops to finish off disrupted enemy ranks. They even had a small number of lancers, which were useful as other forms of cavalry had less reach than bayonet-wielding infantry, who could tighten into a box formation and be well-protected against most close-range combat. The lancer cavalry had longer range, and so could directly charge such an infantry box, dealing a large amount of damage quickly.

In contrast, British tactics, such as those employed by Wellington, relied on smaller numbers of troops, using similar forces to the French but relying more heavily on long lines of

infantry, offering the maximum number of guns pointed forward at the enemy. This had the disadvantage of being slower to move and reform than the French columns, and could more easily be attacked from the rear than other formations. Their artillery was smaller than that of the French, both in number and generally in caliber, but the troops were quite well trained. For much of the war, the British also suffered from a lack of numbers in their cavalry, and had reputedly worse leadership than the French. They did, however, have the same general types of cavalry as the French: light cavalry for skirmishing and intelligence, and heavy cavalry for attacking infantry and artillery. They did not, however, employ any lancers until after the war, when they had seen the effectiveness of the French lancers.

Bonaparte's strategies worked well against the British and the Third Coalition during the Napoleonic Wars, as his troops' speed, combined with a strong ability in tactics, overpowered the more concentrated fire-based tactics of the Coalition. The French moved past much of the Coalition resistance and attacked the Spanish army for a victory, though a short-lived one as soon Spain pushed back with guerrilla forces and attacks on French supply lines. These guerrilla tactics probably worked so well against the French because their primary tactics were shock, speed, and overwhelming strength, which works less well against a defensive, hidden enemy, and as well because they were far away enough from their supply stores that being cut off from supplies would have put a large tax on the French in Spain. Bolstered by multiple French conflicts with Sir Arthur Wellesley, the Spanish created havoc with the invading French forces in a series of conflicts later called the Peninsular War. This war continued until Bonaparte attempted to invade Russia in 1812, failing miserably due to lack of resources, the splitting of his army between the two fronts, and Spanish and Russian battle tactics that he was not prepared to fight against.

In 1814 Napoleon was cornered and exiled, but escaped the next year and retook the 5th Regiment from its former commander and marched towards Paris, collecting troops on the way and promising to retake control and reform the government. In 1815, however, European nations yet again joined in coalition again him, leading to a pitched battle at Waterloo, where he failed to keep the enemy armies separated and was thus defeated by a combined force that was no longer demoralized by the French tactics, had as strong in size as the French, and was better stocked in resources than the French. Bonaparte was forced to retreat to Paris, where he resigned again from power, but kept fighting until he was forced to surrender at Rochefort, then exiled for the remainder of his life.

On the other side of the Atlantic, the turn of the 19th century saw the newly-formed US trying to establish itself as a country following the Revolutionary War. Pushing against its borders, the early battles of the United States consisted mostly of conflicts with the Native Americans who were being pushed back by American expansion, although a short war, the War of 1812, was fought with Britain because Britain was attempting to seize American ships for use against Napoleon.

With the recent expansion, arguments over civil rights and slavery brought eleven southern states to secede from the United States between 1860 and 1861. The first conflict between the U.S. and the Confederacy was at Fort Sumter, North Carolina. The Union's strategy was to use its superior spread and armory to lay a naval blockade around the South, preventing troops and supplies from entering or leaving the South from the Atlantic Ocean, Gulf of Mexico, or Mississippi River. Despite European blockade runners, the Union managed to hold this blockade and enclose the southern Confederacy. Battles happened on three different fronts, though almost always on Confederate States territory. Despite Confederate attempts at gaining

support and recognition from European powers, they were never officially recognized by any countries as an independent nation, and were soundly defeated by the North after four years of fighting.

After the Civil War, the United States had a period of relative peace, until the 1900s and the World Wars. By the time the Spanish-American War occurred, in which the U.S. acquired Cuba, military combat had primarily moved to a long-distance front in which close-range weapons like the sword were, for all intents, ineffective. Swords remained used as ceremonial objects but were no longer instrumental on the battlefield.

2. Infantry Swords

By the 1800s, muskets had been used extensively for at least 100 years in various European armies, the wielders no longer needing dedicated protection from other units during reloading, as they previously did, due to faster reloading speeds thanks to advances in firing technology, and also due to the bayonet, a blade attached to the musket that could be used in the case of a melee attack without dropping the musket. With the increased range that muskets provided, and more so with the development of more precise handguns and deadlier artillery, infantry could no longer count on advancing to melee range with the enemy before being shot by enemy infantry or artillery. This meant that most battles of the 1700s and afterwards were fought at gunshot distance rather than in melee, unless the wielder of the sword had a way to close in to the enemy before being shot, such as riding a mount or setting up an ambush.

Although this fact meant that many infantry units by the 1850s no longer carried swords as standard armament, there were still a few models that were carried by soldiers, whether they were actually put to use against the enemy or not.

One early sword of interest is HAM 267.a, an unmarked, slightly curved saber that could as easily have been used as a cavalry saber or for infantry. It has a black hilt with a straight brass knuckle guard and rear quillon.

Figure 1: HAM 267.a Early 1800s British Saber

International trade meant that by this point technology, such as firearms, was often traded between nearby countries such as France, Spain, Britain, and Germany. This means that for countries like these, development of innovations such as sword styles did not remain unique to a country for very long. By the 1800s, infantry swords from one country looked much like those of another.

HAM 126.a is a composite smallsword that was probably assembled in France. It features a long, straight blade with floral etchings near the hilt, a brass hilt with a curved knuckle guard, and what appears from the picture to be a large, thin, rounded quillon.

Figure 2: HAM 126.a Early 1800s French smallsword

HAM 344.a is an early 1800s hanger, most likely Spanish, a nearly straight-bladed, single-edge sword with a brass crossguard and wooden Mameluke-style hilt.

Figure 3: HAM 344.a Early 1800s Spanish Hanger

Another sword from Spain in the Higgins collection is an 1863 saber (HAM 335.a) with a curved steel blade and a false edge. The back edge on both sides of the blade has narrow fullers. The blade is etched with "FABRICA DE TOLEDO", "ANÑO DE 1863.", and the Spanish royal arms. The brass hilt has a 3/4-basket guard, pierced to form crowned royal arms flanked by furled standards. The guard and pommel are also decorated with various engravings.

Figure 4: HAM 335.a Mid-1800s Spanish Saber

On the other side of the ocean, the United States often imported its sword concepts from other countries, such as Britain or France. For example, the U.S. militia foot artillery sword, pattern 1832, is almost exactly to the same specifications as the French 1816 pattern. HAM 3351 is an example of this pattern sword, with a heavy blade, long fullers on both sides of the blade, and a heavy brass hilt with a crossguard.

On the other hand, with a less curved blade, HAM 3574.a could have been passed off as a British saber. This sword is actually a U.S. light artillery saber of the 1840 model, crafted in 1865. The blade has a false edge and wide fuller down the length of the blade, and the hilt is composed of a slightly curved wooden handle and a brass curved knuckle guard and rear quillon.

Figure 5: HAM 3574.a, U.S. 1840 model artillery saber

Infantry swords of this time were not in the same sort of transition period that cavalry sabers experienced, for although swords were still worn as armaments, infantry swords no longer decided battles in general, and so there was likely not much battlefield testing of swords and thus not much to go by when deciding on pattern modifications.

Even though the late 1800s finalized the decline in functional infantry swords and the Higgins collection doesn't appear to have any late 1800s British non-officer infantry swords, nonetheless they were not completely obsolete in other countries yet.

The sword shown below, HAM 1978.03.1.a, a late Solingen backsword, was crafted in 1889. This straight-blade sword has a spear point and false edge, with two narrow fullers along the blade. It has a black hilt with a thin knuckle guard and an engraving of the Imperial German eagle on it.

Figure 6: HAM 1978.03.1.a, German backsword, 1889

Another German backsword from the Higgins collection (HAM 3161.a.), this one crafted in Hesse, came from the late 1800s. Much the same as the previously described one, this sword has a narrow, straight blade with a spear tip and small false edge. The hilt, however, is much different, in that it has a brass or bronze hilt with a more noticeable rear quillon, a brass knuckle guard with a lower bulge, and a ribbed grip with a protrusion in the middle.

Figure 7: HAM 3161.a German backsword

This Spanish saber (HAM 3602.a.), which was made in 1897, has an interestingly shaped grip that curves almost like a foil's pistol grip, a trait not evidenced in other swords documented here. The blade itself is a standard slightly curved saber blade with a false edge, and the guard has a hole for a sword knot but is otherwise an unmarked brass half-basket guard.

Figure 8: HAM 3602.a, Spanish saber, 1897

The Americans also continued to make swords through the Civil War period, especially the Confederates, as the Union's blockade forced them to rely primarily on the supplies they had available already and to use less advanced equipment.

The sword below, HAM 315, is a straight steel sword, unfullered, with no false edge. It has 3 curved brass bars forming a half-basket hilt, with a brass pommel and leather grip. This sword appears to be crudely made, and is suspected to be of Confederate make.

Figure 9: HAM 315 U.S. Model 1850 imitation

Unpictured is another Confederate saber, HAM 3460.a, a gently curved, single edge steel blade. Crafted around 1864, this saber is based on the US foot officer's sword, model 1850. This piece, as with many swords of this time, has a narrow fuller along the back edge. It has a brass open half-basket hilt that is carved with a leaved pattern and the letters "CS" and a 5-pointed star framed by crossed laurel branches with stalk of corn. The knuckle guard is pierced at top for a sword knot.

In at least Britain and America, a few more specialized regiments kept their swords longer than the standard infantry, whether due to usefulness, tradition, or plain apathy. For example, British sappers carried standard infantry hangers, which were short, wide swords similar to cutlasses, until 1831, when they were issued their own unique style of hanger, with a saw-toothed rather than smooth cutting edge. They were issued another version of this sword in 1856. These swords had a straight, ribbed hilt with knuckle guard and quillon, and also had a saw-toothed blade. This pattern remained until 1903 when they were instead issued a rifle and bayonet. (Latham 20-21)

On early ships, long blades would get in the way of climbing rigging or maneuvering in the tight quarters of a ship, and gunners often could not stay distant enough from their opponents to make having a gun more useful than a sword, so by the 1800s the main weapon of Navy personnel was the cutlass, a small, thick, slightly curved sword that proved especially useful on the seas. (Peterson 47)

HAM 2073.1 is a U.S. navy cutlass whose location of manufacture is unknown, however it is known to have been made around 1810. It has a single-edged blade with a false edge. The

hilt is an undecorated iron grip with a small hand guard and an oval extension reaching across the top half of the knuckle guard.

Figure 10: HAM 2073.1, US Navy cutlass, 1810.

The model 1860 Navy Cutlass is, as was the previous sword described, a single-edged blade with a false edge. This model came with a broad fuller along the length of the blade, with a wooden grip and brass half-basket hilt. HAM 3564 is an example of this type of sword, made in 1862. The U.S. switched to a new model cutlass in 1917, but this older model remained in service on some vessels even up to World War II. (Peterson 54)

3. Dress, Ceremonial, and Hunting swords

A long-standing tradition for soldiers of officer rank is to wear a sword as part of their military dress, and regulations continue to specify swords for this purpose.

In the early 1800s, a regulation sword for a military officer was often simply a well-crafted version of the regulation sword for his subordinates. Officers' swords would often have a hilt decorated with various motifs and a well-sharpened blade decorated either with images etched directly into the blade, or decorated by a process called "bluing", in which the blade was

heated and then quenched, covered in an acid-resistant varnish where the coloring was desired, and then dipped in a weak acid that would eat through the unvarnished portions of the coloring on the blade. As well, metals such as brass or iron would sometimes be used to form the base of a piece, and then this piece would be coated with gold, a process known as "gilting". (http://www.higgins.org/Programs/DecorationOfArmor.pdf)

Dress Swords in Napoleonic Europe: Differences between here and afterwards?

A later piece from the Higgins collection is HAM 3598.a, an 1896 British pattern infantry officers' sword. This particular piece has been personalized with a scrolled puncturing and the royal cypher on the hilt, and etchings on the blade in the shape of plants surrounding another instance of the royal cypher.

Figure 1: HAM 3598.a 1895-1897 British pattern infantry officers' sword

The U.S. was, at the same time, experiencing a drop in the perceived usefulness of swords in battle, but still consistently released new specifications for officers' swords up until a few years after the Civil War ended. Reasons for this include that swords were still cheaper to produce than firearms, and still carried (and carry) a strong image in some peoples' minds as a "last defense in emergencies" (Peterson 61)

Thus, a number of ceremonial and decorative blades do exist from those times in the U.S., many of which are simply decorated versions of current model swords, others which are also etched with symbolic images for the respective army and various slogans and quotations related to that army's ideals.

Interestingly enough, although symbols representing the United States existed that paralleled symbols such as the British royal cypher, symbols such as this seem to have been often foregone in exchange for smaller symbols such as a simple "E Pluribus Unum" and the manufacturer's marks. However, motifs of this kind, such as the eagle and shield, were still sometimes built into the decoration.

An early example of this style of decoration is on a Marine officer's saber (HAM 3459.a). The bluing on the lower half of the blade, the eagle's head shape of the Mameluke hilt, and the decorated crossguard are all quite typical of swords of this time, especially Marine swords.

Figure 2: HAM 3459.a U.S. Marine officers' saber, about 1825-50

Rather than the types discussed above, many swords decorated during the Civil War would instead either have etchings of messages praising the owner's army's ideals, or simply detailed pictorial engravings, rather than ironically continuing to use symbols representing the United States' unity.

At the turn of the 20th century, a new saber was introduced for almost all U.S. officers. This sword was decorated with an engraved silver hilt and guard (which was later replaced by bronze, as silver isn't the most sturdy of metals to use on a high-impact area such as the guard). This sword has the name of the officer the sword was presented to, and the maker's name.

Figure 11: HAM 3618.a U.S. Model 1902 Officer's saber

Even in the current day, swords are in use as military dress by some countries. For example, U.S. Marine Corps officers and British generals still wear a Mameluke style sword consisting of a slightly curved blade, a Mameluke hilt (straight hilt with a small stub sticking out at the bottom end of the hilt, finger-side), and cross guard. (Latham 6) However, although these swords are often designed sharp and strong enough to be functional, their primary purpose is as part of the uniform, as evidenced by their decorative blades, although these swords' decorations are not as complex as many of the older officer's patterns.

Figure 12: U.S. Marine Officer's Mameluke sword, 1875 - present day.

Another modern-day military dress sword is the sword awarded to cadets of the U.S. West Point Military Academy (a Higgins example of this sword is HAM 3560.a). This sword has a gilt brass hilt with a crossguard, the West Point Academy seal, a few instances of the eagle shape, and a grip that mimics the appearance of the wire wrapping that used to compose sword grips. The blade itself is etched with the owner's name and the maker's information on the ricasso.

Figure 13: HAM 3560.a Model 1922 West Point Cadets' Sword

A few other examples of dress swords still in active use in the U.S. include:

- Model 1902 Army Officers' Sword
- Model 1852 Navy Officers' Sword
- Model 1859 Marine Noncommissioned Officers' Sword
- Coast Guard Officers' Sword
- Air Force Academy Cadets' Sword

It was not only in military ceremonies, however, that swords retained their status as symbols of honor and ceremony.

The below piece was a ceremonial sword for an extension of the Masons (the Scottish Rite of Masons) representing the achievement of the rank of Consistory Knight of the Sun. This sword has a decorative, waved blade shape, unetched except for a faded Solingen maker's mark on the ricasso. The hilt is brass, gilt in silver, with a crossguard in the appearance of a pair of crossed bones, and a skull-shaped pommel. Despite the unusual decoration, the grip is a simple sectioned wooden handle.

Figure 14: HAM 2244 Ceremonial sword for a Consistory Knight of the Sun

Another modern non-military ceremonial sword comes from the Order of St. Michael (HAM 2248). This sword consists of a straight steel blade etched to mid-length with various decorations, and an alloyed knuckle-guard hilt decorated with a lion's head pommel and numerous detailed etchings across the handle and guard.

Figure 15: HAM 2248 Sword from a member of the Order of St. Michael

Along with their use as battle dress, there is a continuing history of sword use as an aid in formal hunting, although ranged weapons have overtaken this position as surely as they

have in military applications. Blades used for this purpose were often decorated and personalized to the taste of the specific owner, as they were as much for show and decoration as they were for actual use in the hunt. Blades of this type were usually short and straight bladed, and some had a crossbar placed to prevent the quarry from sliding up the blade and attacking the hunter rather than simply dying. These blades were often not built as strong as swords made for full-combat use, focusing more on decoration since they were normally only used for a fancy coup de grace on a wounded quarry so as not to waste bullets.

Fencing is an ancient sport by the 1800s. During this time period the study of traditional swordsmanship resurfaces, accompanying the increased reproduction of swords as show pieces. This leads to an increase in participation in sport fencing. Despite the times, the rules and methods of fencing remained largely unchanged (except for the introduction of the electric scoring system, because of which the rules of scoring were recently changed slightly)

The foil, the most common sword for beginning fencers to be introduced to, is a descendant of the 17th century short sword, transitioned to be thinner, flexible, and nonlethal. As can be seen in the examples below, there was not much variation in the shape of the "blade", simply being a metal bar tapering into a near point tipped with a blunt, wide stub. The hilt was little more than a shaped block that allowed the foil to be held, and as the primary means of blocking in fencing is deflection with the base of the blade, the guard was also often minimal, merely enough to separate the handle from the blade.

The below examples of foils (HAM 1978.05.01, HAM 2622.1, and HAM 3593) show the strict similarity between these weapons, which likely stems from their use as sporting equipment (and thus a desire to not give one player an unfair advantage). Some foils instead have bowl-shaped grips that offer better protection against accidental hand-stabs.

Figure 16: HAM 1978.05.01 German foil

Figure 17: HAM 2622.1 French foil

Figure 18: HAM 3593 German Foil

4. Materials, Production, and Reproduction

By the end of the Napoleonic Wars, European swords were almost all constructed from steel. Steel can be made harder than iron, but is still workable, and is more versatile as its properties can be altered by changing the proportion of carbon to iron in the metal. The crafting was still done by hand, but the way they were crafted was different. A few processes related to sword production and decoration developed by this time were fire-gilding, heat-treatment for hardening and tempering of the blade, and annealing. (Coe, 92-95)

To go into a bit more detail, the procedure for crafting a sword follows.

Steel has a few key temperatures that change its properties. There is the "critical temperature" and the "forging temperature". These temperatures are different depending on the specific steel, mostly the level of carbon in the steel. Annealing means to bring the steel up to its critical temperature, and then slowly let cool to room temperature. The steel at this point should be extremely soft, and can therefore be compressed to form it into the basic length and shape of the desired blade. The same procedure, done after the sword has been worked into shape, is then

called normalizing. The goal of this procedure is to relax the worked steel and work out the stresses that form when steel is worked on and grinded. Hardening is exactly what it sounds like: the blade is made to be hard, rather than the soft forms described above. For this, the smith heats the steel up to its critical temperature again, but instead of being air-cooled is quenched in a cool, heat-conductive substance such as water or oil. This quickly cools the blade into an extremely hard structure. Tempering of the blade is often done after this, which means to heat the blade to a temperature well below its critical temperature, and cooling it one last time to relieve the stresses made by rapid-cooling the blade before. This leaves the blade hard, but still flexible.

The actual procedure, up until the Industrial Revolution, was to heat the blade to forging temperature and hammer it into the general form of the blade. Next the blade was annealed and hammered into the desired shape, and ground on a grinding stone to the desired cross-section and profile. At this point the base of the metal was reheated and an iron tang was welded into the steel. Then, the whole blade was normalized, and then hardened in whale oil. At this point the blade would be extremely brittle, so a vat of molten lead was prepared, the sword was tempered in this lead, and then it was left to cool to room temperature one last time. (Wilkinson-Latham 53, http://swordforum.com/forge/annealing.html)

Next, the hilt pieces (backpiece, grip, and guard) were crafted, and any etchings or engravings were done at this point. These pieces were fit together to make sure that they fit properly, and then the blade was taken to the grinding wheel be sharpened and smoothed. Once this was done, the pieces were again fit together and secured in place, leaving the final product. The sword was then submitted to various stress and strength tests before being approved for use, including sometimes additional tests required by the customer or government. (Wilkinson-Latham 53-54)

The Industrial Revolution brought about a few key changes in how swords were produced. For example, much of the manual hammering and initial shaping of the sword was able to be done instead by Ryder hammers, introduced around 1860. The sword would be annealed and hammered, and the reshaping would be done by mechanical rollers that stretched the blade into the desired shape. Also, rather than integrating an iron tang into the base of the sword, around this time blacksmiths began to stretch out the base of the steel blade to form an extension which could be hammered into the form of a tang. (Coe 53)

Various things were also done to swords to make them more decorative and personalized. Along with the age-old method of engraving details into sword and hilt, where the smith would sit down with a sharp tool and cut the desired shape into the piece, etching became common in this period. . Etching was the practice of covering the blade with an acid-resistant substance except where the etching was desired, and then covering the sword in an acid, which would then dissolve a bit of the surface at the uncovered areas, after which the substance was removed and the blade washed clean. Recently etching has also been done with lasers instead.

Gilding was the process of coating a piece in a desired metal, such as gold or silver. Gold-gilding is done by coating the piece in a mercury-gold mixture, as gold alone is hard to affix to other metals. At this point, the piece is heated slightly, which causes the mercury to separate, leaving the gold (which has a higher melting and boiling temperature). (Wiklinson 94)

A sword or hilt could also undergo bluing. In this procedure, the piece was heated slightly, as with a torch or other relatively low heat source, which would leave a coat of a color based on the temperature on the piece. This color could be selectively removed from the blade to leave designs that stand out against the blue color, or to leave the bluing only in a desired pattern. (Wilkinson)

One effect of the increased speed and skill with which swords could be produced at this time, was an increase in the number of sword makers creating swords specifically for showing off their craftsmanship at conferences and shows. These swords were often made to look like fancy or intricate pieces from earlier periods. (Coe 93)

In this same time period there was a general revival of public interest in antique crafts and, as part of this, an increase in the collecting of metalwork and swords from the Renaissance and medieval periods. Even the number of rediscovered pieces on the market through antiques dealers and museums did not fully support the demand for high quality, intricate, good condition original pieces. Antique dealers and restorers already existed in large numbers; this demand simply led them to switch their talents to beginning to supply newly built as opposed to repaired pieces. This used many skills that these people had already learned, such as deliberate aging, gilding, and etching, as well as taking genuine parts and combining them with replica parts to make the replica look more like a genuine whole piece. (Coe 94-95)

The Industrial Revolution made the mass-production of replicas possible through the assembly line procedure, especially since they no longer had to worry about combat-testing the swords as many replicas of this time are designed solely for looks, not for combat use.

V. Islamic Swords (Stacy Haponik)

1. Origins of the Islamic States

The Islamic religion arose out of Arabia in the 600s. It is based upon the teachings of the prophet Muhammad.

Muhammad was born circa 570 AD in Mecca, in what is now Saudi Arabia. Orphaned before he was six, he was raised by his uncle Abu Talib (5 Robinson).

In about 610 AD, while praying in a cave, Muhammad had a vision. According to tradition, Gabriel began speaking to him, and ordered him to begin reciting what would become the Koran. He preached his revelation at first to his family, and then in public (5 Robinson). Muhammad preached that he had be chosen by God to lead a revival of the faith.

Some believed his words, but others were upset by his monotheistic message. Wishing to save his followers from persecution, Muhammad sent some to the Christian country of Ethiopia (5-6 Robinson).

Some tribesmen from the city of Medina encountered Muhammad and his message. Medina was religiously mixed between Jewish and pagan religions. The tribesemen invited Muhammad back to their city in the hopes that he could ease the fighting between the Jewish and pagan populations (6 Robinson).

Muhammad led Medina in a series of expansionist wars against the surrounding regions. He received the surrender of Mecca in 630, and had united most of the Arab tribes by his death in 632 (7-8 Robinson).

By the mid 600s, the Islamic empire had grown to contain Persia and parts of Northern Africa. After Mohammed's death, the Islamic empire suffered a civil war which divided the state and split the faith into Sunni and Shi'a.

By the 1400s, three major empires had formed.

1.1 Turco-Mongol Empires

The Turco-Mongol Empires were three large empires which covered the near East, India, and Central Asia. These empires were the Ottoman, Safawid, and Mughal empires. By the 1600s, trade was well established between these three empires. This was due to low taxation, safe travel, and an enormous, contiguous region (Bernard).

1.2 Ottoman Empire

The Ottoman Empire covered Northern Africa, the middle east, and parts of modern-day Turkey. It is the oldest of the three empires, and lasted until World War I, outliving both the Safawid and Mughal empires.

The Ottoman Empire encouraged Orthodox or near-Orthodox orders of Islamism, partly by discouraging Sufism. Sufism was persecuted in part because the Safawid Empire was gaining influence in the Ottoman Anatolian frontiers by converting the tribes there to Sufism. These converts were thought to be of questionable loyalty to the Ottoman Empire (Bernard).

The bureaucracy was made up of the 'ulamaâ™, or 'learned men of Islam'. These ulama were taught through a hierarchical system of religious institutions. The Ulama made up the religious scholars, teachers, scribes, and religious functionaries of the country. The religious

institutions also trained the Qadis, or religious judges, of the state. The Qadis enforced religious and imperial law. They also collected taxes, supervised market places, and ran the local administration in Muslim provinces. The Ulama of the Ottoman Empire (also known as Ilimye) also discouraged experimentation in the fields of science, philosophy, and religion (Bernard).

An influential leader in Ottoman history was Sulayman, who ruled from 1520 to 1566. He established the tradition of separation of the ruler from active government. Heirs were raised in the palace harem, isolating them from both politics and the military. This prevented wars between brothers fighting for the throne, but also lead to inexperienced leaders, resulting in a very bureaucratic society and, when combined with the lack of innovation caused by the Ilimye, a weakened empire (Bernard).

In the 1500s and 1600s, the empire was shielded from invasion by surrounding, weaker countries. However, in the late 1600s and early 1700s, both Russia and Hapsburg reclaimed territory from the Ottoman Empire. As Imperial control laxed, some Qadis became de facto local governors (Bernard).

1.3 Safawid Empire

The Safawid empire was located in modern-day Iran. Its strength was in the charisma of its leaders. The leaders of the Safawid empire united the disparate tribes of the region, using Sufi and Shia ideologies to appeal to them from both a spiritual and secular perspective. These tribes proved to be a valuable military resource, and enabled the empire to control more land.

The Safawid Empire threatend the Ottoman Anatolian frontiers because the Shia found converts there. The converts were seen as possibly disloyal to the Ottoman empire.

In the 1500s, Shah Ismail established a state religion. The government erected Shia shrines, bought religious art, and brought Shia scholars into the country from places such as Syria and Iraq. The government also persecuted non-Shia, especially Sunnis and Sufis. Sufis were seen by Shah Ismail as a possible rival power.

In 1514, Shah Ismail was defeated by the Ottomans in a battle over recruitment of tribes in eastern Anatolia. This defeat caused the Shah to lose influence over the tribes, and the tribes reasserted their independence from the Safawid state. Most of the Safawid region was controlled by the tribal powers by 1587.

Shah Abbas (1567-1629) regained control of the Safawid territory by reducing military dependence on the Qizilbash tribes. The tribes were replaced by slaves.

The Ulama began interpreting the Koran in a way that implied that they were the leaders of the Islamic community, and by 1722 they had taken over control of the empire. The Safawid empire was conquered by the Afghans in 1722, but the Afghans could not rule the state. The various Qizilbash tribes ruled the region after the Afghans left.

1.4 Mughal

The Mughal empire conquered much of Northern India in the 1400s. Unlike the other two empires, the region it ruled was made of of mostly non-Muslims. Eighty to ninety percent of its populace were Hindu, Christian, or other non-Islamic religion. The rulers of the empire did not see the following of Islam as a sign of loyalty, and were tolerant of alternative religions.

The Mughal empire collapsed around 1739 due to a combination of factors. Awrangzeb, the ruler of the time, had fought twenty years of unsuccessful wars. These wars meant he was often away from the seat of government, leading his troops.

Awrangzeb was long-lived, so that by his death, his heir was already old. His heir only ruled 5 years before he, too, died (Bernard).

2. General Information on Islamic Swords

In the Islamic regions, the sword developed to fulfill both a functional and a symbolic capacity.

The form of Islamic swords has not changed very much. The forms of the 1800s are similar to those of the 1400s (5 North). Old weapons were often reworked or given new components, so few older weapons are available for study (136 Coe).

The Islamic region shows a variety of sword types, from straight-edged blades similar to those of Europe to the curved swords for which it is known. One form of blade distinct to the Islamic region is the split-bladed curved sword, which is symbolic of the sword of Muhammad.

It is not entirely clear when curved swords were introduced to Islam. Curved blades are shown in frescos in Turkestan as early as the 800s. By the 1400s, there were two blade shapes in common use: a straight, broad, double-edged blade; and a gently curved, broad blade with a shallow channel and a false edge near the tip.

2.1 Shamshir

A shamshir is a one-handed, curved-bladed sword which developed in the Islamic region. The design was used by the Persians in the 1500s, and from them it spread to the rest of the region (Rawson).

The shamshir was primarily a slashing weapon. The curve of the blade made thrusting difficult (Rawson).

2.2 Yataghan

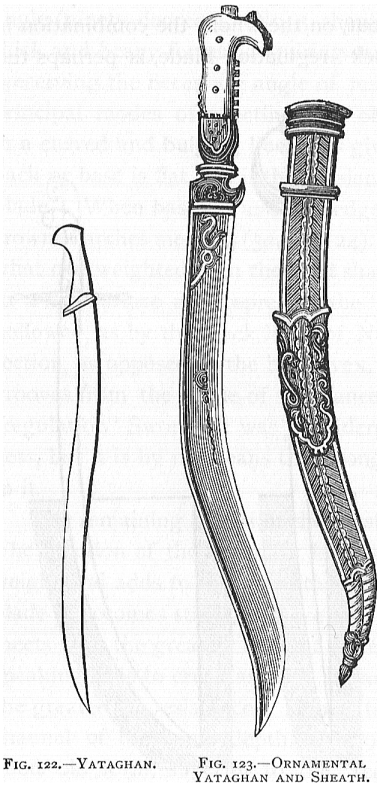


Figure 21: Yataghan. image from Richard Burton's The Book of the Sword, 1884. To fill in until I have an image of a Yataghan from the collection. YOU NEED TO DO SOMETHING ABOUT THIS

The yataghan is a sword form which developed in southwest Turkey. It was used from the mid-1500s to the late 1800s.Rawson It is distinguished by its lack of guard for the hand (24 North).

The blade varies between 23 and 31 inches, and is incurved. The sharpened edge is of steel and the back of the blade is of iron (Rawson).

The classic form of the yataghan is the elongated 'S', though some have straight blades. The distinguishing characteristics of the swords are its lack of hand guard and the 'eared' shape of its pommel. This hilt type predates Muhammad (24-25 North). This lack of hand guard did was not a great disadvantage, as the primary yataghan was used primarily from horseback, to slash.

2.3 Zulfiqar

The zulfiqar is a Islamic sword with a split-tipped blade (Rawson).

The split blade is in reference to a split-bladed sword belonging to Mohammed and his son-in-law Ali (Rawson).

3. Decoration

The swords of the Islamic regions are often highly decorated (5 North). Sometimes names, genealogies, or verses from the Koran can be found on the blade. Various techniques were used to decorate the swords, including false-damascening, inlay, pierced steel, enameling, and etching.

False-damascening is a technique whereby the surface of the object is covered in gold or silver in a pattern, often reminiscent of watered steel. The surface is first cross-hatched, then sheets of gold or silver are hammered onto the surface. The result is fragile: cleaning the blade can remove the metal. Rust could also form under the metal, lifting it off the surface (Coe).

Inlay work is another method of applying gold or silver decorations to an object. In this technique, the surface of the blade is chiseled with the desired pattern, and gold or silver wire is pounded into the groove. This resulted in a more durable decoration, but took more skill and more of the valuable metal (Coe).

VI. Swords of the South Asia (Stacy Haponik)

1. Indus Valley Civilization

Indian society is the result of centuries of invasion and immigration by diverse groups of many backgrounds and cultures.

The first recorded civilization in India is the Indus Valley Civilization. The Indus Valley Civilization formed around 2500 BCE around the Indus River and its tributaries, in what is modern-day Pakistan. The Indus Valley inhabitants irrigated the land alongside the river and built cities of brick.

1.1 Vedic Civilization

Between 1500 and 1200 BCE, the Indus River Valley was invaded several times by Aryans from the north. The Aryan invaders were not city-dwellers like the Indus Valley inhabitants, but were nomadic herders.

When the Aryans invaded the Indus Valley, the Indus Valley civilization died, although remnants of the language group of the Indus Valley civilization appear to survive in southern India and even a few pockets of northern India. Since the Aryans were not city-dwellers, they did not immediately take to the urban centers of the Indus Valley. The cities were abandoned. For the next 600 years or so, the Aryans expanded their territory from the Indus Valley to the south, battling the peoples who had settled there earlier.

The time during which Aryan culture dominated is called the “Vedic Civilization”, after the Vedas which were probably written then. The Vedas are the primary source of information on the Vedic Civilization, and are also the principal texts of Hinduism.

1.2 Class System

The Vedic Civilization also saw rise to a class system, consisting of four groups. These original groups were the nobles, the priests, and the ordinary people. As the Aryans expanded their territory, the conquered peoples became a fourth class.

The 6th century BCE (600–500 BCE) saw the creation of two major new philosophies in India. These philosophies were Jainism and Buddhism, and their development and beliefs shall be discussed later.

1.3 Later Invasions

The Persians controlled the northwestern portion of India from around 520 BCE until Alexander the Great conquered the region in the 330s BCE. Both influenced the resulting cultures in those areas.

Muslim kingdoms became established in parts of Northern India between the 600s and 1100s AD, bringing the Islamic religion with them. The Islamic religion conflicted with the native Hindu beliefs, and there was chronic friction between the invaders and their Hindu subjects.

1.4 Mughal Empire

In the 1500s, the Mughals from Central Asia and Afghanistan conquered Northern India, and eventually spread to control most of the Indian subcontinent. The Mughals showed tolerance for the native religions. The Muslim Mughal emperors married local royalty and attempted to integrate into local culture.

In 1658, Aurangzeb took the Mughal throne. Unlike prior emperors, Aurangzeb was a stern, orthodox Muslim. He departed from the policies of his predecessors and implemented policies which were harsh to the native Hindus. He banned building of Hindu temples, imposed taxes on Hindus, and otherwise discriminated against the culture group which made up the majority of his subjects.

This, coupled with his drawn-out military campaigns, led to the decline of the Mughal empire.

1.5 British Rule

The decline of the Mughal empire led to the rise of several smaller empires, which, in turn, were subjugated by the East India Company. This British-owned company became a territorial power during the 1700s and controlled most of the Indian subcontinent by 1850. Misrule led to the Indian rebellion of 1857 in Northern India. The rebellion failed to free India from British rule, but forced the East India Company to give up control of India to the British government.

2. Philosophies

The many cultures of India have given rise to several different philosophies and religions. The primary philosophies of India are Hinduism, Buddhism, Jainism, Sikhism, and Islam.

2.1 Hinduism

Hinduism is a philosophy which encompasses many religions. It developed out of Aryan traditions and culture in combination with the other traditions evidently inherited from the previous Indus Valley culture. The primary texts of Hinduism are the Vedas, which were written by the ancient Aryans.

Hindus believe in an abstract, supreme, and neutral spirit Brahman who has many forms. These forms make up individual deities, who may be worshiped individually. Hindus also belive in karma, or that the actions one performs on others influence the events which will occur to one.

2.2 The Vedas

There are four collections which comprise the set of texts which are usually referred to as "The Vedas". These are the Rig-Veda, Sama-Veda, Yajur-Veda, and the Atharva-Veda.

The *Rig-Veda* is the oldest of the four collections. It is a collection of religious hymns, rituals, prayers, and poems. It also includes a few secular works. The other Vedas were more specialized. The *Sama-Veda* consists of verses taken from the Rig-Veda. It details the Soma offering, a specific rite. The *Yajur-Veda* is also largely taken from the Rig-Veda and consists of instructions for rituals in addition to the Soma offering. The *Atharva-Veda* differs from the other three Vedas in that it is not primarily religious in nature. It describes charms and supersitions.

2.3 Buddhism

Siddhartha Gautama was born around 565 BCE, the son a king in modern-day Nepal. A seer foretold that he would either become a great king or a great holy man.

Siddhartha was raised as a prince, and shielded from knowledge of human suffering. While on a ride through the countryside, he saw four sights. These four sights were an old man, a diseased man, a corpse, and a mendicant holy man. From the first three of these sights he learned of old age, illness, and death. The last taught him that one can try to find peace through ascetism.

Siddhartha dropped out of his life as a prince and took up the life of an ascetic. After six years of severe ascetism, he realized that without the use of his body, how could he seek enlightenment? Then Siddhartha sought enlightenment through meditation.

Siddhartha's teachings influence Indian culture. Siddhartha's two main teachings were the *Four Noble Truths* and the *Eightfold Path*.

2.4 The Four Noble Truths

The Four Noble Truths are that suffering is part of existence, the origin of suffering is the desire for wrong things, giving up the desire for wrong things will lead to the cessation of suffering, and following the Eightfold Path will lead to a cessation of suffering.

2.5 The Eightfold Path

The Eightfold Path is the way to the cessation of suffering. It consists of right understanding, right thought, right speech, right action, right livelihood, right effort, right mindfullness, and right concentration.

2.6 Decline of Buddhism in India

The cause of the decline of Buddhism in India is not clear, but it was due to a combination of factors. These factors include the assimilation of Buddhist beliefs into Hinduism (leading eventually to the inclusion of Buddha as a manifestation of the Hindu god Vishnu), the conversion of Buddhists to Islam and Hinduism, and the destruction of Buddhist monasteries by invaders.

By the end of the 1200s, Buddhism had nearly died out in India, though still practiced in Nepal to the north and Sri Lanka in the south.

2.7 Jainism

In 540 BCE, Vardhamana was born into a royal family in the kingdom of Vaishali, in northeast India. After his parents died, at the age of thirty, he left his home and his worldly possessions. He started out wearing but a single, thin garment, and after thirteen months gave up even that.

Vardhamana lived a life of religious solitude and meditation, fasting, and avoiding harming other living creatures for the next twelve years. During this time, he achieved enlightenment. For the rest of his life, he preached throughout India about what he had discovered.

Vardhamana's teachings form the core of Jainism, which spread through the urban centers of India.

Jainists believe in nonviolence and compassion for all life. Jainists refuse to eat food which required the death or pain of another to acquire: they do not eat meat, and they do not eat root vegetables, for this requires the death of the plant. Jainists also believe in *Karma*.

2.8 Islam

The various Muslim invasions of northern India brought Islam with them. The Muslim beliefs are rather different from those of the Hindus, Buddhists, and Jainists who were native to the region.

The Muslim believed that suffering came from God and should be accepted. Hindus believed that transcendence was the proper way to deal with suffering. This, and other fundamental differences between the two religions, prevented much conversion between the two groups. Those Hindus who did convert to Islam often retained much of their Hindu culture.

2.9 Sikhism

Sikhism is a religious philosophy originating in Northern India in the 1700s. It is based upon the teachings of ten Gurus. The central belief of Sikhism is that there is one God. Salvation is pursued through meditation upon the idea of God.

Sikhism teaches of five evils. These evils are lust, rage, greed, attachment, and ego. Sikhs try to minimize the effects of these influences. Sikhism also teaches of five virtues. These are truth, compassion, contentment, humility, and love. These influences the Sikh tries to increase.

3. Five K's

Baptized Sikhs wear five articles of faith at all times. These articles symbolize important beliefs held by the Sikhs, and identify him as one of the faith.

keski turban worn to protect the uncut hair of the Sikh.

kangha A small comb representing discipline and the importance of cleanliness. It is used to comb the hair.

kara circular heavy metal bracelet for protection and a reminder of the wearer's ties to the Guro.

kirpaan ceremonial blade symbolizing self respect, used for self defense.

kachh A special undergarment representing modesty.

4. General Information on Indian Subcontinent

Swords have been a part of Indian culture for a long time. The first recorded mention of swords in India is in the Rigveda, composed around 5000 BC by some estimates. Since that time, swords have remained an integral part of Indian culture. They are a means of defense, a status symbol, and, in some regions, a multi-purpose tool.

Indian swords show a blend of native Indian and Islamic cultures. Many swords found in India are based on Islamic designs.

Like Islamic blades, Indian swords are often heavily decorated. The blade may be inlaid with precious metals in a technique called damascening.

The blade is often inscribed with geometric or organic patterns, or verses from either the Koran or the Vedas, depending on the beliefs of the owner. The inscription may be etched using acid, or chiseled into the surface (114 Paul).

5. Types of Swords

Indian swords can be divided into two broad groups: those with curved blades and those with straight blades.

Indian swords exhibit some unique features. Some, called patas, are a combination of blade and gauntlet. Others are broader at the tip than at the base, lending them an axe-like appearance. As regions of India adopted Islamic culture, the Islamic sword style melded with the local style, so that the Islamic split-bladed sword is also found here.

Straight Blades

5.1 Khanda

Figure 1: Khanda, 1700s. HAM 2052.

The khanda is one of the oldest of Indian swords. It was used by Rajputs, Mughals, and Marathas. It is the sword most commonly associated with central India.

The form of the blade is what determines whether or not a sword is a khanda. Khandas have a broad, straight blade is between 29 and 35 inches in length. The blade usually widens to a blunt point. The blade is usually single-edged, with a strengthening plate along the unsharpened edge.

The hilt of the khanda may vary. Around 1600 AD, khandas were manufactured with basket-hilts. The inside of the guard and finger guard were padded, and the pommel often had a spike protruding from it. This spike served as an arm-guard. The spike was also grasped by the second hand when the sword was swung two-handed.

The blunt point of the khanda leads it to be used as a cutting weapon (48 Pant).

5.2 Pata

Figure 2: Pata, 1800s-1900s. HAM 3063.

The Pata is a gauntlet-sword developed by the Marathas in the late 1700s. It originated in West Deccan, and the style then spread throughout their empire (61 Pant).

The gauntlet covers the forearm nearly to the elbow. The interior of the gauntlet is padded. An iron strap hinged to the upper end of the gauntlet goes around the arm, holding the gauntlet to the arm. The grip is at right angles to the blade, and it is held like a punch dagger. The wrist is held straight (62 Pant).

The blade of the Pata is either leaf-bladed or straight, with parallel edges (61 Pant). It was long, flexible, regularly tapering, and steel (62 Pant). Blades were most often European in origin, usually from either Spain or Italy (45-46 Rawson).

The Pata relied upon the motions of the forearm, rather than the wrist. This allows powerful strokes to be used. It took skill to wield, and was not well suited to fencing. The Pata was used primarily by cavalry (45-46 Rawson).

5.3 Dao

Figure 3: Dao from the Assam region of northeastern India, 1800s. HAM2055.

The dao is a multi-use blade. It developed among the tribes of eastern India.

The blade of the dao is straight and heavy. It is square-ended, and narrowest at the hilt. The blade is about 18 inches long, and sharpened only along one side. The hilt is simple, and undecorated. There is no distinct pommel.

The dao was used both as a tool and as a weapon. The weight of the dao allowed it to be used as an axe. Since the wielders used spears as their primary weapon, the dao was a secondary weapon, used primarily on already-disabled enemies (33-42 Pant).

Curved Blades

5.4 Talwar

Figure 4: Talwar, 1800s. HAM 2051.

The talwar is class of Indian saber, which includes almost all curved swords. The blade is sharpened on the outside of the curve.

The typical talwar has a short button on top of a disc pommel, an oval-shaped grip, and short, heavy quillions. It may also have finger guards (83 Pant).

5.5 Kora

Figure 5: Kora from Nepal, 19th-20th century. HAM 2050.

The kora was the primary weapon of the Gurkhas of northern India and Nepal.

The blade of the kora is between 19 and 24 inches long, severely bent, and sharpened on the inside of the curve, in contrast to the talwar. The blade widens to the end, and terminates in two concave curves. The blade is very heavy.

The curve of the blade and its weight make it a powerful chopping weapon (54 Pant).

5.6 Kastane

The Kastane is a curved sword found in Sri-Lanka. It was probably developed after contact with Europeans in the 1500s.

It has a short, heavy blade. The blade is slightly curved and sharpened along the concave edge. The pommel and quillion are decorated with animal shapes.

The Kastane is often heavily ornamented, and served as a status symbol.

VII. African Swords (Stacy Haponik)

1. Ironwork

The origins of ironwork in sub-Saharan Africa are uncertain. Iron was readily available as low-grade ore, but in order for this ore to be useful it had to be refined. African iron smelting may have been developed as early as 800 BC in eastern Africa (33 Iliffe) (46 Thornton). The major iron-making centers of sub-Saharan Africa were Nok in central Nigeria and the Lake Victoria region of eastern Africa (102 Stock).

Because parts of Africa with iron ore were often poor in wood resources, methods of smelting were developed which required less fuel. The most effective of these was a method of pre-heating air as it entered the furnace. These methods also caused Africans to produce rather good steel–superior to early modern European steel in some cases (46 Thornton).

The beginning of Africa's iron age was all the more significant because sub-Saharan Africa did not have a bronze age. This was likely due to the scarcity of copper on the continent. The only part of sub-Saharan Africa with a significant copper deposit was central Africa (33 Iliffe). Once iron smelting was discovered, it became the utilitarian metal of sub-Saharan Africa (33 Iliffe).

Iron was fashioned into more durable tools for agriculture and formed into weapons. Its development allowed iron-making peoples to expand against those using stone tools and weapons. The discovery of iron also allowed farming communities to convert the forests to fields (42 Fyle).

2. Eastern Africa

Between the 700s and 1800s, many city-states were established along the coast of Eastern Africa, between Somalia and Mozambique. All together, there were approximately forty major urban centers (105 Stock).

Figure 23: Topological Map of Africa (to stand in until I create one with places labeled SAME ISSUE). Map by NASA.

These city-states traded gold and ivory with the Arab, Indian, and Persian traders who traveled along the coast. The cities became wealthy off of this trade. Archaeological digs at some of these sites have produced objects which came from as far away as China. The cities also became exposed to the Islamic religion, and this was the dominant religion in some (105 Stock).

The city-states were near their peak when the Portuguese arrived in the 1400s. The Portuguese found the wealthy, literate cities whose inhabitants came from Persia, Arabia, and other parts of Africa (105 Stock).

3. Western Africa

Islamic empires were established in Western Africa between the 800s and 1800s. The more important ones of these were Ghana, Mali, Songhai, Kanem-Borno, the Hausa states, and Sokoto.

These empires had primarily agricultural economies, but grew rich through the control of the trade routes across the Sahara Desert (105-106 Stock). The empires exported gold, slaves, cloth, and ostrich feathers. They imported coins, cloth, and weapons. They also controlled the routes along which salt traveled from the Saharan mines to the markets on the southern savanna and forests (105-106 Stock).

3.1 Ghana

Ghana rose around 800 AD. The rulers and much of the population converted to Islam in the 11th century AD (107 Stock).

The empire of Ghana declined in the 1100s due to the discovery of new goldfields in Bure. These fields were beyond its control, and caused trade routes to shift away (107 Stock).

The loss of trade meant that Ghana could no longer import food to feed its large populations. This destabilized the empire and led to its collapse.

3.2 Mali

The empire of Mali emerged by the mid-1200s in the upper Niger and Senegal valleys. Mali grew rich due to control of the Bure goldfields, as well as various salt deposits (107 Stock).

Mali was governed according to Islamic principles. The rulers established universities in Timbuktu and Jenne. Books and scholars were imported from Greece, Egypt, and Arabia (107 Stock).

Civil war led to the decline of the empire in the 1400s (109 Stock).

4. Central and Southern Africa

4.1 Karanga

The empire of Karanga rose to its height between the 1200s and 1400s AD in southern Africa, primarily in the regions covered by modern-day Zimbabwe and Mozambique. The capital of Karanga was Great Zimbabwe, from which modern-day Zimbabwe draws its name.

The people of Karanga were metalworkers skilled with copper and gold. They mined and smelted iron. The empire was a rich center of trade in gold. The empire's richness can be deduced from the discovery of goods from as far away as India and China in its capital (109 Stock).

4.2 Kongo

Between the 1300s and 1700s, the states of Luba, Lunda, and Kongo rose and fell in what is now south Congo and northern Angola. Kongo was dependant on its agriculture and metalworking. Its primary trade was in food, metals, and salt. The arrival of the Portuguese led to the collapse of the Kongo state in the 1500s. Portugal's main interest in Kongo was as a source of slaves (109 Stock).

5. Slave Trade

Prior to European trade in slaves, wars were not fought to gain slaves, they were fought for other reasons. The slaves gained through wars were incidental.

The European interest in slave trading, beginning in the 1500s, caused slaves to be more valuable. Wars began to be fought for the purpose of capturing slaves. These wars disrupted agriculture and hindered the development of cultures (109-112 Stock).

The goods received through the trade in slaves were mostly weapons and luxory goods. States which participated in the slave trade gained military and economic advantages over their neighbors, which allowed them to further enslave their neighbors.

5.1 End of Slave Trade

In 1807, Great Britain forbade its citizens to participate in the African slave trade, and tried to impose this rule on other slave-trading countries. In 1833, slavery in the British empire was abolished (117 Stock).

This caused the bottom to fall out in the African slave market. The transition from a slaves-based economy to a goods-based economy was difficult for Africa states. Some states collapsed and new leaders arose in others (117 Stock).

6. European Colonialism

Small European colonies had existed in Africa since the late 1400s. These had been established as slave-trading bases. The unrest in the continent due to the fall of the slave trade allowed European forces to increase their influence. Before 1880, 90% of Africa was ruled by Africans. By 1900, only Liberia and Ethiopia remained uncolonized (118 Stock).

In the mid-twentieth century, a major push was made to return rule of the continent back to the natives. Beginning in the 1950s, the various colonial powers made an effort to convert their colonies to independent nations.

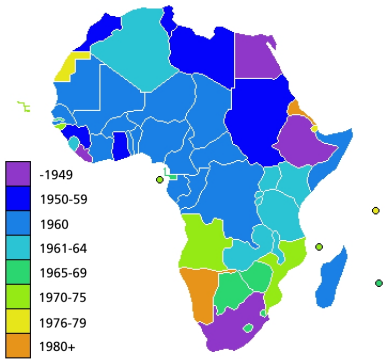


Figure 24: Approximate dates of independance of African countries. Image from wikipedia.

7. Swords of Africa

The swords of Africa are radically different from those of other regions. Their shapes range from straight-bladed, almost European styles to multi-bladed objects. They were created to serve in rituals and as currency, as well as a status symbol and for use as a weapon.

7.1 The Smith

In African cultures, the smith was often viewed with superstitious awe. He was a figure of magic and mystery. The smith often lived apart from the rest of the tribe. In the Maasai tribe of eastern Africa, the smith was viewed with disdain, but the weapons he created were prized second only to the tribe's cattle (205 Coe).

In other tribes, smithing was a respected profession. Kings were proud to have learned the art (11 Fischer).

7.2 Materials

The first metal worked in Africa, apart from some limited copper-work in west Africa, was iron. This was because the only significant copper deposits in Africa were in central Africa (33 Iliffe). Copper was treated as a valuable metal, similar to gold. One traveler reported a meeting with the Mangbetu king in which the king held a copper-bladed trumbash as a scepter, and was surrounded by bars of copper. This was apparently to illustrate the tribe's wealth and power (90 Zirngible).

Evidence suggests that ironworking may have been discovered as early as 800 BC in eastern Africa (33 Iliffe).

Steel was the material most commonly used for swords. Other materials used were copper, brass, or wood, but these were used primarily for ritual weapons (22, 62-63, 84, 90 Zirngible).

7.3 Steel

Iron was found all across Africa in the form of iron ore, which requires processing before it can be used (10 Fischer). The process of turning iron ore into a usuable material is called *smelting.*

7.4 Smelting

The Africans used a type of smelting called "bloomery smelting". This is the same process used by the Europeans before the invention of the blast furnace. In bloomery smelting, the ore is heated up to 1200 degrees Celsius in a furnace. The resulting sponge of iron and impurities, or *slag,* is called a "bloom" (Lee).

The bloom is further purified through hammering. The result is a low-carbon, mild steel which formed the basis for dense, springy and flexible blades (10 Fischer)(17 Spring).

7.5 Shape

After the iron ore was smelted into a bloom and hammered into a bar, the smith would forge it into its final shape. The steel was often hammered into wide, thin blades which were then stiffened by grooves or ridges. Blades were rarely stiffened through shear thickness of material (10 Fischer).

7.6 Decoration

After the blade was created, palm oil was often burned on its surface to blacken it. After the blade was blackened, parts of it would be polished to provide contrast (10 Fischer). An example of this can be seen in Figure 1.

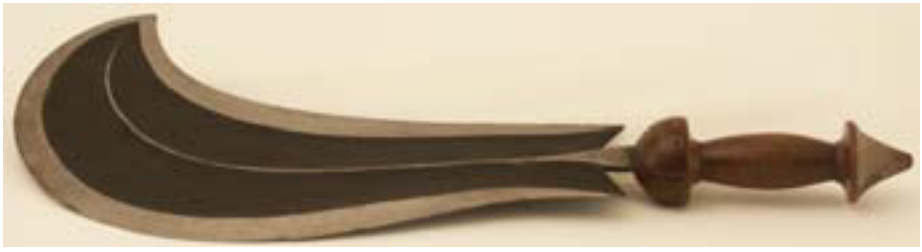


Figure 25: Sword made by the Banle people of the Ivory Coast, Western Africa, 1800s. HAM 3480.

Copper was often used to decorate weapons, in a manner reminiscent of the way Islamic and Indian weapons were decorated with gold and silver.

7.7 Purposes

The uses to which African swords were put were as varied as the cultures which created them. The weapons often served as status objects, symbols of rank. They were used in religious rituals and in the ceremonies of secret societies. They were traded as currency and wielded in wars.

Because of the dispersal of weapons caused by their use in battle and as currency, it is often difficult to determine where a style of weapon originated.

Blades destined for use as currency were often poorly made (90 Zirngible).

8. European Influence

In the 1500s, trade between Europe and Africa increased. Firearms and imported European-style swords weapons began to replace native African styles (207 Coe).

The demand for European-style blades was such that often they were locally made, rather than imported(208Coe).

The increase in trade also brought European steel to the area (207 Coe). The Europeans used blast furnaces to smelt their iron ore, which resulted in large quantities of steel with slightly different properties.

Imported files were used on later weapons (207 Coe).

Locally smelted steel was of higher quality and was believed to possess mystical properties. It was often used on important weapons, such as those used as symbols of rank or for religious rituals (207 Coe).

VIII. Chinese Swords (Jessica Copp)

1. Chinese History

While modern-day China is a vast amount of land that spreads from the Himalayas to the Pacific Ocean, the majority of people were first centered around the Yellow River, though there were nomadic tribes spread all over the area. These people were making advances in technology long before Europe. Some of the advances made in Chinese culture were a very early form of script, paper, printing, gunpowder, pyrotechnics, the compass, silk textiles and high-quality ceramics. (Meyer 16) This drew the surrounding tribes to China and their culture because they wanted these luxuries and technologies as well. These migrations led to the densely populated region of China.

From early in Chinese civilization, they were very densely populated and eventually most heavily populated area in the world by 1122. This high concentration of people led to war and rebellions throughout their history. Rebellions and invasions gave rise to the series of dynasties used to divide Chinese history. Each dynasty would start when an uprising or invasion would place a new ruling family on the throne. Some lasted more than others, but there were always wars and battles that threatened the throne. (Meyer 19-20)

The earliest dynasty was the Xia Dynasty (2201 or 1994 BCE). The Shang dynasty (1523-1027) was the first historical dynasty and also centered around the Yellow River. This is when the Chinese formed a written language and began creating their famed artisanal works. They were strongly influenced by diviners who read information from bones, pieces of wood, or sacrifices. (Meyer 121) The battles that the Chinese were fighting during this time were mostly against invaders from bordering areas. They also were fighting to loot and plunder as well. The armies usually consisted of 3000-5000 men, who wore bronze helmets and leather armor

reinforced with bone and wood, and carried spears. Hunting was still being practiced, but mostly just as a sport for the nobility. (Meyer 123) There was some trading that went on with regions south of China to import the materials necessary for bronze.

The Zhou dynasty reigned from 1122-221 BCE, which was primarily a period of war. It took over two decades for the new leaders to conquer all of the city-states that were spread throughout China. Their troops were split into three main types. There were the nobility and kings who rode in chariots with spear-armed men. There were men on foot with bows and bronze-tipped arrows. The crossbow was invented by the Chinese around 340 BCE as well. This was a highly advanced weapon that wouldn't be developed by Europe until much later. Towards the end of the dynasty, a cavalry was formed. War was used to punish enemies, expand the Chinese territory, to settle private conflicts, and continued to be used to loot and plunder. (Meyer 129-133)

By 500 BCE iron was used in place of bronze. This allowed for longer weapons, and swords were created that were up to three feet long. This was a remarkable change from the first bronze swords which were only about a foot long. As different weapons with different purposes were created, the way they were tactically used could change as well. *The Art of War* by Sun-tzu is the world's oldest known tactical writing about war dating to about 515 BCE.

Sun-tzu's outlook has much in common with Confucianism and Daoism, which were taking shape at about the same time. Confusianism is a philosophy more than a religion, but people still followed it devoutly. Its practices are integrity, loyalty, righteousness, reciprocity, and human-heartedness. Daoism was also formed during this time, which was advocating a simple and honest lifestyle without interfering with nature's course of events.

The Qin dynasty was in place from 221-206 BCE. This was a dynasty of standardization in China, developing a centralized government and an official language. This is also the time when China began to take its shape geographically as it is today. The centralization of China that took place during the Qin dynasty is still in place today. It was also a time of battles. There was a strong cavalry which was needed especially on the borders. The country was split into forty-one different military regions. One major change was that peasants now could privately own land, but they now had to pay taxes on it. This caused a shift in the social structure. The lower class could now buy their way into nobility through gifts and services to the king. (Meyer 152)

The Han dynasty (206 BCE – 220 CE) with the Xin dynasty ruling a few years in the middle (9 – 23 CE) was still a time of war. There were still battles for expansion and defense against others. The Han dynasty's main enemy was the Huns (Meyer 159). Unlike the Qin dynasty, the Han dynasty followed Confucianism quite enthusiastically, but integrated some elements of Daoism. During the Han dynasty, there were many scientific discoveries in astronomy that, though often credited to Europeans, actually took place in China much earlier than anywhere else. Paper and porcelain were also invented during this time. (Meyer 164-168) Such advances were the reasons that other countries and civilizations would send people to China to learn. Through the trading that was going on during this time, Buddhism made its way into China around 100 CE.

After the fall of the Han the next dynasty to unify and hold China was the Tang Dynasty (618-907 CE). Tang scholars studied mathematics and astronomy. New plants were being grown for food as well as wines. Wood-block printing was a major invention during this time, though ink and brushes had been used since antiquity. Its first use was to make copies of

Buddhist writings. China became a major exporting civilization, mostly of silk, porcelain, and spices. It imported copper, precious stones, and possibly slaves from Africa. (Meyer 205-211)

The Song dynasty (960-1279 CE) continued to modernize China. This dynasty saw the use of banks, crossbreeding of rice, gunpowder for military projectiles, and a navy of over 50,000 men. (Meyer 122) The Mongols came in and conquered China to establish the Yuan Dynasty (1279-1368 CE). They established a strong bureaucracy and moved the capital into Mongolia. They had a different language, and only accepted some of China's customs. In writings, the Chinese describe the Mongols as barbaric, drunks, savages, and culturally backwards.

Eventually, the communication barrier, cultural differences, and vast area of China made it difficult for the Mongols to rule, and led to the fall of the Yuan Dynasty. (Meyer 227 – 233) The Ming Dynasty (1368- 1644 CE) took over after the Mongols. This was a peaceful dynasty that brought prosperity along with Confucian ideals. This placed the capital back into central Chinese territory. Many buildings were created during this time, and the Great Wall was also erected. As western countries started visiting China in the mid 1500's, the Ming dynasty was already weakening from internal conflict, and China became divided over the involvement of the new visitors. This division led to the fall of the Ming Dynasty and the rise of the Qing Dynasty. (Meyer 235-245)

The Qing dynasty (1644-1912 CE) saw more military expansion and uprisings at the borders. China was now trading with many other countries including overseas. Europe and eventually America showed special interest in trading with China and negotiated treaties to gain access to Chinese goods.

Towards the end of the Qing dynasty, the major event was the Opium Wars. The Opium Wars started in 1839 and were between Britain and China because China wanted to ban the drug due to the harm it was causing, while Britain wanted to keep bringing it in to maximize their profits. When Britain kept importing the drugs, the emperor destroyed it, which caused retaliation by Britain. (Meyer 254-255) This was the first time that China was completely dominated in a one-sided war. The British navy could use their boats, which were now steam powered, to go up the rivers now, which was how they were able to conquer the Chinese. After this, China was weakened and the countries that traded with China were looking to gain more rights. The French took over railways, Germany controlled ports, and England gain new territory. Countries continued to take what they could of China, leaving it with a large debt and humiliation. (Meyer 262-266)

After all that the Qing dynasty had been put through, it was finally overthrown in 1912 and was the last dynasty that China had. The new goal of the Chinese was to restore China's stability and power like there had been during the Tang and Song Dynasties. Yet, after the fall of the Qing dynasty, there was no stability and wars arose all over the country. It wasn't until 1949 that a government was able to gain control. Modern China now has a president and is known as the People's Republic of China. (Meyer 255). Very recently, China has been gaining power by buying up the US's deficit. Countries are starting to worry about the power that China is gaining and they're beginning to see them as a threat.

China's Dynasties

Xia (unsubstantiated):	2201-1766 BCE or 1994 – 1523 BCE
Shang:	1766-1122 BCE or 1523 – 1027 BCE
Zhou:	1122 or 1027 – 221 BCE
Qin:	221-206 BCE
Han:	221 BCE – 220 CE

Six Dynasties:	220-589 CE
Sui:	589 – 618 CE
Tang:	618 – 907 CE
Five Dynasties:	907 – 960 CE
Song:	960 – 1279 CE
Mongol or Yuan:	1279 – 1368 CE
Ming:	1368 – 1644 CE
Manchu or Qing:	1644 – 1912 CE

2. Chinese Swords

There are two major sword categories in Chinese history. The first is the jian, which is a straight double-edged sword, used for slashing and thrusting. It was first manufactured around the 4th century BCE. In legend, the jian had mystical powers that would allow it to glow in the dark and utter sounds (Coe 172). It was associated with chivalry and seen as a necessity for an established gentleman. (Tom)

As technology progressed, the swords were able to become longer. The jian was about 14 inches when it was first being manufactured. The "hollow-hilt" which followed was around 16 inches. The jian that appeared during the 4th and 3rd centuries were 20 inches long and also became decorated with inscriptions dedicated to ancestors. The appearance of the jian was changing. By the 3rd century, it became very long and slender with the blade reaching up to 26 inches. The manufacturers used a chromium wash on the blade during production which enhanced and preserved the sharpness of the blade. There was a turn towards the use of iron and steel, but bronze was also still used regularly (Coe 174).

Figure 1. Bronze sword from the Zhao Dynasty (1123-250 BCE). HAM 238.9

Figure 2. A jian from the 1800s. HAM 3277.a

During the Han dynasty in particular, steel swords of the jian type were used. These were very similar to the bronze version. The makers started using decorations of jade and gold. The only people in the Han military that carried swords were officers and a few foot soldiers. (Coe 175).

By the Qing Dynasty in 1912 there had been changes made to some swords in China. There was now a pair of swords that were meant to be fought with together, one in each hand. They fit side-by-side together in the same scabbard. They are called either shuangjian or yanyang jian. These are short bladed, double edged weapons. They are sometimes referred to as butterfly knives and used in Chinese martial arts. (Coe 182)

Figure 3. Shuangjian from late 19th – early 20th century. HAM 2111.a

The jian was later joined by the dao, which was a single-edge saber with a very slight curvature that was used by both cavalry and footmen. It tended to be used more than the jian. In legends, the dao could change into a dragon (Coe 172). It's associated with the martial spirit of a soldier and was used as a military weapon. (Tom)

In the Eastern Han dynasty, 25 – 220 AD, a new single-edge sword began to appear. The huanshou dao is of similar form as the jian, created during the Han dynasty, and was about 36 inches long (blade), but very narrow with a ring pommel. There were also some two-handed swords that came around during the late Qing dynasty. The most common surviving sword is the dadao, which has a long, broad, curved blade and a ring pommel. (Coe 175, 182) The dao is a single edged sword that can vary greatly. It may be straight or curved, long or short, wide or narrow. The peidao is a common Chinese sword that is analogous to the European saber. It's a "waist knife" with a blade of at least 65 cm. in length. It was generally used by cavalry because the curve of the blade allowed for effective swing and cut from on top of a horse. There are four types of the peidao: yanmaodao, liuyedao, piandao, and niuweidao. The yanmaodao is the oldest of the four types, found during the early Ming Dynasty. Its cutting edge is straight over most of the blade and gradually curves upwards at the point. The liuyedao also started during the Ming Dynasty. It's lightly curved throughout most of the blade. This makes it more efficient for cutting than the yanmaodao, but, lessens its effectiveness of thrusting. It was primarily used by

the military forces of the Qing Dynasty. The piandao is a strongly curved blade that's analogous to the Ottoman and Persian shamshir. It was used for slicing in close range, not thrusting. It was not very common but some artifacts have been found from the first half of the Qing Dynasty. The niuweidao was a strongly curved blade that widens before coming to a point. Decorations started becoming popular on the mountings and blades during the Ming and Qing Dynasties. Some decorations included scroll work, leaves, and lotus or peony blossoms. (Tom)

Figure 4. Dadao from late 19th- early 20th century. HAM 2076

Figure 5. Yanmaodao and scabbard (top) from late 16th century. Liuyedao and scabbard (middle) from late 18th-early 19th century. Niuweidao and scabbard (bottom) from late 19th-early 20th century. (Tom)

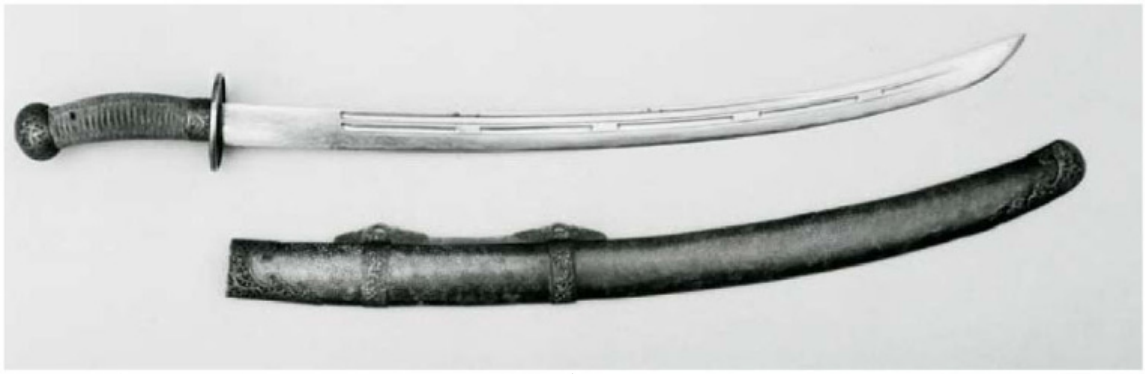


Figure 6. Piandao and scabbard from late 19th century. (Tom)

IX. Japanese Swords (Jessica Copp)

1. Japanese History

The first humans are thought to have appeared in Japan were said to have done so around 200,000 years ago. Trading also began early, though it had to be by water. As early as 20,000 years ago, the Japanese were traveling overseas to trade obsidian. (Naff 28-30) By trading with the other regions the Japanese were exposing themselves to other cultures, traditions and knowledge that in some ways were more advanced then their own.

At first the Japanese didn't realize how much they were imitating China, but once they saw how beneficial it was (550 CE), they began deliberately adopted Chinese religions, politics and language. Buddhism was the first borrowed idea from China that became prominent in Japanese society. (Meyer 27-28)

The samurai is an important part of Japanese history and possibly the most recognizable Japanese concept today. The samurai were the higher class military men. They were supposed to live a life of service and inference to personal danger and gain. They received special treatment in the criminal courts, like being able to kill a commoner for being rude. Their purpose was to uphold structure and morals in society. They wore two swords in their sash, one long and one short. This made them walk and stand differently to keep the swords in place. The samurais also stood out from others by the "topknot" that they war on top of their head. They also had a special outfit, consisting of a stiff-shouldered jacket and pants that looked like a skirt. As the samurai class began to fall, they could no longer afford to keep their possessions because samurais didn't work. This was a major downfall for the samurai rulers. (Jansen 101-110)

The leader of the Japanese government is the emperor technically, but the shogun is the one with the real power. The shogun was military leader, but took over power from the emperor.

The emperor was removed from the public's eye and took his place as a deity not a ruler. (Gunsaulus 2)

During the Heian Period (794-1185) Japan abandoned their ties with China and stopped with the cultural exchanges. This is when Japan started its own cultures that still thrive today. Japanese literature, calligraphy and the curved blade all came from this period. The curved blade is what makes the Japanese sword so recognizable. The blade is said to be strong enough to cut through iron. Buddhism was also a strong force in Japan during this time. It was as political as it was as a religion. There were warrior monks who worked for the government to uphold structure and stability. (Coe 152) Swords were needed to arm the military forces, but at the beginning of this period, they weren't really being produced, which was why Japan needed to turn inwards and form their own manufacturing method.

The Muromachi Period (1392-1477) was when Zen practices became popular. The samurais devoted themselves to it. Communications opened again with China. The wars and fighting that were going on at this time didn't involve horses anymore. The quarters were much closer while fighting so it was hand to hand combat that was dominate. This meant more swords were needed and used. This was not just in Japan, but in China as well. Japan began exporting swords to other countries. The two stereotypical samurai swords were produced during this time. The katana is a long sword that was only wore outside. The wakizashi is a short sword that was worn at all times or put next to the bed while sleeping. (Coe 160)

The Azuchi -Momoyama Period (1574-1602) and the Edo period (1603-1867) were a time of peace which left the samurais unemployed. Some began to form gangs that they called brotherhoods. They caused a great deal of trouble and would go around killing people for fun. Swords were also being used for executions which could also test the swords. After the people

were beheaded, they would use the rest of the body to conduct more tests to check the cutting efficiency of the blades. (Coe 164-168 and Yumoto 28).

Tokugawa Japan (1603-1868) was a time of isolation. It was a feudal system based on Confucianism. With other countries beginning to explore, they eventually made their way to Japan. At first the Japanese were welcoming of the new people, but then felt that their politics and way of life were in danger. In 1637, Japan began its isolation period. (Meyer 100-103) By 1641, the Dutch were forced to an island. The Spanish were banned in 1624 and the Portuguese were sent away in 1638. Not only were people not allowed to enter the country, beginning in 1637, no one could leave the country either. During this time, it was also outlawed for peasants to carry swords. However, samurais were allowed to carry their swords, and were favored under Tokugawa rule. They were their own class, the warrior class.

2. Japanese Swords

The swords of Japan are an important part of their history. The samurai is the main sword carrier of Japan and the sword is said to be the soul of the samurai.

The first swords were made around 300 CE. The chokuto is a straight, single edged sword with blade length of about 31 inches. This was used mostly by cavalry. They also carried a warabite-tachi which was a shorter, broader sword. Also around this time, many swords were imported from China and India. There were few swords made in Japan, but more so later on. (Coe 151)

The Kamakura Period (1185-1392) was a time of change to the sword. The blade became more slender and sturdier. The curve became deeper throughout the blade to increase cutting efficiency. They found that though the blade was able to cut through iron, that it was much more

difficult to cut through the tough leather that the Mongols wore. Swords were also now given as gifts to the nobles. (Coe 156) The swords began to be looked at as a status symbol.

During the Muromachi Period (1392-1477) two stereotypical samurai swords came into being. The katana is a long sword that was only worn outside. The wakizashi is a short sword that was worn at all times or put next to the bed while sleeping. (Coe 160) There were variations to these types over the years, but the name and basic idea stayed the same. During the Tokugawa Period, to touch another's weapon or bump into the scabbard was a serious offense. When entering a friend's house, the katana was to remain outside. If the host insisted, it could be placed on a rack on the right hand side of the guest. This way the guest could never grab the sword with intent to use it. The rack was only on the left hand side if there was immediate threat of attack. The wakizashi could be worn indoors. (Turnbull 138) They were worn on the left hand side and there is a very particular ways to attach both the wakizashi and the katana.

The katana is measured at 24 inches or more. It was used as a cut and thrust weapon. It was used in World War II and also in fencing. (Ratti 260) The rebellion katana was produced in 1877. An artifact that was measure and weighed was of overall length was 40 ½ inches, the blade 27 inches long with width 1inch. The sword alone weighs 30 ounces and with the scabbard weighs 40 ounces. It has an unsigned blade with iron mounts and a black lacquered scabbard. (Fuller 108)

The wakizashi usually ranges from 16-20 inches. It was used in beheadings and ritual suicides that were performed by the samurais. A rebellion wakizashi artifact was measured at an overall length of 23 7/16 inches, the blade 16 1/16 inches with width 1 1/8 inches. The sword weighs 19 ½ ounces and with scabbard weighs 24 ounces. Like the katana it has an unsigned blade with iron mounts and a black lacquered scabbard. (Fuller 108)

figure 1. A katana from late 17002 – early 1800s. HAM 1860

figure 2. Wakizashi from the 1500s. HAM 2290.1

Figure 3. Samurai dressed in armor (1860s). (www.wikipedia.com)

The kaigunto is a naval sword that was used by officers. It's a short sword, only about 15 inches long, but sometimes longer and more narrow looking more like a saber. These were, for the most part, factory-made blades that had no real value. They were carried by officers. After artifacts were looked over, it was found that between 1868-1945, the kaigunto ranged from an overall length of almost 37 inches to almost 40 inches, a blade length ranging from 26 to 30 inches and had widths of at least 1 inch but not much more. The average weight of the kaigunto without the scabbard during this time was between 20 and 42 ounces.

The process that sword-smiths go though to create a traditional Japanese sword is a long one. Most sword-smiths use a steel called tamahagane. Today, this type of steel is produced almost exclusively in a single Japanese smelter called a tatana and is one of the most expensive types made. This smelter uses charcoal heating to add carbon. It takes five days to create the

steel. The first day is used to build the walls from clay and sand which are rebuilt after every cycle. The smelting takes three days. The last day is for removing the steel. After the walls are created a small fire is started in the bottom of the trough and small pieces of oak and pine charcoal are added continuously for three hours. The top of the coals are spread with iron sand, which is followed immediately by another layer of charcoal. Thirty minutes later more iron sand and charcoal are added. This cycle continues every half-hour for 72 hours. In the end a two-ton brick of steel is created. This is smashed into smaller pieces which are inspected and sorted. The steel ranging from .6 to 1.5 percent carbon is tamahagane. (Kapp 61-66)

After the iron is created the sword-smith takes it to turn it into a sword. The forge and bellows is the major equipment used. Unlike what was used in Europe, the air blast comes from one side and the bellows are to the left of the forge so the sword can be manipulated with the right hand. A steel block is created by welding together the small pieces. The block is wrapped in paper to hold it together in the forge. Clay slurry and rice straw ashes are applied to the hot steel block to help prevent overheating, oxidation and the resultant loss of carbon. The block is heated and hammered until it's completely welded together. (Kapp 70)

After the solid block is created it's heated and folded onto itself six times. Each fold requires 30 minutes and 2-3 heatings. The block is cut into three equal pieces. It takes two pieces to create a small sword and four to make a full size blade. The pieces are heated and hammered out until they are welded together and resemble the shape of a sword. Only six inches are heated at a time and the temperature is very important. A hammer is used to smooth out the edges until the steel is long and straight. This is not an easy task and takes people years to perfect the technique. The point of the blade is carefully shaped with a hammer. (Kapp 70-82)

After the forging process the blade is refined by filing and scrapping. Both sides of the blade are smoothed. An adhesive clay mixture (clay, charcoal powder, and pulverized sandstone) is applied to the blade. The clay helps to insulate, the sandstone prevents shrinking and cracking, and the charcoal powder helps control the rate of the heating and cooling. The blade is hardened by making it red-hot then submerging it in cool water. After this the curvature of the blade is adjusted by heating the blade and hammering it over a heated block. Once the blade is set grooves can be added using a draw knife and decorative carvings using a chisel. (Kapp 84-96)

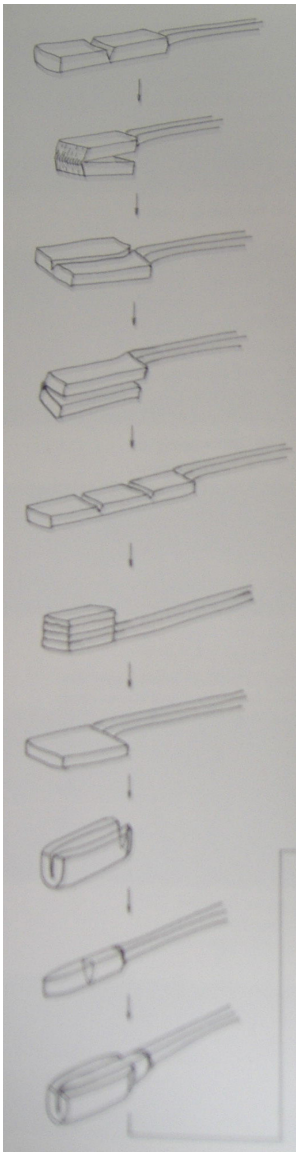


Figure 4: folding the steel (Kapp)

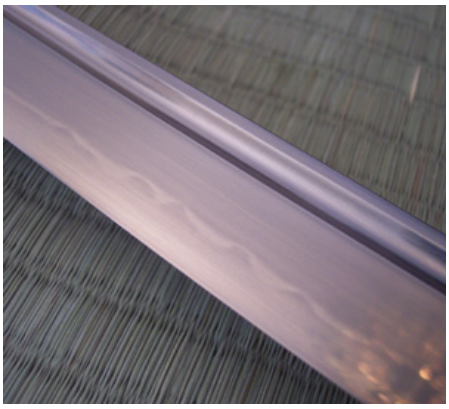


Figure 5: On this sword you can see the hamon. The round, bubbly pattern indicates a good hamon. The hamon is the pattern that forms when the edge is being hardened. (www.wikipedia.com)

X. Southeast Asian Swords (Jessica Copp)

1. Southeast Asian History

Although not much is known about the prehistory of Southeast Asia, human remains have been found that date back a million years. Though there may have been small groups of people coming into the Southeast Asian area, the first significantly large migration started around 2500 BCE from China. Many times, whole communities would migrate together to Southeast Asia from China. These immigrants mixed and intermarried with the cultures already present in the area, and from this branched the four main racial and linguistic families. In northern and central Burma river valleys, Tibeto-Burmese languages were spoken. In the lower area of the same region, Mon-Khmer was spoken. In central and southern Vietnam and the archipelagoes, Malay was the primary language and in northern Vietnam, Annamese was used. With more migration from China, India, and Arabic countries, more languages and variations arose. (Meyer *Asia* 60)

figure 1. Southeast Asia (www.wikipedia.com)

Since little is known about prehistory, most scholars start with the introduction of the Hindu culture. Legend says that Adji Saka, during the 5th and 6th centuries CE, saved the people of Java from their king, Mendang Kamulan who was cannibalistic and each day would randomly choose a subject to eat. Saka became king after he over threw Kamulan. (Draeger 17)

India was a strong cultural influence in Southeast Asia. It was started at first, in the 5th and 6th centuries, by the water-way trade routes used, but then there were established Indian colonies. This allowed for the spread of Hindu and Buddhist ideas, which were welcomed and accepted by kingdoms in Cambodia, southern Vietnam, Thailand, Burma, and Malaya. (Meyer *Asia* 61-62)

Within the Indonesian Archipelago, Malaya was one of the major civilizations. Malaya between 135 and 1389 had strong ties with China. It borrowed from them centralized bureaucracy for revenue, justice, and agricultural and public works, which were all headed by members of the royal house. Nobles governed local areas and headmen presided over villages. There weren't any great kingdoms or anything politically powerful, but there were some city-states. In the early 16th century, Portuguese traders began to make a presence in Malaya. They wanted control over the sources of the spices. They set up trade ports, but without much government support from Portugal, their cities grew weak and were eventually overthrown by the Dutch in 1641. Also during this time, Arab traders from the Middle East brought Islamic influences. The Muslim faith was accepted in some regions and spread over much of Malaya. In 1591, Britain began sending expeditions to the Spice Islands to establish trade ports. It was a struggle to get anything set up and by 1700, they still only had one port. The British helped northern Malaya during its war with the Chakri dynasty and as compensation gained power in Malacca and Java. The Anglo-Dutch treaty in 1824 gave the English Singapore and Malaya

while the Dutch maintained Indonesia. Between 1874 and 1888, Malaya became under British protection. Malaya exported rubber and tin which brought in a lot of American money for Britain. On August 31, 1957, The Federation of Malaya was granted independence by the British. Malay would now have a king who would rule religion, the Islamic faith, as well as politically. Singapore remained separate for many years, but run under a similar government as Malaya. On September 16, 1963, Malaysia was established including Borneo, Singapore, Malaya, and other small British controlled islands. However, this arrangement didn't last long and different countries began to leave. Modern day Malaysia is closely tied to the US through the Peace Corps, education, and trade. (Meyer *Asia* 159-243, 402-406)

The Philippines is another region that other countries were very interested in. It was this interest from others that caused the struggle for independence to go on for so long. In 1519, when Ferdinand Magellan started out to circumnavigate the world, he landed in the Philippines, where he was killed. This was cause for the Spanish to send more ships to the islands. By 1576 the Philippines fell to the Spanish. The Spanish united the scattered villages by 1600, with the exception of the south, which was densely Islamic. The Spanish wanted to continue to spread their control into the Spice Islands, but this area was already guaranteed to the Portuguese by the Treaty of Tordesillas in 1494. The Spanish ruled the Philippines harshly. Between the 15th and 16th centuries, they were the first westernized area of Southeast Asia. With the new school systems that the Spanish had put in place, the Filipinos realized that they wanted their independence. The Spanish however would not change anything. In the mid 1800's nationalist movements arose that were critical of Spanish rule. The Spanish won against all the rebels. In 1898 the Spanish-American War broke out. The Americans, after defeating the Spanish, proclaimed the Philippine Republic independent. The Filipinos didn't like Americans being

there and wouldn't recognize the American sovereignty and continued with guerrilla warfare for three years (1899-1902). Americans established and ran the government for the Filipinos and slowly would introduce Filipinos into the system. However, during the 1920's while the Republicans were in office in the US, no more progress was made towards independence for the Philippines. In 1935 there was an act passed which gave Filipinos independence for ten years, at which point they would be reviewed. The Philippines stayed dependent on the US, but in 1945 were granted full independence and had their own president. In 1992 Americans completely left the Philippines with optimistic hopes of maintaining a stable government on their own. (Meyer *Asia* 161-246, 408-419)

2. Southeast Asian Swords

2.1 Panabas:

The panabas is found in the Philippines and is a Moro jungle knife. It was also likely used for executions. It has a long, straight hilt and the blade bends back near the hilt and it widest near the tip. (Stone 480)

Figure 1: Panabas (20th century) originating from the Philippines from the Higgins Armory Museum. HAM 2747.1

2.2 Talibon:

The talibon has a heavy blade that's normally straight on the back. It has a strong curve on the edge with a very long point. There's a long point at the tip. Its length can range from 1-2 feet. It was used for fighting by the Christain followers of the Philippines. (Stone 601)

Figure 2: Talibon (19th -20th century) originally from the Philippines, from the collection at Higgins Armory Museum. HAM 3143.12

2.3 Kampilan:

The kampilan was originally the national weapon of the Sea Dyaks of Borneo. It has a carved hilt, usually of wood. The pommel is forked and usually decorated with hair dyed either red or black. It has a long, straight, single-edged blade that's much wider at the point. The scabbard is made of two pieces of wood shaped like the blade with two fasteners (one at the lower end and one a little further up). By unfastening the two places, the scabbard can come apart to put the blade in. In some parts of Mindanao, a different scabbard was used. It's a single piece of hard wood that's shaped as a hexagon. It has a loop handle on one side so that it can also be used a shield. (Stone 159)

Figure 3: Kampilan (19th – 20th century) originating from Malaya from the Higgins Armory Museum. HAM 2410

XI. Conclusion (Chris Bass)

A year later, our part in this project, the Global History of the Sword, is complete. We began work in September of 2006, and finalized this report in April of 2007. We began in the PQP stage by discussing where the various centers of sword manufacture and use were, both geographically and chronologically. Each student studied and researched one of the areas, which were Europe/America (Further divided chronologically into Ancient and Medieval, Post-Medieval, and Modern-day), Asia/Japan, and Africa. We began to collect sources for use later in the project, and also to plan the remainder of the project.

In B term, we began our research on our regions. This amounted to poring through many books and websites related to our topics, learning the history of our regions and time periods, as well as beginning to understand the various types of swords used in these regions, why they were used, and how their form and uses changed during those periods. Each of us separated our topic into six smaller areas of focus, and wrote about these topics, making use of the Higgins library, a collection of photography and information about certain pieces in the Higgins Armory sword collection, and outside resources such as the libraries in the Worcester region and the various Worcester area colleges. With this information, we set our report into its first few iterations, and planned what we might do for a final presentation piece. A few of the ideas that came up included setting up an exhibition on swords for the Higgins Armory, creating a virtual exhibition of the same for placement on the Higgins website, creating a search function to more quickly look up bibliography sources and artifacts in the Higgins collection, and updating the Higgins Armory's database of sword pieces and descriptions.

We returned in C term to put our research to use, each week descending into the museum basement and sitting around a table filled with the week's assortment of swords from our various

regions. We spent this time discussing the pieces with the professor, sharing our theories on the stories of these pieces, finding intricate details that might otherwise have been overlooked about them, taking measurements of the pieces to add back to the Higgins database, and taking photographs of interesting traits of these pieces. This was in preparation for the final part of our project, which would be to create a website showcasing these swords, displaying these and the rest of the Higgins sword collection in a searchable manner, and storing even more research writing, this time related to the pieces we'd showcased and additional information we wanted to make available to visitors to the Higgins website.

Finally, we began work on the website, beginning with storyboards describing how our website would look and navigate, and then moving iteratively to a mock-up that then evolved into our final website. As well, we looked at other online exhibitions, taking note of various statistics such as word count / page, number of pages, word:picture ratio on any given page, and our impressions of the pages, in preparation for actually constructing our own.

We were fortunate, in the beginning, to have a working (if incomplete and inconsistent) spreadsheet of the artifacts in the collection. This was able to be changed into a MySQL database that served as the background to our website, so that we could show all the swords rather than just a few, as well as making it so that the website automatically updated if you added new swords to our database. We then worked out the actual final design of our page, although due to our programming skills were not able to create it to all the specifications we originally suggested. Nevertheless, thanks to Stacy a template was found that served as a backbone for something very similar to our original design.

The website ran into a few major issues early on, including the need for a hosting space. We originally set up the website on Stacy's personal WPI account, but this space had many

issues, such as that she was the only one who could actually access the site, and that the space itself was too small to hold the collection of Higgins's sword images that we'd collected along with our reports. This was finally fixed in Week 3 of the last term, only 4 weeks before the end of the project, when we got approval for a WPI group account to store our website. However, despite the short time left the pages still looked clean already, and the search functions and sword display pages worked well. After continuing to work on the website and our research documents for the website, we uploaded those to the site and added a few graphics to make the site more visually appealing.

It seems the general consensus among the group that our favorite part was, as could be expected, actually being able to request the pieces that we'd been researching, and being able to actually handle them and discuss them with the professor. Until this point, our knowledge of the subject had been strictly book and picture-based, so this was a good chance to finally understand how swords really look, how they feel in the hand, the effects of curving and weight balancing, and other fine details that couldn't be made out in a picture.

As well, the group decided that the best achievements of this team, as well as completing the website and research documents, were updating the Higgins armory's pictures for some of the swords, finding some of the many discrepancies in the collection's various databases, and the creation of Brett's bibliography searcher.

There is still much to be done after this project is complete. The website works, but there is always room for additional research documents and more detail on the artifacts. We have attempted to design the website in such a way that additional swords can be added quickly, as well as the information for them updated. As well, the database holds many formats for the names of the artifacts, leaving much ambiguity between "No#.X, XXXX.XX, and HAM X".

These same artifacts do not appear to have a stable listing of whether or not they are on display, being studied, or in storage, which means that to find an artifact a worker must look through the database, find the artifact, and then search through the physical storage area and find where the piece would be stored to figure out whether or not the piece is actually there. The database also could use much reworking in the realm of pictures, where a number of artifacts simply do not have useful ones on record.

This project leads on to further projects, in which students could either expand/update the website we have crafted, correct and update the bibliography as well as expanding the search functionality, create a single, complete database for the Higgins Armory (or even just the swords therein) and merge this into the website, as well as using the information we have added to do further research in any number of more specialized topics we have touched upon in our reports.

These projects also should take a few lessons from our experiences. We found that as well as meeting with the professor, in times that we worked together on any part of the project we found it useful to meet a second time halfway through the week, to discuss our project's direction and progress. As well, future groups might find it useful to use the WPI Writing Center's facilities to make the Project Advisor's job to analyze the content of research documents rather than focusing on the grammar, spelling, and report structure.

Over the time of this project, we completed all of the tasks we set out to, despite a complex topic that has had little research attention in the past, a large group that often had trouble finding enough time to meet up and discuss the project as a whole, Chris' propensity for failing to meet deadlines, and a website that nobody could actually work on half of the time. We learned a lot about the various time periods and areas that we worked on, the various swords in

the Higgins Armory collection, and the overall history and evolution of the sword as a martial and ceremonial icon for all of humanity.

Appendix A - Manufacturing (Brett Levasseur)

1. Bronze

The first metal that swords were made from was bronze, an alloy made of copper and usually tin. Bronze is a much harder metal than pure copper and also is easier to cast. Copper will melt around 1083 °C, while tin will melt around 231.9 °C; when combined to make bronze, the melting point will vary depending on the specific copper-tin ratio, but the melting temperature is usually around 1030 °C.

The bronze would be melted and then poured into a mold. These molds could be cut out of stone or made from clay through use of a model. In the case of HAM 238.10 we can see very fine lines in the metal that run with the blade from end to end, indicating that this sword may have been made using a wax model and a clay mold, with the lines coming from the tool used to make the wax model.

HAM 238.35, a bronze sword blade from the 12th – 10th century B.C.E., probably Italic culture. A stone mold would probably not produce such fine lines as we can see on the sword.

There was some use of iron during the Bronze Age but iron did not become widely used until after around 1200 B.C.E. Some of the first places to use iron were Syria, Palestine, Cyprus,

and Greece. Iron was not used much in Europe until the late Bronze Age, and it was not completely adopted until around 700 B.C.E.

2. Iron and Steel

Iron holds advantages over copper in that it is more abundant, it is more evenly distributed, and it can be forged into much harder and sharper weapons than bronze. The first iron swords in Greece were still made on the same design as the bronze swords used before.

The first step in making a sword from iron or steel is to get iron metal. Iron can be mined in the form of an impure iron ore consisting of oxidized iron with various impurities. To make this iron pure it would have to be smelted. The melting point of iron is around 1535° C, a temperature beyond the reach of early furnaces so other processes were needed. One type of smelting used by Europeans and Africans is called "bloomery smelting". In bloomery smelting, the ore is heated up to 1200° C in a furnace. To reach this temperature air would be blown into the furnace either with the aid of a bellows or using a natural draft. The resulting sponge of iron and impurities, or slag, is called a "bloom". This bloom would be beaten with hammers to drive out the slag. This work gave the product the name “wrought iron”. This process continued to be used by the Europeans until the invention of the blast furnace around 1350.

In Medieval Europe swords were made from wrought iron. Some of the reasons why wrought iron was valuable in making weapons is that it is resistant to corrosion, malleable enough to shape into different designs, and soft enough to be cut.

Sword blades need to be strong and sharp to be of any real use. That is why blades were also given an outer layer of steel to make the exterior of the blade hard, and to let it hold a sharp

edge. With an outer layer of steel the sword was a strong weapon, and the inner layer of wrought iron made it resistant to fractures.

Steel is a form of iron that has had carbon absorbed into it, a process known as carburization. Medieval swordsmiths did this by heating wrought iron using a carbonaceous material, usually charcoal (which is essentially pure carbon). The carbon passed into the wrought iron, converting it into steel. In some cases, such as with weapons, the metalworkers hardened the finished surface of steel by heating the metal once more and quenching it in a cool material like water. The cold quenching material made the metal cool down faster than it normally would, making the metal harder than if it cooled down gradually. When the metal is cooled down rapidly, the carbon and iron in the metal form cementite, which is a hard and brittle iron carbide. If the metal were allowed to cool down slowly the carbon and iron would separate. During the medieval period metalworkers did not realize that it was the carbon in the charcoal they used that made the metal hard. Instead they believed that the process was made successful by the type of liquid used to cool the blade.

The quenching process made the metal harder and more brittle. In order to reduce the brittleness of the metal while maintaining its hardness it would go through the annealing process. Annealing is when metal is raised to a red heat and then allowed to cool slowly over time. There were two phases of the annealing process, the first being the recovery phase, which results in softening the metal through the removal of defects and the internal stresses within the steel that they cause. The second phase is recrystallization where new grains nucleate and grow to replace those deformed by internal stresses. This process is done after the blade has been quenched and it allows the cementite crystals to disperse into a less regular arrangement. It is this arrangement of the cementite crystals that creates the brittleness of the metal.

The sword makers of northwest Europe who did not have access to better quality ores after the fifth century C.E. had to use limonite, which was a mineral consisting of hydrous ferric oxides. These were referred to as bog ores because they were collected from lake bottoms and marshlands. The high phosphorus content of these ores allowed them to be smelted at low temperatures, but the process created a soft and impure iron. It was up to the swordsmith to determine what parts of this metal were worth using in their swords, and which portions were worthless. One of the ways smiths could find the better metal in their ores was a method used by the Celts, who would bury their iron in the ground before they would re-forge it. Burying the metal allowed the softest portions to be eaten away by rust. The sword-smith was then left with the harder portions of iron that would be used to make swords.

The major manufacturing process that was used from the Dark Ages until around 1050 C.E. was pattern-welding, which is believed to have been developed by Celtic sword makers. This process of sword making could use both good and poor quality iron, allowing good quality blades to be produced even when good iron was hard to find. A pattern-welded blade was made in multiple parts. A center bar was made from several thin rods of wrought iron that were hardened in a charcoal fire that turned the surface of the wrought iron into steel. The rods were then heated until red hot, and then twisted together and hammer-welded at white heat to forge the center bar together. Then two ‘v’ shaped pieces of steel that formed the edges of the blade were placed on either end of the center bar and were hammer-welded into place. The way in which the twisting of the metal and the forging process was done would determine the pattern that would be visible at the surface of the blade.

HAM 576, the blade of a sax sword from the 10th century C.E., found in France. Note the lines that can be seen on the blade due to the pattern welding process.

If the blade were to have a fuller (as many of the earlier blades did) then the blade would be forged with a shallow hollow. Once the blade had taken its final shape it would be heated and quenched to make an outer skin of hardened steel, then annealed to reduce the brittleness. The blade could then be treated with acid to bring out the design created by the pattern-forging process. Through the pattern-welding process less than 1 % of the blade would contain carbon.

Evidence suggests that pattern-welded swords were not made in too many places. Some locations that seem to be likely sources include the Rhineland in present-day Germany, Noricum in present-day Austria, and around the Pyrenees mountains that border France and Spain. There is no evidence that these swords were ever made in England or Scandinavia. It appears that England and Scandinavia did not make blades of swords, but they did import blades to be mounted with local fittings. Evidence of this includes pattern-welded blades with Anglo-Saxon or Scandinavian hilt designs.

Sword blades were typically made in regions that had access to good blade-quality iron ore, and shipped all over Europe. Once the blade reached its destination it was given a hilt design to fit the local style. Some hilts have been found inscribed with the names of the hilt makers,

which suggests that at least around the ninth and tenth centuries C.E. that there were organized groups of hilt-makers. Also, since a blade would last longer than the hilt, it was common to fit new hilts onto old blades. While some hilts were practical, others were very decorative. It is not uncommon for decorative swords to have gold and precious stones imbedded in the hilt. The grip of the hilt needed to sit comfortably in the hand, but this left the guard and the pommel to receive decoration.

After 1050 C.E. when new mines were established, the metal workers gained access to better quality iron ores, allowing smiths to create blades by carefully heating and hammering them into shape. These blades could also then be quenched and annealed like the pattern-welded blades, but they did not need the mix and match of metals that the older process required.

During the Renaissance the method of manufacturing saw new technological advancements. The metal for the blades now came as manufactured billets of steel that were cut to the required length for the specific blade. The steel rods were then fed through water powered rolling mills until the rods were correctly shaped. The blades were then ground on large grinding wheels, where the craftsman would lay on the ground in front of the wheel and hold the blade against it.

A Renaissance sword was the work of many skilled craftsmen, who each produced a separate part, so that a sword could be produced within a short amount of time. Besides the blade makers, there were craftsmen in charge of shaping and decorating the hilt.

The Industrial Revolution brought about a few key changes in how swords were produced. For example, much of the manual hammering and initial shaping of the sword was done by Ryder hammers, introduced around 1860. The sword would be annealed and hammered, and then reshaping would be done by mechanical rollers that stretched the blade into the desired shape.

Also, rather than integrating an iron tang into the base of the sword, around this time blacksmiths began to stretch out the base of the steel blade to form an extension which could be hammered into the form of a tang.

3. Japanese Swords:

While sword construction became uniform in Europe, the sword-smiths of Japan had a different approach. Most Japanese sword-smiths use a steel called *tamahagane*. Today, this type of steel is produced almost exclusively in a smelter called a *tatana* and is one of the most expensive types made. Steel ranging from .6 to 1.5 percent carbon is *tamahagane*.

After the iron is smelted the sword-smith turns it into a sword. A forge and bellows is the major equipment used. Unlike what was used in Europe, the air blast comes from one side and the bellows are to the left of the forge so the sword can be manipulated with the right hand. A steel block is created by welding together other small pieces. The block is wrapped in paper to hold it together in the forge. Clay slurry and rice-straw ashes are applied to the hot steel block to help prevent overheating, oxidation and the resultant loss of carbon. The block is heated and hammered until it's completely welded together.

After the solid block is created it's heated and folded onto itself six times. The block is cut into three equal pieces. It takes two pieces to create a small sword and four to make a full size blade. The pieces are heated and hammered out until they are welded together and resemble the shape of a sword. A hammer is used to smooth out the edges until the steel is long and straight. The point of the blade is carefully shaped with a hammer.

After the forging process the blade is refined by filing and scraping. Both sides of the blade are smoothed. Heating the blade and hammering it over a heated block adjusts the

curvature of the blade. Once the blade is set grooves can be added using a draw knife and decorative carvings using a chisel.

4. Decoration:

Decoration was a symbol of status to those who could afford it and many swords were etched, engraved, enameled, carved, chiseled, inlayed, encrusted, gilded, or silvered. Viking blades were often decorated with inlay. This was accomplished by hammering thin strips of decorative metals like gold, silver, and copper onto the surface of the iron blade that had designs already cut into it. The metal that was used for inlay was softer than the iron and so it was forced into the cut designs on the blade.

Etching was the practice of covering the blade with an acid-resistant substance except where the etching was desired, and then bathing the sword in an acid, which would then dissolve a bit of the surface at the uncovered areas, after which the substance was removed and the blade washed clean. Recently etching has also been done with lasers instead.

Gilding was the process of coating a piece in a desired metal, such as gold or silver. Traditional European gilding as done by coating the piece in a mercury-gold mixture, as gold alone is hard to affix to other metals. At this point, the piece was heated slightly, which caused the mercury to evaporate, leaving the gold (which has a higher melting and boiling temperature).

A sword or hilt could also undergo bluing. In this procedure, the piece was heated slightly, as with a torch or other relatively low heat source, which would leave a coat of a color based on the temperature on the piece. This color could be selectively removed from the blade to leave designs that stand out against the blue color, or to leave the bluing only in a desired pattern.

HAM 2036.1, single-handed sword from 1050 – 1150 C.E., found in Germany. In this picture you can see an example of inscriptions placed on blades. These were probably once inlaid with a decorative metal.

HAM 3259.a, Marine Officers' saber from 1825 – 1850. This blade from Germany shows the result of bluing.

HAM 639, Smallsword from France, 1779-80. The hilt of this sword is cast silver.

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Appendix B – Web Documents

The following documents are condensed versions of the full research documents as well as specific information about a few selected artifacts. These are the word documents of the information that can be found on the website that was created for this project.

I. Ancient and Medieval Europe: (Brett Levasseur)

The sword in western Eurasia has its origins in blade weapons of the late Stone Age. Daggers were being made of flint by the late Stone Age, but as people developed new technologies they started to redesign the weapons. As metals came into use, the blades of daggers became longer, changing the way the weapon was used, and eventually producing swords. The material went from stone to copper to bronze, then iron, and by the medieval period swords were being made of steel.

Sword designs varied depending on who needed them and for what purpose. Swords could have heavy rounded blades for slashing, or they could have sharp points for thrusting. The cultural importance of the sword also changed with time. For the Greeks the sword was a secondary weapon to the spear, but the Vikings had so much affection for their swords that they would give them names. In medieval Europe the sword became not just a weapon but also a symbol of power, piety, and of the knight.

1. Greece:

The ancient Greeks can be broken down into two time periods. The first is the Mycenaeans from around 1600 B.C.E. to around 1100 B.C.E. This was a time when the Greeks were first forming the culture that would eventually influence the entire Mediterranean world

and the rest of Europe. The Mycenaeans were a warlike people who embraced the heroic ideal. These values were embodied in the Mycenean Greek heroes that the poet Homer wrote of in the Iliad and the Odyssey, the epic poems of the Trojan War and the journey home.

The Greeks who followed the Mycenaeans are known more for their contributions to politics and science than war. The next major Greek period began around the eighth century B.C.E. At this point the Greeks developed the Polis or city-state, where regions were divided into different governments centered on their cities. These city-states included Athens and Sparta. Athens was a leading center in Greece for the development of culture, science, and politics. In contrast Sparta was militaristic and developed some of the greatest warriors in all of history. It was during this time that Greece entered into the Persian Wars from around 500 to 449 B.C.E. In these wars the Spartans, Athenians, and other Greek city-states defended Greece from the Persians, ending with a permanent Persian retreat.

2. Medieval Europe:

The classical Greco-Roman age lasted for most of a millennium after 500 B.C.E., but the barbarians who began invading Roman territory after 200 C.E. became the rulers of Europe after Rome's fall. As Rome's resources weakened they could no longer protect their colonies in Britain. In 408 C.E. the Romans decided to give the people of Britain the right to arm so that they could defend themselves. Different groups began to invade Britain around the fifth century C.E. and by the tenth century C.E. Germanic people like the Angles, Saxons, Jutes, Frisians had gained control of modern England. For the rest of Europe, by the end of the sixth century the Bavarians moved to the upper Danube, the Lombards to Italy, the Slavs to the Balkan provinces of the Roman Empire and west into Bohemia and Moravia.

Post-Roman Europe developed a feudal system where a lord would grant land to a vassal in exchange for military service. The smallest but most important component of the medieval army was the knights, highly trained soldiers who fought in full armor. While the armor made them slow, they were skilled warriors and horsemen. Armed with a spear, sword, and armor, they became a powerful force in battle.

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II. Ancient and Medieval Artifacts

1. HAM 238.10:

The grip-tongue sword represented a major advancement in sword technology. For a long time swords had a problem with the connection from the blade to the hilt. Up until the mid Bronze Age, swords had separate blades and hilts, connected by rivets.

HAM 238.35, bronze blade from 12th – 10th century B.C.E., this blade was attached to its hilt using rivets.

However this was a weak connection, and the blade and hilt could easily become separated in battle. The answer to this problem was to cast the hilt and blade in one piece. One of the first swords of this type was the grip-tongue design first made in Europe during the mid Bronze Age, some time around 1500 B.C.E. In this design the hilt was made into a tongue-like shape, integrated with the blade.

HAM 238.10, a grip-tongue from the 13th – 10th century B.C.E.

The grip-tongue sword came to be widely used across all of Europe and in the Mediterranean, and by the year 1200 B.C.E. it was the standard long sword of the Greeks. While the grip-tongue sword was popular for its better structural properties, it also became popular because many different types of blade designs could be used with the same hilt. The different people who used the sword would keep the tongue-shaped grip, but used blade designs specific to their own combat needs.

While the grip-tongue sword was originally made of bronze, it was still in use when iron began to be used in Europe after 1200 B.C.E. Iron made a stronger blade so the grip-tongue swords that used to be made of bronze were also made out of iron.

While the grip-tongue sword was used widely it eventually fell out of use. However, while later swords do not have the same tongue-shaped hilt, they do have an extended section of the blade metal called a tang. The tang would extend below the blade and would have the hilt built around it. This way later swords could have the same secure connection that the grip-tongue sword had, but with different hilt designs. So while the grip-tongue sword did not last, its design has affected all subsequent swords made in Europe.

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2. HAM 1199:

By the end of the thirteenth century, Europeans began to use plate armor, which made cutting and slashing weapons ineffective. Swords now needed to develop into better thrusting weapons so that they could penetrate the new armor. The length of the new style of sword blades began to increase to an average of around 50 in / 125 cm. Blades were broad, double-edged, and had a sharp point. In order to compensate for the longer blades, the hilts were made longer so that both hands could be used to hold the sword. Pommels were made heavier, and we see more metal pommels in use, though some examples of rock and crystal pommels are known. One example from the Higgins Armory collection, HAM 1199 is 2.4 lbs.

Some of the new types of swords that fit this style are the hand-and-a-half swords, also known as bastard swords. These weapons were so named because they were primarily meant for one hand, but the hilt was long enough so that two hands could be used on the sword for a more powerful attack. The hand-and-a-half swords were first developed in the mid twelfth century, but became very popular in the fourteenth and fifteenth centuries.

Different versions of hand-and-a-half swords can be seen in popular culture today. The character William Wallace in the movie Braveheart uses this type of sword. Hand-and-a-half swords were also one of the types used in the Lord of the Rings movies based on the book series by J. R. R. Tolkein. Hand-and-a-half swords are probably depicted more in popular culture since a larger weapon has more of a visual presence than a smaller one. At the same time the hand-and-a-half sword is not so large that it becomes cumbersome and hard to use, which is probably another plus for movies and television.

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3. HAM 238.98 and HAM 2036.1:

There were many different kinds of single-handed medieval swords. Most of them took on a cruciform shape, having a straight blade and cross guard that made a cross shape. These swords were made all over Europe for various purposes. The swords described here are some of the first designs that mark the transition from the Viking style of swords to the medieval style.

HAM 238.98, 950-1050 C.E., probably from northern Europe. This artifact has an overall length of 79.8 cm and weighs 1lb 6 oz.

The medieval single-handed sword was first being developed when the bladesmiths in Europe were still using the pattern-welding technique. This way even though the blade smiths did not have access to enough high-quality metals, they could still produce high-quality swords. After 1050 C.E. new mines were opened in Europe and the bladesmiths of Europe finally had enough access to high-quality metal that they could just work the metal available, and they did not have to worry about correctly mixing and matching different quality metals.

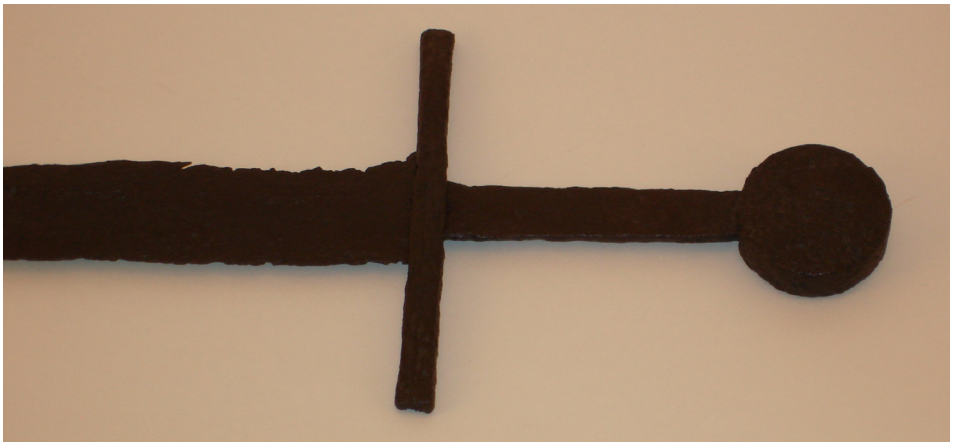
Typical medieval single-handed swords had a flat broad blade around 76.2 – 88.9 cm (30 - 35 inches) in length and weigh about 2 – 3 lbs. The blades often included a fuller, a groove that ran down the middle of the blade and served to lighten the weapon. These swords had short grips to be used by one hand. The cross guard was narrow and longer than on swords previously found in Europe. The pommel was often a Brazil-nut's shaped, but could also be a disc.

By the time of this swords usage in Europe Christian had already begun to spread so these swords can often be found with Christian inscriptions, pagan symbols on the blade would indicate that the sword was made during an earlier time. Inscriptions on swords added nothing for its combat value so they are purely for the owner and the craftsmen. As such they will only have information or designs that are important to them. The weapons that they used would reflect their beliefs and what was important to them, which was now Christianity. There is some variety of blade designs for this basic sword but most are the same. Some have very sharp points while others are blunt. Overall the most common blade tip is to have a subtle rounded point, which is not very suited for thrusting. While this is a medieval weapon, plate armor would not be developed in Europe until the late thirteenth century, so a piercing weapon that could get through armor was not needed. The most common usage of the sword would be as a slashing weapon, which would require a more rounded blade as opposed to a sharp pointed shape.

HAM 2036.1, a type XA or XI from 1050-1150 C.E., probably from Germany. This artifact has an overall length of 98.7 cm and a blade length of 86.4 cm. The width of this blade at the hilt is 4.9 cm. Also this artifact weighs 1lb 10oz.

Another group of swords have a long narrow blade that is different from the broad short blade of the swords described previously. The fuller, which normally runs the majority of the blade's length, is narrow usually shallow and poorly defined. In some late examples of this sword the fuller could start in the tang inside the hilt. The cross guard of these swords is generally straight and of a rectangular shape. Like the pommel's used on the swords described previously with this sword are of the Brazil-nut and disc shape. Some of the disc pommels seen on these swords have strongly beveled edges. While the tang is short like the other swords described earlier it is not as flat as its predecessor.

Disc Shaped pommel:



HAM 238.98, 950-1050 C.E., probably from northern Europe. This artifact has an overall length of 79.8 cm and weighs 1lb 6 oz.

Brazil-nut Shaped pommel:

HAM 2036.1, a type XA or XI from 1050-1150 C.E., probably from Germany. This artifact has an overall length of 98.7 cm and a blade length of 86.4 cm. The width of this blade at the hilt is 4.9 cm. Also this artifact weighs 1lb 10oz.

Further Reading:

Coe, M. (1989). *Swords and Hilt Weapons*. New York, New York: Weidenfeld and Nicolson. HAM 739.77 Sw 7.

p. 39

Holmes, G. (1988*). The Oxford History of Medieval Europe.* Great Britton: Cox & Wyman Ltd. Reading, Berkshire.
p. 68

Oakeshott, E. (1965). *The Sword in the Age of Chivalry*. New York, New York: Frederick A. Praeger Publishers. HAM 739.7.
p.25 – 32.

III. Swords from Early Modern Europe 1500-1800 (Meghan Labounty)

1. HAM 114 Hunting Hanger

Origin: Germany
Date: 1700s-1800s
Length of blade: 73.6 cm, 29 inches

History:

The hunting sword was very popular in early modern Europe. The earliest specialized hunting swords appeared during the 14th century, worn as a side arm when hunting big game. These swords evolved from a particular form of the shortsword, which was a scaled down version of the "cruciform" or "war sword". It was a straight single-edged weapon with a flat knife-like grip and a knuckleguard. The blade of the hunting sword or hanger was very stiff and was often triangular, square, or octagonal in cross-section. The hanger became widespread through the 15th century and remained popular into the late 18th century. Despite its functional design, the hunting hanger was primarily carried as a representation of one's status.

The blade of this hunting sword is double edged and is made of tapering steel of a hexagonal shape. Both sides of the forte are etched with characters that resemble letters and numbers. On the base of the sword, where the blade meets the guard, there are copper inlays punched with symbols that vaguely resemble Arabic script. The sword is fitted with a straight iron crossguard and the spiraled horn grip expands to the end and is fitted with three mother-of-pearl beads. The beads, reminiscent of Islamic amulets, could suggest working-life modification of an existing piece by or for an Islamic client.

Further Reading

Blackmore, Howard, L. (1972). *Hunting Weapons*. New York: Walker. HAM 739.76 B 56h.

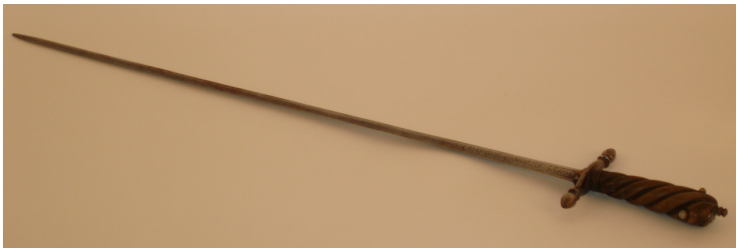
Coe, Michael. (1989). *Swords and Hilt Weapons*. New York: Weidenfeld & Nicholson. HAM 793.77 Sw7.

Pictures:

Etching on the blade

The etching on the blade is of unidentified symbols, which resemble three letters and two numbers.

Copper inlaid strips with punched designs vaguely suggestive of Arabic script.



Horn grip with mother-of-pearl beads.

2. HAM 265.a Hanger

Origin: Austria
Date: 1700s
Length: 58.4 cm, 23 inches
Weight: 1lb. 10 oz.
Materials: Steel; cast brass

History:

The hanger was popular for both military and civilian use. The hanger had strongly curved quillons to which a small shell was sometimes attached, and it also had a short and curved blade. Hangers were used in Europe well before the arrival of the saber in the late 1600s, and were widely used by infantrymen after 1500. By 1800, infantry swords were disappearing from the European battlefield, having lost their practical importance with the development of the bayonet.

The general design for the hanger was uniform throughout Europe with slight regional variations. The part of the hanger that greatly differed by region was the hilt. In England the hilts were often made of iron with a pommel in the shape of a bird or animal head. Some brass hilts survive from the last quarter of the 16th century, but silver hilts came into production from the 1660s on. Because the hanger was widely worn, the hilt was often extravagantly decorated since it was seen when walking or traveling. There were hilts that were fitted with grips of ivory or bone and mounted with agates and semi-precious stones.

Description:

This hanger has a single-edged steel triangular blade. The cast brass hilt has a baseplate with a raised molded edge and short rear quillon sharply turned to the back of the blade. The raised edges on the grip, knuckleguard, and button suggest that the handle was cast from a hand carved wax mold which allowed for the mass production of these infantry swords.

Further Reading:

Coe, Michael. (1989). *Swords and Hilt Weapons*. New York: Weidenfeld & Nicholson. HAM 793.77 Sw7.

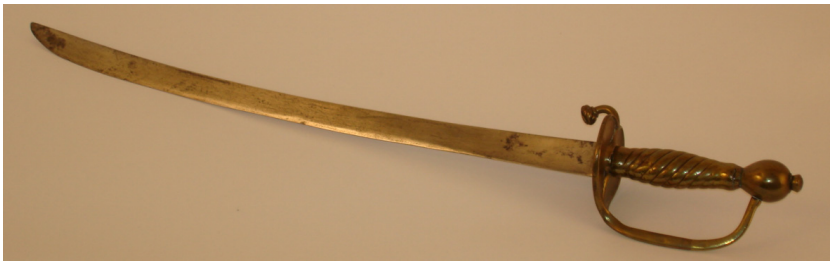
Reid, William. (1976). *Arms through the Ages*. New York: Harper & Row. HAM 739.76 R 26a.

Pictures:

The raised edges on the brass grip, knuckleguard, and button are from the mold that was used to cast the pieces. Using a mold to cast the handles made the production process very efficient and allowed for the mass production of these infantry hangers.

Heart-shaped brass guard with deep engravings

These engravings were possibly for inventory use and may have told of the unit the sword belonged to.



3. HAM 639 Smallsword

Origin: France
Date: 1779-1780
Length: 78.7 cm, 31 inches

History:

By the last quarter of the 17th century, the smallsword had acquired its basic form, evolving from the scarf sword and light rapier of the 1600s. The smallsword had a shell guard made as a separate element, with the blade passing through an aperture in its center and a quillon block that acts as a sleeve to hold the shell guard against the blade. With a blade 30'' in length, smallswords had two small, flat shells, a knucklebow, and a rear quillon often curved horizontally with an ovoid or urn-shaped pommel.

The earliest smallswords date from about 1635, however they were not common until 1660. Smallswords of the earliest form had simple, attenuated forward quillons and two arms that sprung from the quillon block and curved to meet the shells. The absence of a knucklebow indicates an early date.

Because the smallsword originated from the rapier, early versions did not have blades that were specific to the weapon. Early smallswords were fitted with narrow rapier blades that had been considerably shortened, or with light, double-edged blades supplied by Solingen cutlers. By 1660, when smallswords became more fashionable, a new type of blade was

developed. German cutlers began making hollow-ground triangular-section blades to be fitted specifically on smallswords, which combined strength and lightness. The earliest types of smallswords were intended for cutting and thrusting and had wide edges, especially at the forte. However, the edges were usually very weak and would crack and split easily.

Although the smallsword once served a purpose, by 1765 the weapon was purely for decoration. The blades of these elegant swords were often creatively decorated with strapwork and figurative design. Since the smallsword was considered a piece of jewelry, much effort and work went into its design. Despite the popularity of the smallsword and the trend of wearing the weapon to show status and wealth, the practice of wearing the sword in public began to decline by the late 1700s, and by the 1800s its use was limited to court dress and other special occasions.

Description:

This smallsword has a triangular blade typical of many smallswords from the time. The blade tapers to a hollow-ground triangular section point. The forte is elaborately etched with trophy groups, foliate tracery, a crown device, and the furbisher's inscription. The hilt of the smallsword is cast silver with more elaborate decoration consisting of floral-filled vases in cartouches, broken scrolling, leaved motifs.

Further Reading:

Coe, Michael. (1989). *Swords and Hilt Weapons*. New York: Weidenfeld & Nicholson. HAM 793.77 Sw7.

North, Anthony. (1982). *An Introduction to European Swords*. Owings Mills, Maryland: Stemmer House. HAM 739.77 N 75e.

Wilkinson, Frederick. (1976). *Swords and Daggers*. London: Ward Lock & Co. Limited. HAM 739.77 W 65s.

Pictures:

Elaborate decorations

Etching in script of furbisher's name: "Poncet M Fourbisseur quay Des Celestins a Lyon"

More elaborate decoration

4. HAM 1802.1 Cup Hilt Rapier

Origin: Spain or Spanish Italy
Date: 1650-1675
Length: 107.5 cm, 42.3 inches

History:

The late 15th century through the first quarter of the 16th century was the period in which the rapier was evolving from popular swords of the Middle Ages. There is some historical

uncertainty as to when the rapier came into being, and its form and style were developing throughout Western Europe at different times. The earliest reference to the rapier was a sword used for cutting, and the origins of the rapier can be traced to Spain where it first appeared in the mid 15th century as the "espada ropera" or "dress sword". As the use of the rapier became popular throughout Europe, its style and form became more uniform.

The most typical rapier of the 1600s was the cup-hilt rapier. Originating in Spain or Italy around 1610, the design of the cup-hilt rapier was soon adopted by other European countries. Widely used because of its defensive properties, the cup-hilt rapier provided additional protection to the user's hand by placing a solid plate between the bars which was often pierced with designs. By 1620 this plate was a common feature on all cup-hilted rapiers and it was often the fashion to fit large, solid fluted shells between the bars and to then fill the bars with a pierced plate. This led to further protection against thrusting and cutting and by 1630 the entire hand was protected.

Description:

The blade is steel and double edged, ending in a rounded point. Both faces of the forte are stamped with the words "IN TOLETO", which could signify that the blade of the sword is of Spanish origin. This cup-hilted rapier has a deep cup which is pierced with two rows of foliation. It is possible that this item is a composition of different swords as shown by the asymmetrical alignment of the cup and the blade with the crossbar.

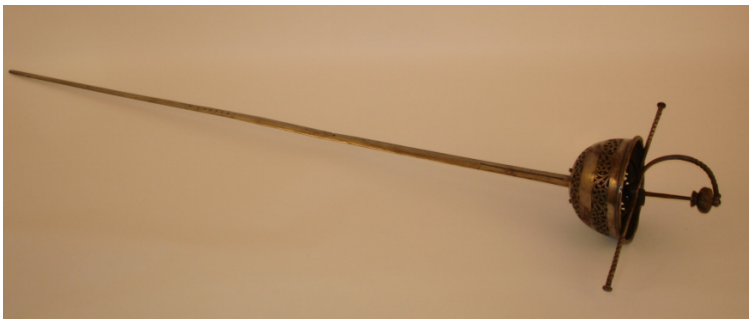
Further Reading:

Coe, Michael. (1989). *Swords and Hilt Weapons*. New York: Weidenfeld & Nicholson. HAM 793.77 Sw7.

North, Anthony. (1982). *An Introduction to European Swords*. Owings Mills, Maryland: Stemmer House. HAM 739.77 N 75e.

Wilkinson, Frederick. (1976). *Swords and Daggers*. London: Ward Lock & Co. Limited. HAM 739.77 W 65s.

Pictures:



Intricately pierced cup-hilt. The way the pommel is misaligned with the rest of the hilt suggests that they may be separate pieces from different swords. The actual grip has been lost.

Engraving of: “IN TOLETO”. The “IN” has been rubbed away, suggesting it was engraved at a later time.

IV. Modern America and Europe (Chris Bass)

1. Fantasy Sword of the early 1900's (HAM 1)

Figure 26: The blade of the sword

This sword is an early example of the world's fantasy-based idea of a sword. The piece has many qualities about it that make it useless as a weapon, yet it still fits into the definition of "a sword". The overall piece is 53 inches long, with the blade being 46 inches long. This blade length exceeds by a few inches even some two-handed swords. The grip is only about 7 inches long, only enough for a one-handed hold. However, the blade length and the weight of the piece make it quite difficult to hold without a second hand supporting the blade. The ricasso is thinner than the rest of the blade, which would make this sword liable to break in combat given such a heavy blade. The grip is oval-shaped, and stout enough to prevent a good hold even for one hand, even if it wasn't also covered in small studs. This combination of traits would have made it extremely hard to use, and in fact hard even to carry around.

Figure 27: The hilt and guard

This still leaves the possibility of ceremonial use, but the sword's only decorations are the studs on the grip, small bird-heads on the crossguard, and the large shells on the hilt, which

while decorative are not typical of ceremonial swords. Normally pieces for that purpose are smaller and thinner (making it easier to be carried or displayed, since they usually aren't intended to withstand significant force anyways), as well as being crafted in ways that incorporate precious metals or gems, symbolism relevant to the owner/organization, and advanced decorative techniques such as gilding, bluing, etching, or damascening.

2. A comparison of three similar sabers (HAMs 315, 1852.a, and 3576.a)

These three cavalry sabers show a bit of the globalization of swords. A casual observation of these swords suggests that they are nearly the same. However, one of them is from France in the early 1820s, and the other two are from the United States around the time of the Civil War, one being an 1860 pattern Federal model, and one being a Confederate model imitating the 1850 pattern.

All three have the same brass-bars guard, except for the original French one which has an extra small bar in the middle (four bars rather than three total). All have leather grips wrapped with wire, with a brass cap at the end called Phrygian helmet pommels. The French one has a sword knot, and although the other pieces do not still have theirs, their guards are nearly the same shape, and so could have just as easily accommodated one tied to them.

The French sword has "Coulaux frere Maitre à Klingenthal" (Coulaux brothers, Master at Klingenthal) etched into the blade. Coulaux is the name of two French brothers who were sword makers, and this is their maker's mark.

During the early 1700's, the French king Louis XV decided to limit France's reliance on Solingen, Germany for weaponry by starting a French manufacturing company in Alsace, France, which was soon afterwards renamed "Manufacture de Klingenthal" (Klingenthal translates to "The Valley of Blades"). At this factory, French swords for the military would continue to be produced until 1836, when the French decided to move the workers further away from Germany. This turned out to be a smart move, as Klingenthal was captured by Germany during the Franco-Prussian war in 1870, where it fell into disarray until it was taken back by the French in 1918 and remained a minor producer of French weaponry and tools until it was shut down in 1962.

A simpler maker's mark was stamped into the Federal sword, "AMES MFG CO/CHICOPEE./MASS." The Ames Manufacturing Company was founded in 1834, soon becoming a major producer of swords and other weapons, including for the United States government.

The loose wrapping and comparatively crude workmanship on the Confederate sword differentiate the two American pieces from each other, as well as the lack of any maker's mark or other markings on the Confederate model. The Federal sword also has fullering

across the blade, which this piece lacks. The other differences between these three pieces are mostly cosmetic, except for a slightly straighter blade on the American pieces and the shape of the counterguard.

3. Beginnings of the Mameluke pattern (HAM 3459.a)

Interesting points about this piece include the brass Mameluke-style hilt (meaning the sharply curved pommel, thin crossguard, and the long thin langets perpendicular to them), thickly blued blade with gilded markings, and the scribed “Sohlingen” on the blade (more recently spelled “Solingen”)

The first United States military action overseas, executed by the U.S. Marines and Navy, was the sending of a fleet to Derna, Tripoli to put down Barbary Coast pirates harassing American merchant ships in the Mediterranean. Upon their resounding success in this maneuver, a nearby Turkish chieftain presented O'Bannon with a scimitar to show his appreciation and respect. The scimitar was the same type used by North African Mameluke warriors. This same style of sword, later known as the Mameluke pattern, was incorporated as the Marine Corps's official dress sword in 1825, and its use, only slightly modified, continues to this day. The same events are commemorated in the opening line of the Marine's Hymn, "From the halls of Montezuma to the shores of Tripoli."

The blade is marked “P Knecht”, the name of a cutler in the German blade making center at Solingen. It’s likely that the blade was forged in Solingen, and then shipped to America to be combined with the hilt and then sold.

Some of the bluing on the blade has worn off near the hilt, leaving an iridescent coating visible. Bluing is the process by which a sword is heated and cooled in a way that colors the surface of the blade, and then acid is used to strategically remove the coloring in order to create designs. This rubs off over time as the sword is cleaned and used, whereas gilding is actually gold lain onto the blade itself, and therefore generally takes longer to wear off.

4. An introduction to modern reproductions

One effect of the technological advancements of the Industrial Revolution was that after this period, swords could be produced in part by machines, which could form some pieces, such as the hilt and scabbard, quickly and with intricate detailing. As well, smiths in this period gained a much better understanding in the heat-treating and shaping processes that make the steel blades have desirable properties. During this time there is a rise both in collecting and in the general awareness and appreciation of swords as art. This led to an increase in the number of sword makers creating swords specifically for collectors and historians, rather than for use as weapons. These swords were often made to look like fancy or intricate pieces from earlier periods, as these were the public's idea of what they wanted to see in a sword.

However, even the high number of rediscovered swords on the market through antiques dealers and museums did not fully support the demand for high quality, intricate, undamaged original pieces. Antique dealers and restorers already existed in large numbers; this demand simply led them to switch their talents to beginning to supply newly built as opposed to repaired

pieces. This used many skills that these people had already learned, such as deliberate aging, gilding, and etching, as well as taking genuine parts and combining them with replica parts to make the replica look more like a genuine whole piece.

5. The evolution of the cavalry sword's shape

The 1800's were marked in Europe by the search for the perfect cavalry sword. Most major armies of the world assigned specifications for accepted weapons for its units, to the point where in a given year, the most recent pattern of sword for each army was mass-produced in a nearly uniform manner (this is not to say that soldiers didn't personalize their swords after receiving them). Thus, a prominent area of research for many armies was comparing different weights, edges, curvatures, fullers, hilts, and guards for their swords, finding which style of each was the most effective for their cavalry units. (Not much research was done on infantry swords anymore, as most active armies had switched to ranged weaponry for their infantry.)

For the British, the thought of the day was that cavalry sword motions combined slashing actions with thrusting, leading to a century's worth of designs that tried to balance these two types of motion in a single model of sword. As with most cases of trying to combine two abilities into a single object, many of these designs were relatively ineffective in both in an attempt to balance the two.

Cavalry served a few common purposes between various armies. There were the heavy cavalry, which were armored in breastplates and rode upon large horses trained for charging. These were used as shock troops, to frighten the enemy and disorient them in preparation for

other strikes, as well as for delivering a crushing blow at end-battle, or attacking artillery mid-battle. These troops wielded long straight blades, as the primary attack for them was to charge straight at a line, thrusting into the enemy formations, using to their advantage the momentum of the two forces moving towards each other.

Later in the battle, when units were scattered, light cavalry, equipped with little to no armor and smaller horses, could run circles between infantry and dismounted cavalry and attack them from the sides. As well, these forces were useful for recon, scouting, communication, and transport. In these hit-and-run situations, cuts were the faster, easier maneuvers to perform, and thus the cut was the more common attack.

Near the beginning of this period, the cavalry sword was envisioned as a cutting tool, more suited for the light cavalry but also used with a slightly straighter blade for heavy cavalry. The straight blade had more blade strength but reduced usability as a cutting weapon, as less of the blade could be used against an opponent in a slashing motion.

In 1853, British cavalry swords for heavy and light cavalry were merged into a single model, and future models were designed for use by both subtypes for as long as cavalry were used in the British army. These models tried to strike a balance between the two, with each new model changing the curvature as various people brought up situations in which the statistics said one was better than the other or that soldiers preferred a particular curvature.

Along with the curvature, various details such as the weight of the swords, the grips, and the shape of the blade's tip were all changed repeatedly, but the curvature arguably had the most influence on how swords were used for the end of their time as military weapons.

The debate on the properties desired for a cavalry sword culminated in the War Office Committee of 1906, where the specifications were created for the 1908 pattern cavalry trooper's saber. In a sudden jump from previous models, it was decided that the best saber, despite soldiers' past training in both styles, would be designed for maximum thrusting power. Thus, the 1908 pattern saber had a straight blade, spear-tip, and a grip shaped to be held almost pistol-style, allowing a maximum amount of force to be put into a thrust, either to the side into an opposing cavalry unit or downward into an infantry unit.

6. European and American History, 1800s

6.1 European History, 1800s

In European history, the 1800s mark the tail end of the Industrial Revolution. Developed during this time were many advances in transportation, manufacturing, and weapons, among other advances that ultimately drove Europe from being an agricultural society to one based on manufacturing and production. The waterwheels and windmills of before were improved with beveled gears and later altered to eventually lead into turbines and steam-engines. These allowed for more efficient power production, to run more complex machinery in places that would not be feasible for the use of older power sources. Various improvements were also made to lathes and other industrial machining tools, allowing for more precise metalcrafting without direct human interaction. In 1837, the electric telegraph was designed, allowing distant places a near-instantaneous form of communication.

Along with this, solid roads were developed, with which research was done that culminated in Joseph Cugnot designing the first successful steam-powered wagon in 1769. This

was followed by the steam-powered boat, which fared much better than the car version. The suspension bridge was also created during this period, the first of which was opened in 1826. The popularity of the steam-powered railroad car, another example of steam-power being used for transporting people and goods across long distances, may in part be because it was much harder to pave ground than it was to lay railroad ties.

Advancements were also made in artillery, with longer-ranged rifled guns and cannons, as well as in the chemical industry.

6.2 American History, 1800s

As it was only beginning in the early 1800's, the American Industrial Revolution was primarily a combination of industry building on European past advances and research towards mass production and transportation. At this time, machines were used for specialized purposes, with the more detailed parts still often being hand-crafted. This period progressed towards mechanized mass production, culminating in the first Ford assembly line.

Part interchangeability within a project (the ability to refit, say, the hilt of a sword with another hilt of the same model, without altering the tang or hilt) was a key to mass-production: if a company could not make a machine that made the part the same way every time, then the parts would still have to be hand-worked to fit each other in the final product.

Merritt Roe Smith claimed in his work "Military Entrepreneurship" (1981) that the United States Ordnance Department was a major force in spreading the use of machine-made parts in the production of small arms in the 1850's, by spreading knowledge of the required technology for mass production and integrating it as a requirement into their production contracts. Although this department worked with firearm production, the technology and processes of mass machining quickly spread to other fields.

Soon after this period came the Civil War, which brought out the finer points of the differences in technology and engineering between the northern and southern regions. While the North had many factories and manufactured numerous high-quality weapons, the South had a much harder time finding such things and relied on a combination of breaking through the North's naval blockade, smuggling weapons across the land, and a number of generally inexperienced smiths.

By 1913 Henry Ford and his Ford Motor Company had figured out part interchangeability and machine production well enough that on April 1, 1913 he began the use of the moving assembly line, incorporating it into most of Ford's productions within 18 months. Within the next few years many other industries incorporated the same methodologies, rapidly increasing the speed of machine production across the board. This innovation would lead to the increase in mass-production that is so pronounced in the present day world economy.

This period eventually led to America (and because of a similar situation at the same time, Germany) matching England as the main technologically advanced countries (Until the end of World War II, when Japan finally industrialized and joined them)

V. Africa (Stacy Haponik)

1. Regions

Sub-Saharan Africa can be divided into several cultural regions. Eastern Africa, Western Africa, Central and Southern Africa.

1.1 Eastern Africa

Between the 700s and 1800s, many city-states were established along the coast of Eastern Africa, between Somalia and Mozambique. All together, there were approximately forty major urban centers. These city-states traded gold and ivory with the Arab, Indian, and Persian traders who traveled along the coast. The cities became wealthy from this trade. Archaeological digs at some of these sites have produced objects which came from as far away as China. The cities also became exposed to Islam, and this was the dominant religion in some.

1.2 Western Africa

Islamic empires were established in Western Africa between the 800s and 1800s. The more important ones of these were Ghana, Mali, Songhai, Kanem-Borno, the Hausa states, and Sokoto. These empires had primarily agricultural economies, but grew rich through the control of the trade routes across the Sahara Desert. The empires exported gold, slaves, cloth, and ostrich feathers. They imported coins, cloth, and weapons. They also controlled the routes along which salt traveled from the Saharan mines to the markets on the southern savanna and forests.

1.3 Central and Southern Africa

1.3.1 Karanga

The empire of Karanga rose to its height between the 1200s and 1400s AD in southern Africa, primarily in the regions covered by modern-day Zimbabwe and Mozambique. The capital of Karanga was Great Zimbabwe, from which modern-day Zimbabwe draws its name. The people of Karanga were metalworkers skilled with copper and gold. They mined and smelted iron. The empire was a rich center of trade in gold. The empire's richness can be deduced from the discovery of goods from as far away as India and China in its capital.

1.3.2 Kongo

Between the 1300s and 1700s, the states of Luba, Lunda, and Kongo rose and fell in what is now south Congo and northern Angola. Kongo was dependent on its agriculture and metalworking. Its primary trade was in food, metals, and salt. The arrival of the Portuguese and the accompanying slave trade led to the collapse of the Kongo state in the 1500s.

2. European Influence and Slavery

2.1 Slave Trade

Prior to European trade in slaves, wars were not fought to gain slaves. The slaves gained through wars were incidental.

The European interest in slave trading, beginning in the 1500s, caused slaves to be more valuable. Wars began to be fought for the purpose of capturing slaves. These wars disrupted agriculture and hindered the development of cultures.

The goods received through the trade in slaves were mostly weapons and luxury goods. States which participated in the slave trade gained military and economic advantages over their neighbors, which allowed them to further enslave their neighbors.

2.2 End of Slave Trade

In 1807, Great Britain forbade its citizens to participate in the African slave trade, and tried to impose this rule on other slave-trading countries. In 1833, slavery in the British empire was abolished.

This caused the bottom to fall out in the African slave market. The transition from a slaves-based economy to a goods-based economy was difficult for African states. Some states collapsed and new leaders arose in others.

2.3 European Colonialism

Small European colonies had existed in Africa since the late 1400s. These had been established as slave-trading bases. The unrest in the continent due to the fall of the slave trade allowed European forces to increase their influence. Before 1880, 90% of Africa was ruled by Africans. By 1900, only Liberia and Ethiopia remained uncolonized.

In the mid-twentieth century, a major push was made to return rule of the continent back to the natives. Beginning in the 1950s, the various colonial powers made an effort to convert their colonies to independent nations.

3. Swords

The swords of Africa are radically different from those of other regions. Their shapes range from straight-bladed, almost European, styles to multi-bladed objects. They were created to serve in rituals and as currency, as well as status symbols or for use as weapons.

3.1 The Smith

In African cultures, the smith was often viewed with superstitious awe. He was a figure of magic and mystery. The smith often lived apart from the rest of the tribe. In the Maasai tribe of eastern Africa, the smith was viewed with disdain, but the weapons he created were prized second only to the tribe's cattle. In other tribes, smithing was a respected profession. Kings were proud to have learned the art.

3.2 Materials

The first metal worked in Africa, apart from some limited copper-work in west Africa, was iron, which may have been worked as early as 800 BC in eastern Africa. This was because the only significant copper deposits in Africa were in central Africa. Copper was treated as a valuable metal, similar to gold. One traveler reported a meeting with the Mangbetu king in which the king held a copper-bladed trumbash as a scepter, and was surrounded by bars of copper. This was apparently to illustrate the tribe's wealth and power.

Steel was the material most commonly used for swords. Other materials used were copper, brass, or wood, but these were used primarily for ritual weapons.

3.3 Steel

Iron was found all across Africa in the form of iron ore, which requires processing before it can be used. The process of turning iron ore into a usable material is called smelting.

3.4 Smelting

The Africans used a type of smelting called "bloomery smelting". This is the same process used by the Europeans before the invention of the blast furnace. In bloomery smelting, the ore is heated up to 1200 degrees Celsius in a furnace. The resulting sponge of iron and impurities, or slag, is called a "bloom".

The bloom is further purified through hammering. The result is a low-carbon, mild steel which formed the basis for dense, springy and flexible blades.

3.5 Shape

After the iron ore was smelted into a bloom and hammered into a bar, the smith would forge it into its final shape. The steel was often hammered into wide, thin blades which were then stiffened by grooves or ridges. Blades were rarely stiffened through sheer thickness of material.

3.6 Decoration

After the blade was created, palm oil was often burned on its surface to blacken it. After the blade was blackened, parts of it would be polished to provide contrast.

Copper was often used to decorate weapons, in a manner reminiscent of the way Islamic and Indian weapons were decorated with gold and silver.

3.7 Purposes

The uses to which African swords were put were as varied as the cultures which created them. The weapons often served as status objects, or symbols of rank. They were used in religious rituals and in the ceremonies of secret societies. They were traded as currency and wielded in wars.

Because of the dispersal of weapons caused by their use in battle and as currency, it is often difficult to determine where a style of weapon originated. Blades destined for use as currency were often poorly made.

3.8 European Influence

In the 1500s, trade between Europe and Africa increased. Firearms and imported European-style weapons began to replace native African styles. The demand for European-style blades was such that often they were locally made, rather than imported.

The increase in trade also brought European steel to the area. The Europeans used blast furnaces to smelt their iron ore, which resulted in large quantities of steel with slightly different properties.

Imported files were used on later weapons. Locally smelted steel was of higher quality and was believed to possess mystical properties. It was often used on important weapons, such as those used as symbols of rank or for religious rituals.

VI. India (Stacy Haponik)

1. Indus Valley Civilization

Indian society is the result of centuries of invasion and immigration by diverse groups of many backgrounds and cultures.

The first recorded civilization in India is the Indus Valley Civilization. The Indus Valley Civilization formed around 2500 BCE around the Indus River and its tributaries, in what is modern-day Pakistan. The Indus Valley inhabitants irrigated the land alongside the river and built cities of brick.

1.1 Vedic Civilization

Between 1500 and 1200 BCE, the Indus River Valley was invaded several times by Aryans from the north. The Aryan invaders were not city-dwellers like the Indus Valley inhabitants, but were nomadic herders.

When the Aryans invaded the Indus Valley, the Indus Valley civilization died, although remnants of the language group of the Indus Valley civilization appear to survive in southern India and even a few pockets of northern India. Since the Aryans were not city-dwellers, they did not immediately take to the urban centers of the Indus Valley. The cities were abandoned. For the next 600 years or so, the Aryans expanded their territory from the Indus Valley to the south, battling the peoples who had settled there earlier. The time during which Aryan culture dominated is called the 'Vedic Civilization', after the Vedas which were probably written then. The Vedas are the primary source of information on the Vedic Civilization, and are also the principal texts of Hinduism.

1.2 Later Invasions

The Persians controlled the northwestern portion of India from around 520 BCE until Alexander the Great conquered the region in the 330s BCE. Both influenced the resulting cultures in those areas.

Muslim kingdoms became established in parts of Northern India between the 600s and 1100s AD, bringing the Islamic religion with them. Islam conflicted with the native Hindu beliefs, and there was chronic friction between the invaders and their Hindu subjects.

1.3 Mughal Empire

In the 1500s, the Mughals from Central Asia and Afghanistan conquered Northern India, and eventually spread to control most of the Indian subcontinent. The Mughals showed tolerance for the native religions. The Muslim Mughal emperors married local royalty and attempted to integrate into local culture.

In 1658, Aurangzeb took the Mughal throne. Unlike prior emperors, Aurangzeb was a stern, orthodox Muslim. He departed from the policies of his predecessors and implemented policies which were harsh to the native Hindus. He banned building of Hindu temples, imposed taxes on Hindus, and otherwise discriminated against the culture group which made up the majority of his subjects.

This, coupled with his drawn-out military campaigns, led to the decline of the Mughal empire.

1.4 British Rule

The decline of the Mughal empire led to the rise of several smaller empires, which, in turn, were subjugated by the East India Company. This British-owned company became a territorial power during the 1700s and controlled most of the Indian subcontinent by 1850. Misrule led to the Indian rebellion of 1857 in Northern India. The rebellion failed to free India from British rule, but forced the East India Company to give up control of India to the British government.

2. Philosophies

The many cultures of India have given rise to several different philosophies and religions. The primary philosophies of India are Hinduism, Buddhism, Jainism, Sikhism, and Islam.

2.1 Hinduism

Hinduism is a philosophy which encompasses many religions. It developed out of Aryan traditions and culture in combination with the other traditions evidently inherited from the previous Indus Valley culture. The primary texts of Hinduism are the Vedas, which were written by the ancient Aryans.

Hindus believe in an abstract, supreme, and neutral spirit Brahman who has many forms. These forms make up individual deities, who may be worshiped individually. Hindus also believe in karma, or that the actions one performs on others influence the events which will occur to one.

2.2 The Vedas

There are four collections which which comprise the set of texts which are usually referred to as 'The Vedas'. These are the Rig-Veda, Sama-Veda, Yajur-Veda, and the Atharva-Veda.

The Rig-Veda is the oldest of the four collections. It is a collection of religious hymns, rituals, prayers, and poems. It also includes a few secular works. The other Vedas were more specialized. The Sama-Veda consists of verses taken from the Rig-Veda. It details the Soma offering, a specific rite. The Yajur-Veda is also largely taken from the Rig-Veda and consists of instructions for rituals in addition to the Soma offering. The Atharva-Veda differs from the other three Vedas in that it is not primarily religious in nature. It describes charms and superstitions.

2.3 Buddhism

Siddhartha Gautama was born around 565 BCE, the son a king in modern-day Nepal. A seer foretold that he would either become a great king or a great holy man.

Siddhartha was raised as a prince, and shielded from knowledge of human suffering. While on a ride through the countryside, he saw four sights. These four sights were an old man, a diseased man, a corpse, and a mendicant holy man. From the first three of these sights he learned of old age, illness, and death. The last taught him that one can try to find peace through ascetism.

Siddhartha dropped out of his life as a prince and took up the life of an ascetic. After six years of severe ascetism, he realized that without the use of his body, how could he seek enlightenment? Then Siddhartha sought enlightenment through meditation.

Siddhartha's teachings influence Indian culture. Siddhartha's two main teachings were the Four Noble Truths and the Eightfold Path.

2.4 The Four Noble Truths

The Four Noble Truths are that suffering is part of existence, the origin of suffering is the desire for wrong things, giving up the desire for wrong things will lead to the cessation of suffering, and following the Eightfold Path will lead to a cessation of suffering.

2.5 The Eightfold Path

The Eightfold Path is the way to the cessation of suffering. It consists of right understanding, right thought, right speech, right action, right livelihood, right effort, right mindfulness, and right concentration.

2.6 Decline of Buddhism in India

The cause of the decline of Buddhism in India is not clear, but it was due to a combination of factors. These factors include the assimilation of Buddhist beliefs into Hinduism (leading eventually to the inclusion of Buddha as a manifestation of the Hindu god Vishnu), the conversion of Buddhists to Islam and Hinduism, and the destruction of Buddhist monasteries by invaders.

By the end of the 1200s, Buddhism had nearly died out in India, though still practiced in Nepal to the north and Sri Lanka in the south.

2.7 Jainism

In 540 BCE, Vardhamana was born into a royal family. After his parents died, at the age of thirty, he left his home and his worldly possessions. He started out wearing but a single, thin garment, and after thirteen months gave up even that.

Vardhamana lived a life of religious solitude and meditation, fasting, and avoiding harming other living creatures for the next twelve years. During this time, he achieved enlightenment. For the rest of his life, he preached throughout India about what he had discovered.

Vardhamana's teachings form the core of Jainism, which spread through the urban centers of India.

Jainists believe in nonviolence and compassion for all life. Jainists refuse to eat food which required the death or pain of another to acquire: they do not eat meat, and they do not eat root vegetables, for this requires the death of the plant. Jainists also believe in Karma.

2.8 Islam

The various Muslim invasions of northern India brought Islam with them. Muslim beliefs are rather different from those of the Hindus, Buddhists, and Jainists who were native to the region.

The Muslim believed that suffering came from God and should be accepted. Hindus believed that transcendence was the proper way to deal with suffering. This, and other fundamental differences between the two religions, prevented much conversion between the two groups. Those Hindus who did convert to Islam often retained much of their Hindu culture.

2.9 Sikhism

Sikhism is a religious philosophy originating in Northern India in the 1700s. It is based upon the teachings of ten Gurus. The central belief of Sikhism is that there is one God. Salvation is pursued through meditation upon the idea of God.

Sikhism teaches of five evils. These evils are lust, rage, greed, attachment, and ego. Sikhs try to minimize the effects of these influences. Sikhism also teaches of five virtues. These are truth, compassion, contentment, humility, and love. These influences the Sikh tries to increase.

2.10 Five K's

Baptized Sikhs wear five articles of faith at all times. These articles symbolize important beliefs held by the Sikhs, and identify him as one of the faith.

keski turban worn to protect the uncut hair of the Sikh.

kangha A small comb representing discipline and the importance of cleanliness. It is used to comb the hair.

kara circular heavy metal bracelet for protection and a reminder of the wearer's ties to the Guru.

kirpaan ceremonial blade symbolizing self respect, used for self defense.

kachh A special undergarment representing modesty.

3. South Asian Swords

Swords have been a part of Indian culture for a long time. The first recorded mention of swords in India is in the Rigveda, composed around 2000 BC by some estimates. Since that time,

swords have remained an integral part of Indian culture. They are a means of defense, a status symbol, and, in some regions, a multi-purpose tool.

Indian swords show a blend of native Indian and Islamic cultures. Many swords found in India are based on Islamic designs.

Like Islamic blades, Indian swords are often heavily decorated. The blade may be inlaid with precious metals in a technique called false-damascening.

The blade is often inscribed with geometric or organic patterns, or verses from either the Koran or the Vedas, depending on the beliefs of the owner. The inscription may be etched using acid, or chiseled into the surface.

3.1 Types of Swords

Indian swords can be divided into two broad groups: those with curved blades and those with straight blades.

Indian swords exhibit some unique features. Some, called patas, are a combination of blade and gauntlet. Others are broader at the tip than at the base, lending them an axe-like appearance. As regions of India adopted Islamic culture, the Islamic sword style melded with the local style, so that the Islamic curved sword and split-bladed sword is also found here.

3.2 Straight Blades

3.2.1 Khanda

The khanda is one of the oldest of Indian swords. It was used by Rajputs, Mughals, and Marathas. It is the sword most commonly associated with central India. The form of the blade is what determines whether or not a sword is a khanda. Khandas have a broad, straight blade is

between 29 and 35 inches in length. The blade usually widens to a blunt point. The blade is usually single-edged, with a strengthening plate along the unsharpened edge.

Khanda, 1700s. HAM 2052

The hilt of the khanda may vary. Around 1600 AD, khandas were manufactured with basket-hilts. The inside of the guard and finger guard were padded, and the pommel often had a spike protruding from it. This spike served as an arm-guard. The spike was also grasped by the second hand when the sword was swung two-handed. The blunt point of the khanda leads it to be used as a cutting weapon.

3.2.2 Pata

The pata is a gauntlet-sword developed by the Marathas in the late 1700s. It originated in West Deccan, and the style then spread throughout their empire.

Pata, 1600s-1700s. HAM 1549.

The gauntlet covers the forearm nearly to the elbow. The interior of the gauntlet is padded. An iron strap hinged to the upper end of the gauntlet goes around the arm, holding the gauntlet to the arm. The grip is at right angles to the blade, and it is held like a punch dagger. The wrist is held straight.

The blade of the pata is either leaf-bladed or straight, with parallel edges. It is long, flexible, regularly tapering, and steel. Blades were most often European in origin, usually from either Spain or Italy.

The pata relied upon the motions of the forearm, rather than the wrist. This allows powerful strokes to be used. It took skill to wield, and was not well suited to fencing. The pata was used primarily by cavalry.

3.2.3 Dao

The dao is a multi-use blade. It developed among the tribes of eastern India.

The blade of the dao is straight and heavy. It is square-ended, and narrowest at the hilt. The blade is about 18 inches long, and sharpened only along one side. The hilt is simple, and undecorated. There is no distinct pommel.

The dao was used both as a tool and as a weapon. The weight of the dao allowed it to be used as an axe. Since the wielders used spears as their primary weapon, the dao was a secondary weapon, used primarily on already-disabled enemies.

Dao from the Assam region of northeastern India, 1800s. HAM 2055.

3.3 Curved Blades

3.3.1 Talwar

The talwar is class of Indian saber, which includes almost all curved swords. The blade is sharpened on the outside of the curve.

The typical talwar has a short button on top of a disc pommel, an oval-shaped grip, and short, heavy quillions. It may also have finger guards.

Talwar, 1800s. HAM 2051.

3.3.2 Kora

The kora was the primary weapon of the Gurkhas of northern India and Nepal.

Kora from Nepal, 19th-20th century. HAM 2050.

The blade of the kora is between 19 and 24 inches long, severely bent, and sharpened on the inside of the curve, in contrast to the talwar. The blade widens to the end, and terminates in two concave curves. The blade is very heavy.

The curve of the blade and its weight make it a powerful chopping weapon.

3.3.3 Kastane

The Kastane is a curved sword found in Sri-Lanka. It was probably developed after contact with Europeans in the 1500s.

It has a short, heavy blade. The blade is slightly curved and sharpened along the concave edge. The pommel and quillion are decorated with animal shapes. The Kastane is often heavily ornamented, and served as a status symbol.

Kastane, 1600s-1700s. HAM 2392.

VII. Islam (Stacy Haponik)

In the Islamic regions, the sword developed to fulfill both a functional and a symbolic capacity.

The form of Islamic swords has not changed very much. The forms of the 1800s are similar to those of the 1400s. Old weapons were often reworked or given new components, so few older weapons are available for study.

1. Types of Swords

The Islamic region shows a variety of sword types, from straight-edged blades similar to those of Europe to the curved swords for which it is known. One form of blade distinct to the Islamic region is the split-bladed curved sword, which is symbolic of the sword of Muhammad.

It is not entirely clear when curved swords were introduced to Islam. Curved blades are shown in frescos in Turkestan as early as the 800s. By the 1400s, there were two blade shapes in common use: a straight, broad, double-edged blade; and a gently curved, broad blade with a shallow channel and a false edge near the tip.

1.1 Shamshir

A shamshir is a one-handed, curved-bladed sword which developed in the Islamic region. The design was used by the Persians in the 1500s, and from them it spread to the rest of the region.

The shamshir was primarily a slashing weapon. The curve of the blade made thrusting difficult.

1.2 Yataghan

The yataghan is a sword form which developed in southwest Turkey. It was used from the mid-1500s to the late 1800s. It is distinguished by its lack of guard for the hand.

The blade varies between 23 and 31 inches, and is incurved. The sharpened edge is of steel and the back of the blade is of iron.

The classic form of the yataghan is the elongated 'S', though some have straight blades. The distinguishing characteristics of the swords are its lack of hand guard and the 'eared' shape of its pommel. This hilt type predates Muhammad. This lack of hand guard did was not a great disadvantage, as the yataghan was used primarily from horseback, to slash.

1.3 Zulfiqar

The zulfiqar is a Islamic sword with a split-tipped blade.

The split blade is in reference to a split-bladed sword belonging to Mohammed and his son-in-law Ali.

1.4 Decoration

The swords of the Islamic regions are often highly decorated. Sometimes names, genealogies, or verses from the Koran can be found on the blade. Various techniques were used to decorate the swords, including false-damascening, inlay, pierced steel, enameling, and etching.

False-damascening is a technique whereby the surface of the object is covered in gold or silver in a pattern, often reminiscent of watered steel. The surface is first cross-hatched, then

sheets of gold or silver are hammered onto the surface. The result is fragile: cleaning the blade can remove the metal. Rust could also form under the metal, lifting it off the surface.

Inlay work is another method of applying gold or silver decorations to an object. In this technique, the surface of the blade is chiseled with the desired pattern, and gold or silver wire is pounded into the groove. This resulted in a more durable decoration, but took more skill and more of the valuable metal.

2. Islamic Background

The religion of Islam arose out of Arabia in the 600s. It is based upon the teachings of the prophet Muhammad.

Muhammad was born circa 570 AD in Mecca, in what is now Saudi Arabia. Orphaned before he was six, he was raised by his uncle Abu Talib.

In about 610 AD, while praying in a cave, Muhammad had a vision. According to tradition, Gabriel began speaking to him, and ordered him to begin reciting what would become the Koran. He preached his revelation at first to his family, and then in public. Muhammad preached that he had be chosen by God to lead a revival of the faith.

Some believed his words, but others were upset by his monotheistic message. Wishing to save his followers from persecution, Muhammad sent some to the Christian country of Ethiopia.

Some tribesmen from the city of Medina encountered Muhammad and his message. Medina was religiously mixed between Jewish and pagan religions. The tribesmen invited Muhammad back to their city in the hopes that he could ease the fighting between the Jewish and pagan populations.

Muhammad led Medina in a series of expansionist wars against the surrounding regions. He received the surrender of Mecca in 630, and had united most of the Arab tribes by his death in 632.

By the mid 600s, the Islamic empire had grown to contain Persia and parts of Northern Africa. After Mohammed's death, the Islamic empire suffered a civil war which divided the state and split the faith into Sunni and Shi'a.

2.1 Turco-Mongol Empires

By the 1400s, three major empires had formed. The Turco-Mongol Empires were three large empires which covered the near East, India, and Central Asia. These empires were the Ottoman, Safawid, and Mughal empires. By the 1600s, trade was well established between these three empires. This was due to low taxation, safe travel, and an enormous, contiguous region.

2.2 Ottoman Empire

The Ottoman Empire covered Northern Africa, the Middle East, and parts of modern-day Turkey. It is the oldest of the three empires, and lasted until World War I, outliving both the Safawid and Mughal empires.

The Ottoman Empire encouraged Orthodox or near-Orthodox orders of Islamism, partly by discouraging Sufism. Sufism was persecuted in part because the Safawid Empire was gaining influence in the Ottoman Anatolian frontiers by converting the tribes there to Sufism. These converts were thought to be of questionable loyalty to the Ottoman Empire.

The bureaucracy was made up of the 'ulama' or 'learned men of Islam'. These ulama were taught through a hierarchical system of religious institutions. The Ulama made up the

religious scholars, teachers, scribes, and religious functionaries of the country. The religious institutions also trained the Qadis, or religious judges, of the state. The Qadis enforced religious and imperial law. They also collected taxes, supervised market places, and ran the local administration in Muslim provinces. The Ulama of the Ottoman Empire (also known as Ilimye) also discouraged experimentation in the fields of science, philosophy, and religion.

An influential leader in Ottoman history was Sulayman, who ruled from 1520 to 1566. He established the tradition of separation of the ruler from active government. Heirs were raised in the palace harem, isolating them from both politics and the military. This prevented wars between brothers fighting for the throne, but also lead to inexperienced leaders, resulting in a very bureaucratic society and, when combined with the lack of innovation caused by the Ilimye, a weakened empire.

In the 1500s and 1600s, the empire was shielded from invasion by surrounding, weaker countries. However, in the late 1600s and early 1700s, both Russia and Hapsburg reclaimed territory from the Ottoman Empire. As Imperial control laxed, some Qadis became de facto local governors.

2.3 Safawid Empire

The Safawid empire was located in modern-day Iran. Its strength was in the charisma of its leaders. The leaders of the Safawid empire united the disparate tribes of the region, using Sufi and Shia ideologies to appeal to them from both a spiritual and secular perspective. These tribes proved to be a valuable military resource, and enabled the empire to control more land.

The Safawid Empire threatened the Ottoman Anatolian frontiers because the Shia found converts there. The converts were seen as possibly disloyal to the Ottoman empire.

In the 1500s, Shah Ismail established a state religion. The government erected Shia shrines, bought religious art, and brought Shia scholars into the country from places such as Syria and Iraq. The government also persecuted non-Shia, especially Sunnis and Sufis. Sufis were seen by Shah Ismail as a possible rival power.

In 1514, Shah Ismail was defeated by the Ottomans in a battle over recruitment of tribes in eastern Anatolia. This defeat caused the Shah to lose influence over the tribes, and the tribes reasserted their independence from the Safawid state. Most of the Safawid region was controlled by the tribal powers by 1587.

Shah Abbas (1567-1629) regained control of the Safawid territory by reducing military dependence on the Qizilbash tribes. The tribes were replaced by slaves.

The Ulama began interpreting the Koran in a way that implied that they were the leaders of the Islamic community, and by 1722 they had taken over control of the empire. The Safawid empire was conquered by the Afghans in 1722, but the Afghans could not rule the state. The various Qizilbash tribes ruled the region after the Afghans left.

2.4 Mughal

The Mughal empire conquered much of Northern India in the 1400s. Unlike the other two empires, the region it ruled was made up of mostly non-Muslims. Eighty to ninety percent of its populace were Hindu, Christian, or other non-Muslims. The rulers of the empire did not see the following of Islam as a sign of loyalty, and were tolerant of alternative religions.

The Mughal empire collapsed around 1739 due to a combination of factors. Awrangzeb, the ruler of the time, had fought twenty years of unsuccessful wars. These wars meant he was often away from the seat of government, leading his troops.

VIII. China (Jessica Copp)

1. Chinese History

While modern-day China covers a vast amount of land that spreads from the Himalayas to the Pacific Ocean, the majority of people were first centered around the Yellow River, though there were nomadic tribes spread all over the area. The Chinese developed many important technologies long before Europe, including paper, printing, gunpowder, the compass, silk textiles and high-quality ceramics.

figure 1. Map of China. (www.wikipedia.com)

From early in Chinese civilization, the region was very densely populated and eventually the most heavily populated area in the world by 1122. Rebellions and invasions gave rise to the series of dynasties used to divide Chinese history. Each dynasty would start when an uprising or invasion would place a new ruling family on the throne.

The Qin dynasty ruled from 221 to 206 BCE. This was a dynasty of standardization in China, developing a centralized government and an official language. This is also the time when China began to take its shape geographically as it is today. It was also a time of battles. There was a strong cavalry, which was needed especially on the borders. The country was split into forty-one different military regions. One major change under the Qin was that peasants now could privately own land, but they now had to pay taxes on it. This caused a shift in the social structure. The lower class could now buy their way into nobility through gifts and services to the king.

The Han dynasty, 206 BCE – 220 CE, with the Xin dynasty ruling a few years in the middle, 9 – 23 CE, was still a time of war, mainly against nomadic tribes to the north and west. The Han dynasty's main enemy was the Huns. During the Han dynasty, there were many scientific discoveries in astronomy that, though often credited to Europeans, actually took place in China much earlier than anywhere else. Paper and porcelain were also invented during this time. Such advances drew many foreign visitors to China to learn from Chinese culture.

2. Jian

Type: bronze sword of the Jian type
Accession Number: HAM # 238.9
Region: China
Time Period: 1123-250 BCE (Zhao Dynasty)
Blade Length: 33cm (13 inches)
Weight: 15.36 oz (438.8 g)
Material: Bronze

The jian is a straight double-edged sword that was used for slashing and thrusting. It was first developed around the 4th century BCE. In legend, the jian had mystical powers that would

allow it to glow in the dark and utter sounds. It was associated with chivalry and seen as the appropriate weapon for a gentleman.

The jian is one of the more stereotypical swords from China, and can be seen in the movie *Mulan* when the main character decides that she's going to join the Chinese army in her father's place. The father had one because he was a respected gentleman of their village. Mulan was pretending to be her father's son and through being passed down, she got the heirloom sword to keep the prestige of their family name.

figure 1. HAM # 238.9 (1123-250 BCE). Bronze jian sword from Higgins Armory. Note: missing pommel cap

As technology progressed, swords were able to become longer. The jian was about 14 inches when it was first developed. The "hollow-hilt" which followed was around 16 inches. The jian that appeared during the 4th and 3rd centuries BCE were 20 inches long and decorated with inscriptions dedicated to ancestors. The appearance of the jian was also changing. By the 3rd century BCE, it became very long and slender with the blade reaching up to 26 inches. The manufacturers used a chromium wash on the blade during production, which enhanced and preserved the sharpness of the blade. There was a turn towards the use of iron and steel, but bronze was also still used regularly.

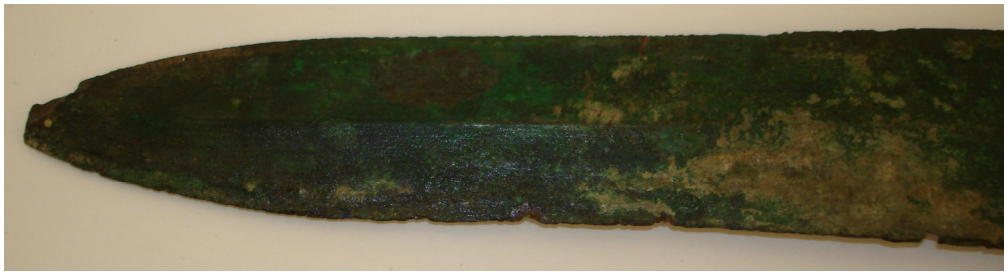


figure 2. HAM # 238.9 (1123-250 BCE). Tip of bronze jian sword from Higgins Armory

figure 3. HAM # 238.9 (1123-250 BCE). Hilt of bronze jian sword from Higgins Armory. Note: the grip would have originally been wrapped in cord and the pommel cap is missing.

When studying the specific artifact from Higgins, you can see the lines, much like a grain, going down the blade, which implies that method of manufacturing was wax molding. The robust cross section is similar to the Grip Tongue sword produced by the Greeks, which had blades ranging anywhere from 24 to 32 inches long.

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IX. Japan (Jessica Copp)

1. Japanese History

Overseas trading between Japan and mainland Asia began as early as 20,000 years ago. By trading with other regions the Japanese were exposing themselves to other cultures, traditions and knowledge that initially were more advanced than their own.

For much of their history, Japan was closed off to the outside world. But during the Muromachi Period (1392-1477) communications opened again with China. The wars and fighting that were going on at this time didn't rely on horses anymore. Fighting was at close quarters so it was hand-to-hand combat that was dominant. This meant more swords were needed and used. This was not just in Japan, but in China as well. Japan began exporting swords to other countries. The two stereotypical samurai swords were produced during this time. The katana is a long sword that was worn outside. The wakizashi is a short sword that was worn at all times or put next to the bed while sleeping.

figure 1. Samurai in traditional costume.

www.wikipedia.com

One tradition from this period that remained a Japanese icon was the idea of the samurai. The samurai is an important part of Japanese history and possibly the most recognizable Japanese concept today. The samurai were the higher class of military men. They were supposed to live a life of service and indifference to

personal danger and gain. They received special treatment in the criminal courts, such as being able to kill a commoner for failing to show respect.

Their purpose was to uphold structure and morals in society. They wore two swords in their sash, one long and one short. This made them walk and stand differently to keep the swords in place. The samurai also stood out from others by the "topknot" that they wore on top of their head. They also had a special outfit, consisting of a stiff-shouldered jacket and pants that looked like a skirt.

As commerce became more important in Japan in the centuries after 1600, many samurai could no longer afford to keep their possessions because samurai didn't work. This was a major downfall for the samurai.

2. Manufacturing

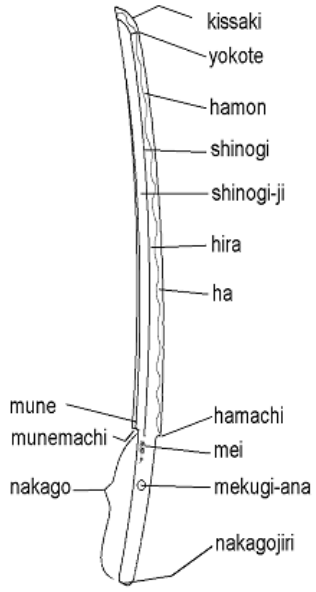

figure 1. Parts of the katana. (www.wikipedia.com)

The process that sword-smiths go though to create a traditional Japanese sword is a long one. Most sword-smiths use a steel called tamahagane. Today, this type of steel is produced almost exclusively in a smelter called a tatana and is one of the most expensive types made. This

smelter uses charcoal heating to add carbon. It takes five days to create the steel. The first day is used to build the walls from clay and sand which are rebuilt after every smelting. After the walls are created a small fire is started in the bottom of the trough and small pieces of oak and pine charcoal are added continuously for three hours. The smelting itself takes three days. Iron sand is spread on top of the coals followed immediately by another layer of charcoal. Thirty minutes later more iron sand and charcoal are added. This cycle continues every half-hour for 72 hours. By the fifth day a two-ton brick of steel is created. This is smashed into smaller pieces which are inspected and sorted. The steel ranging from .6 to 1.5 percent carbon is tamahagane.

After the iron is smelted the sword-smith turns it into a sword. A forge and bellows is the major equipment used. Unlike what was used in Europe, the air blast comes from one side and the bellows are to the left of the forge so the sword can be manipulated with the right hand. A steel block is created by welding together the small pieces. The block is wrapped in paper to hold it together in the forge. Clay slurry and rice-straw ashes are applied to the hot steel block to help prevent overheating, oxidation and the resultant loss of carbon. The block is heated and hammered until it's completely welded together.

After the solid block is created it's heated and folded onto itself six times. Each fold requires 30 minutes and 2-3 heatings. The block is cut into three equal pieces. It takes two pieces to create a small sword and four to make a full-size blade. The pieces are heated and hammered out until they are welded together and resemble the shape of a sword. Only six inches are heated at a time and the temperature is very important. A hammer is used to smooth out the edges until the steel is long and straight. This is not an easy task and it takes people years to perfect the technique. The point of the blade is carefully shaped with a hammer.

After the forging process, the blade is refined by filing and scraping. Both sides of the blade are smoothed. Prior to heat-hardening, an adhesive clay mixture (clay, charcoal powder, and pulverized sandstone) is applied to the blade. The clay helps to insulate, the sandstone prevents shrinking and cracking, and the charcoal powder helps control the rate of the heating and cooling. The blade is hardened by heating it red-hot then submerging it in cool water. After this the curvature of the blade is adjusted by heating the blade and hammering it over a heated block. Once the blade is set, grooves can be added using a draw knife and decorative carvings using a chisel.

3. Katana and Wakizashi

Type: Katana
Accession Number: HAM # 1860
Region: Japan
Time Period: late 18th century-early 19th century
Weight: 3 lbs. 11 oz
Materials: steel, iron, copper, ray skin, wood, silk, gilding

The swords of Japan are an important part of their history. The samurai is the main sword carrier of Japan and the sword is said to be the soul of the samurai.

As swords were imported from China into Japan, the Japanese found they needed to make some changes to the style to fit their needs. The curve became deeper throughout the blade to increase cutting efficiency. This blade was able to cut through the tough leather worn by the Mongol invaders of the late 1200s.

During the Muromachi Period (1392-1477) two stereotypical samurai swords came into being. The katana is a long sword that was only worn outside. Its deep curvature allows for an easier cut and more strength. The katana was known to behead a person in one swing.

figure 1. HAM # 1860, late 18th century-early 19th century. Katana from Higgins Armory

Type: Wakizashi
Accession Number: HAM # 2290.1
Region: Japan
Time Period: 1500s
Weight: 1 lb.
Materials: steel, iron, silver, copper, ray skin, wood, lacquer, gilding

The wakizashi is a short sword that was worn at all times or put next to the bed while sleeping. The wakizashi was important to the samurai because it was used in ritual suicides that allowed them an honorable death.

figure 2. HAM # 2290.1, 1500s. Wakizashi from Higgins Armory

There were variations to these types over the years, but the name and basic idea stayed the same. During the Tokugawa Period (1603-1868), to touch another's weapon or bump into the scabbard was a serious offense. When entering a friend's house, the katana was to remain outside. If the host insisted, it could be placed on a rack on the right-hand side of the guest. This way the guest could never grab the sword with intent to use it. The rack was only on the left-hand side if there was immediate threat of attack. The weapons were worn on the left-hand side and there is a very particular way to attach both the wakizashi and the katana.

The two swords together, which are known as a daisho, has become a Japanese icon. They're present in many Japanese artworks, mainly with the samurai, who, for many, is the ultimate warrior. The daisho has stayed through modern times as a part of Japanese culture, where swords were faded out in most other areas. There are some that believe that the katana is the best sword ever made. This adds to its popularity and mystique. Americans like Japanese culture in general: along with Japanese anime and sushi, art and films, has come the icon of the katana. Two popular films that feature the daisho are *Kill Bill* and *The Last Samurai*.

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X. Southeast Asia (Jessica Copp)

1. Southeast Asian History

Although not much is known about the prehistory of Southeast Asia, human remains have been found that date back a million years. Though there may have been small groups of people coming into the Southeast Asian area, the first significantly large migration started around 2500 BCE from China. Many times, whole communities would migrate together to Southeast Asia from China. These immigrants mixed and intermarried with the cultures already present in the area.

Within the Indonesian Archipelago, Malaya was one of the major civilizations. Malaya, during the late 1300s, had strong ties with China. It borrowed from them centralized bureaucracy for revenue, justice, and agricultural and public works, which were all headed by members of the royal house. Nobles governed local areas and headmen presided over villages.

In the early 16th century, Portuguese traders began to make a presence in Malaya. They wanted control over the sources of spices. They set up trade ports, but without much government support from Portugal, their cities grew weak and were eventually overthrown by the Dutch in 1641.

In 1591, Britain began sending expeditions to the Spice Islands to establish trade ports. It was a struggle to get anything set up and by 1700, they still only had one port. The British helped northern Malaya during its war with the Chakri dynasty and as compensation gained power in Malacca and Java. The Anglo-Dutch treaty in 1824 gave the English Singapore and Malaya while the Dutch maintained Indonesia. Between 1874 and 1888, Malaya came under British protection.

figure 1. Southeast Asia (www.wikipedia.com)

On August 31, 1957, The Federation of Malaya was granted independence by the British. On September 16, 1963, Malaysia was established including Borneo, Singapore, Malaya, and other small British-controlled islands. However, this arrangement didn't last long and different countries began to leave. Modern day Malaysia is closely tied to the US through the Peace Corps, education, and trade.

The Philippines is another region that other countries were very interested in. By 1576 the Philippines fell to the Spanish. The Spanish ruled the Philippines harshly. In the mid 1800s nationalist movements arose that were critical of Spanish rule. The Spanish won against all the rebels. In 1898 the Spanish-American War broke out. The Americans, after defeating the Spanish, proclaimed the Philippine Republic independent. The Filipinos didn't like Americans being there and continued with guerrilla warfare for three years (1899-1902). Americans

established and ran the government for the Filipinos and slowly introduced Filipinos into the system. In 1935 there was an act passed which gave Filipinos independence for ten years, at which point they would be reviewed. The Philippines stayed dependent on the US, but in 1945 were granted full independence and had their own president. In 1992 Americans completely left the Philippines with optimistic hopes of maintaining a stable government on their own.

2. Kampilan and Talibon

Type: Kampilan
Accession Number: HAM # 3143.11
Region: Malaya or Philippines
Time Period: 1800s – 1900s
Blade Length: 70.5 cm (27.6 inches)
Materials: steel, wood, iron

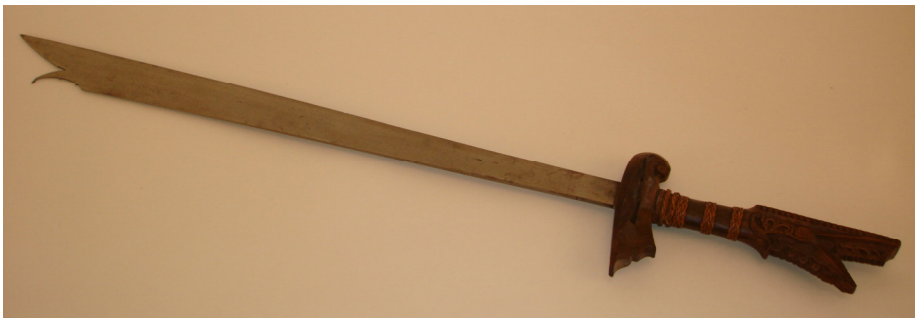

Figure 1: HAM # 3143.11, 1800s – 1900s. Kampilan from the Higgins Armory Museum.

The kampilan was originally the national weapon of Borneo. It has a carved hilt, usually of wood. The pommel is forked and usually decorated with hair dyed either red or black. It has a long, straight, single-edged blade that's much wider at the point. The scabbard is made of two pieces of wood shaped like the blade with two fasteners (one at the lower end and one a little further up). By unfastening the two places, the scabbard can come apart to put the blade in. In some parts a different scabbard was used. It's a single piece of hard wood shaped as a hexagon. It has a loop handle on one side so that it can also be used a shield.

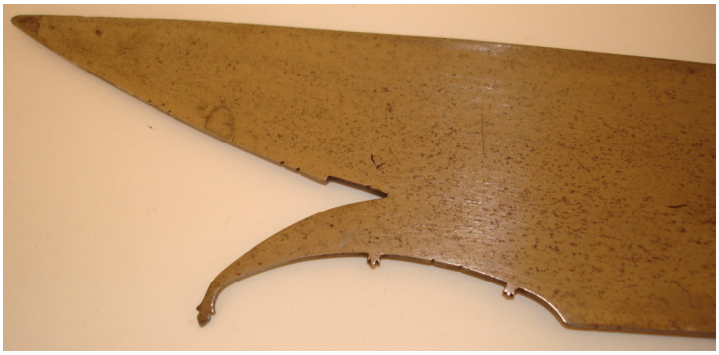

figure 2. HAM # 3143.11, 1800s – 1900s. tip of kampilan

The artifact from the museum has some unique features. Along the back edge of the blade, there are pairs of engravings (shown in figure 3). You can see in figure 4 that along the back of the blade there's a line that looks like a crack, which suggests that there were two separate pieces that were welded together. This made it easier to create the decorative detail at the tip (shown in figure 3), and makes the blade more structurally sound. There are two metal hooks on the cross bar (shown in figure 4) which could possibly be for some sort of suspension.

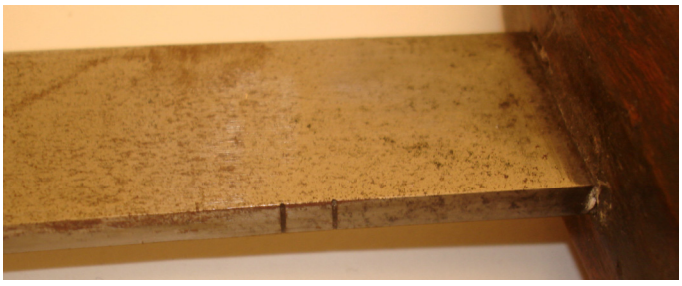

figure 3. HAM # 3143.11, 1800s – 1900s. notches on kampilan

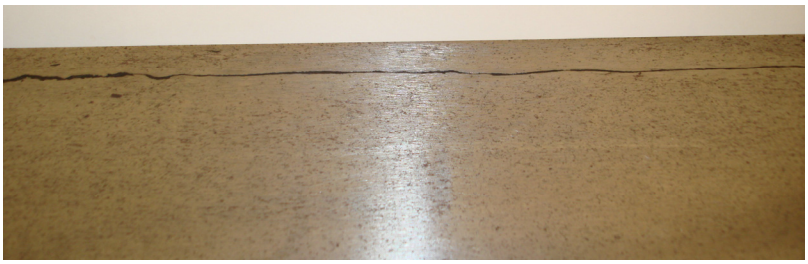

figure 4. HAM # 3143.11, 1800s – 1900s. line along back of blade

figure 5. HAM # 3143.11, 1800s – 1900s. hooks on cross guard

Type: Talibon
Accession Number: HAM # 3143.12
Region: Philippines
Time Period: 1800s – 1900s
Blade Length: 42 cm (16.5 inches)
Materials: steel, wood

The talibon has a heavy blade that's normally straight on the back. It has a strong curve on the edge with a very long point at the tip. Its length can range from 1-2 feet. It was used for fighting by Christian Filipinos.

Figure 6: HAM # 3143.12, 1800s – 1900s. Talibon from the collection at Higgins Armory Museum.

When looking at the talibon from the museum, you can see marks that suggest pattern welding where the blade meets the hilt (shown in figure 7). This could have been done because it's a weak point for the blade. There's a line along the edge of the blade that could be from

welding two types of iron together, a high and a low carbon (shown in figure 8). The blade is rough and looks like it was hammered out to form the shape.

figure 7. HAM # 3143.12, 1800s – 1900s. possible pattern welding

figure 8. HAM # 3143.12, 1800s – 1900s. line down blade

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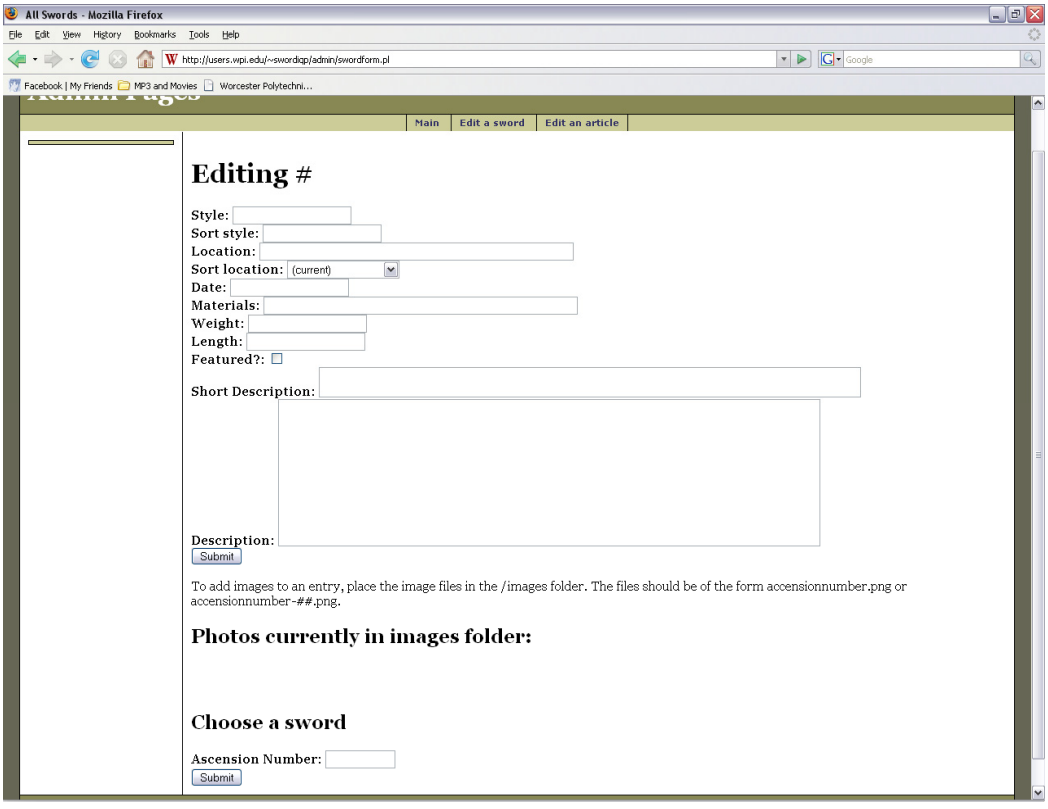
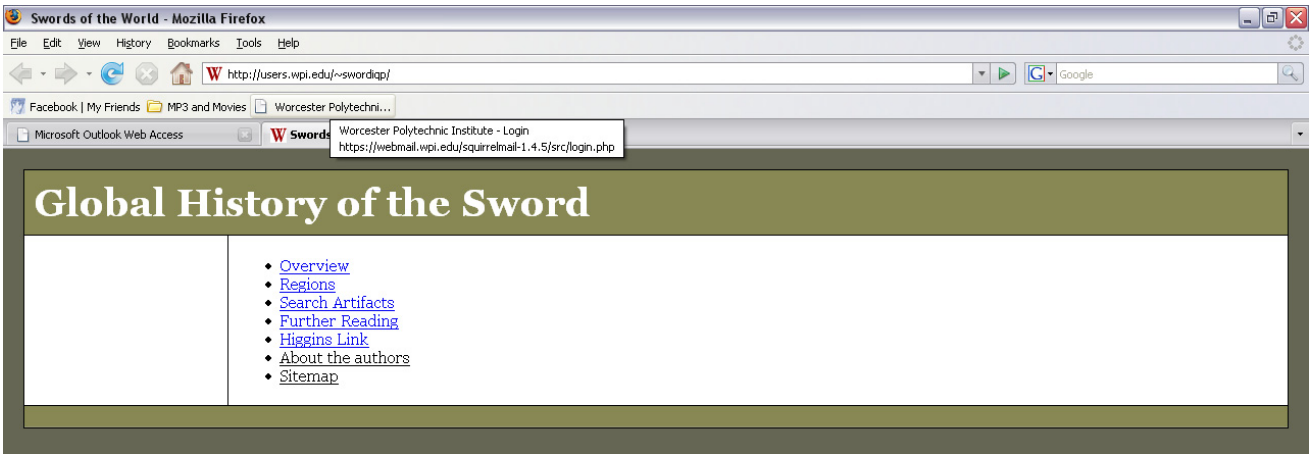
Appendix C – Screen Shots of Website

This is a small collection of a few of the pages on our website.

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Global History of the Sword
Overview
Regions
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Further Reading
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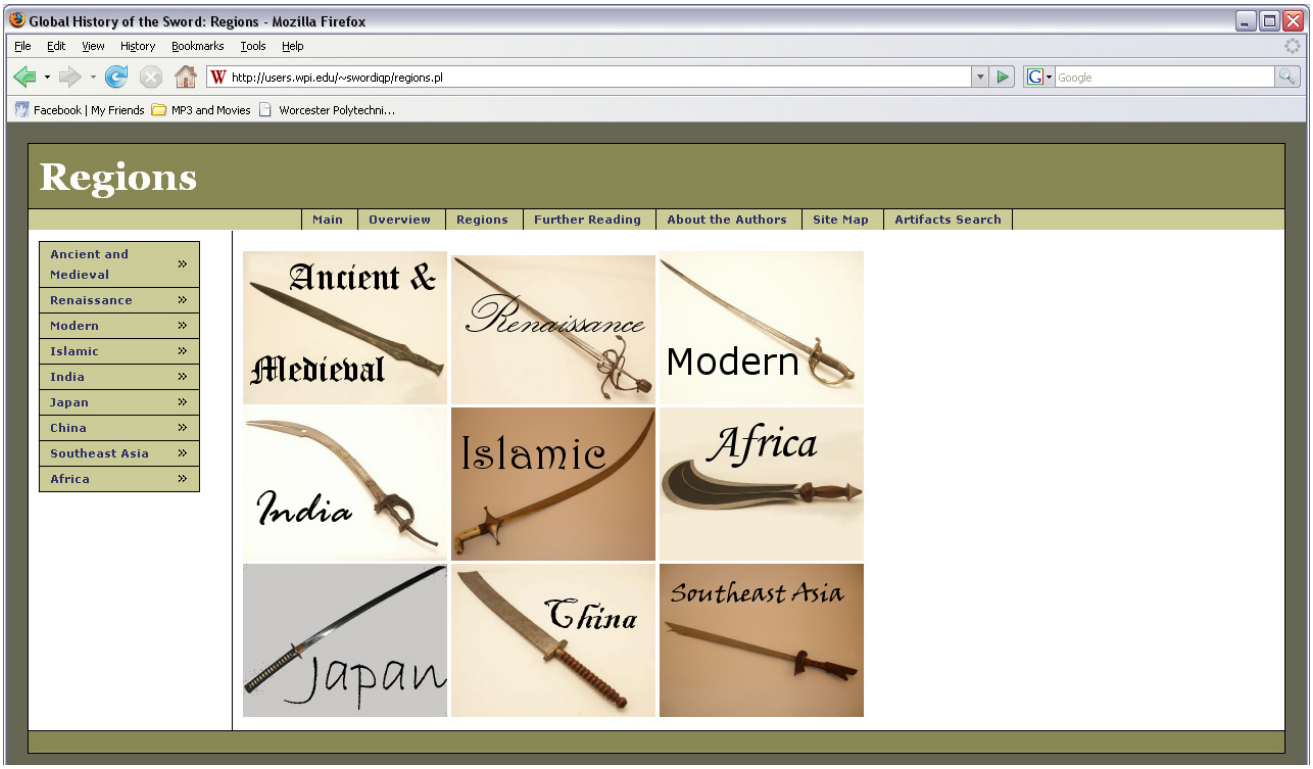
About the authors
Sitemap


Global History of the Sword: Regions - Mozilla Firefox
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Ancient and Medieval
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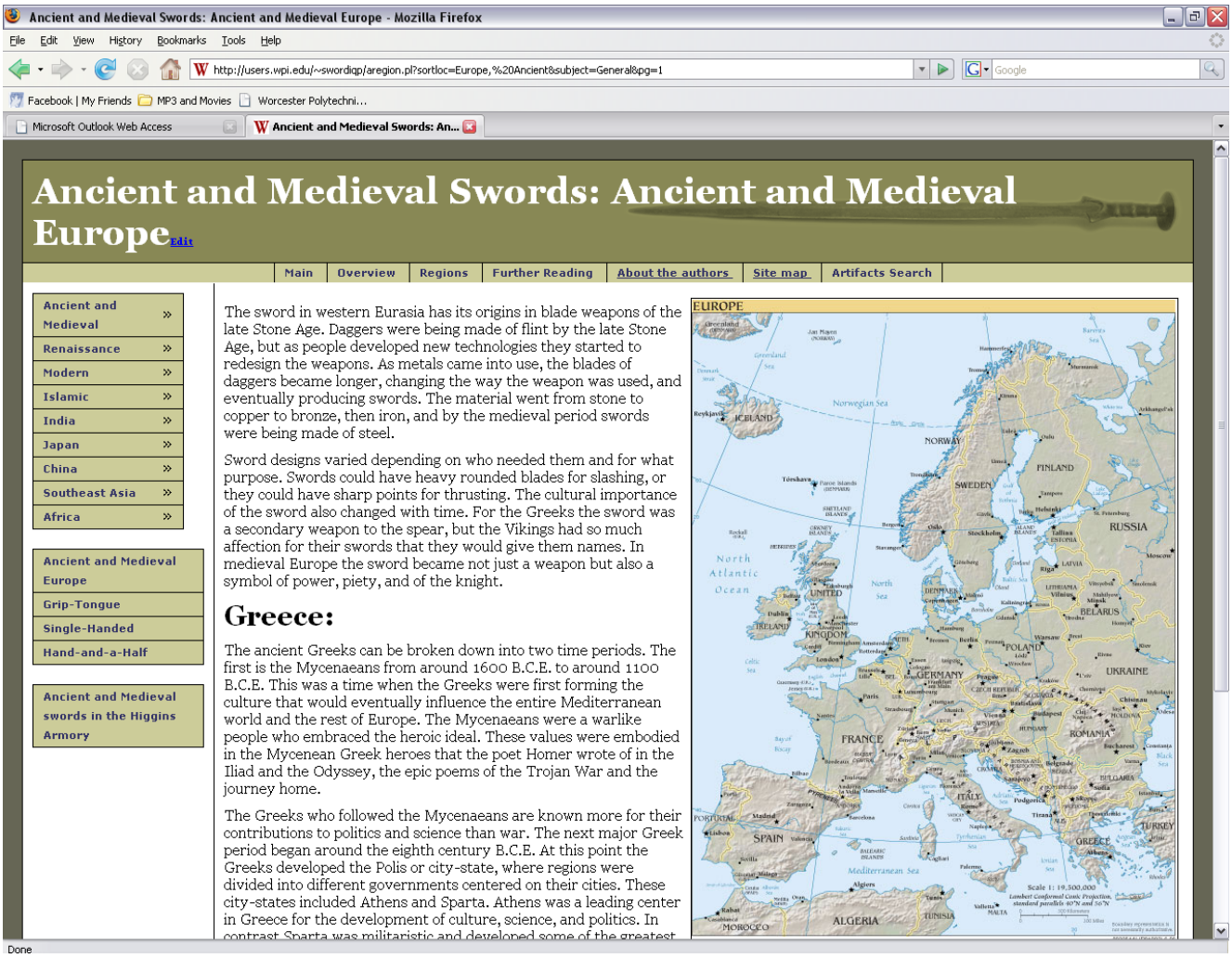
Ancient and Medieval Swords: Ancient and Medieval Europe - Mozilla Firefox
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Ancient and Medieval Swords: Ancient and Medieval Europe
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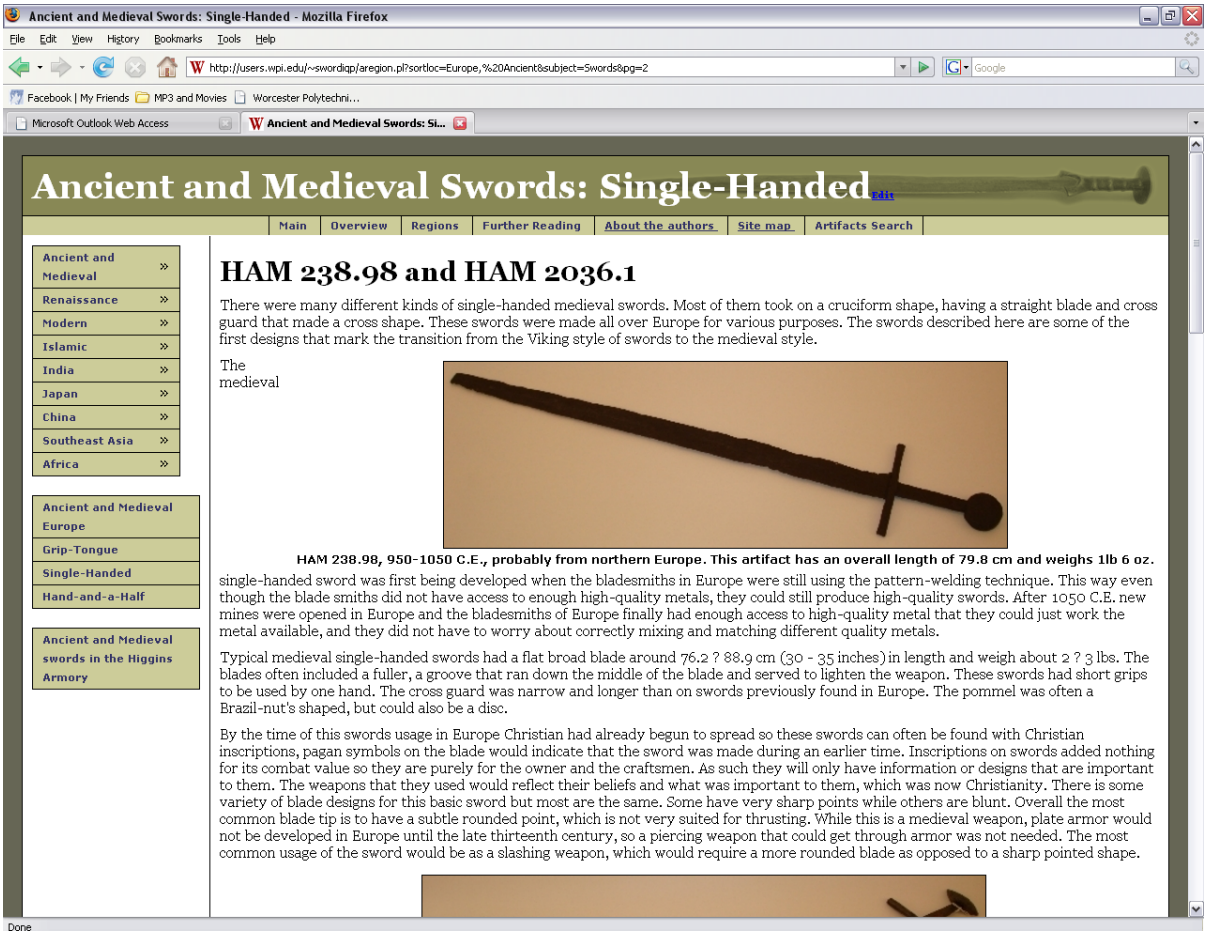
Artifacts Search
Ancient and Medieval
Renaissance
Modern
Islamic
India
Japan
China
Southeast Asia
Africa
Ancient and Medieval Europe
Grip-Tongue
Single-Handed
Hand-and-a-Half
Ancient and Medieval swords in the Higgins Armory
The sword in western Eurasia has its origins in blade weapons of the late Stone Age. Daggers were being made of flint by the late Stone Age, but as people developed new technologies they started to redesign the weapons. As metals came into use, the blades of daggers became longer, changing the way the weapon was used, and eventually producing swords. The material went from stone to copper to bronze, then iron, and by the medieval period swords were being made of steel.
Sword designs varied depending on who needed them and for what purpose. Swords could have heavy rounded blades for slashing, or they could have sharp points for thrusting. The cultural importance of the sword also changed with time. For the Greeks the sword was a secondary weapon to the spear, but the Vikings had so much affection for their swords that they would give them names. In medieval Europe the sword became not just a weapon but also a symbol of power, piety, and of the knight.
Greece:
The ancient Greeks can be broken down into two time periods. The first is the Mycenaeans from around 1600 B.C.E. to around 1100 B.C.E. This was a time when the Greeks were first forming the culture that would eventually influence the entire Mediterranean world and the rest of Europe. The Mycenaeans were a warlike people who embraced the heroic ideal. These values were embodied in the Mycenean Greek heroes that the poet Homer wrote of in the Iliad and the Odyssey, the epic poems of the Trojan War and the journey home.
The Greeks who followed the Mycenaeans are known more for their contributions to politics and science than war. The next major Greek period began around the eighth century B.C.E. At this point the Greeks developed the Polis or city-state, where regions were divided into different governments centered on their cities. These city-states included Athens and Sparta. Athens was a leading center in Greece for the development of culture, science, and politics. In contrast Sparta was militaristic and developed some of the greatest
EUROPE
Done


Ancient and Medieval Swords: Single-Handed - Mozilla Firefox
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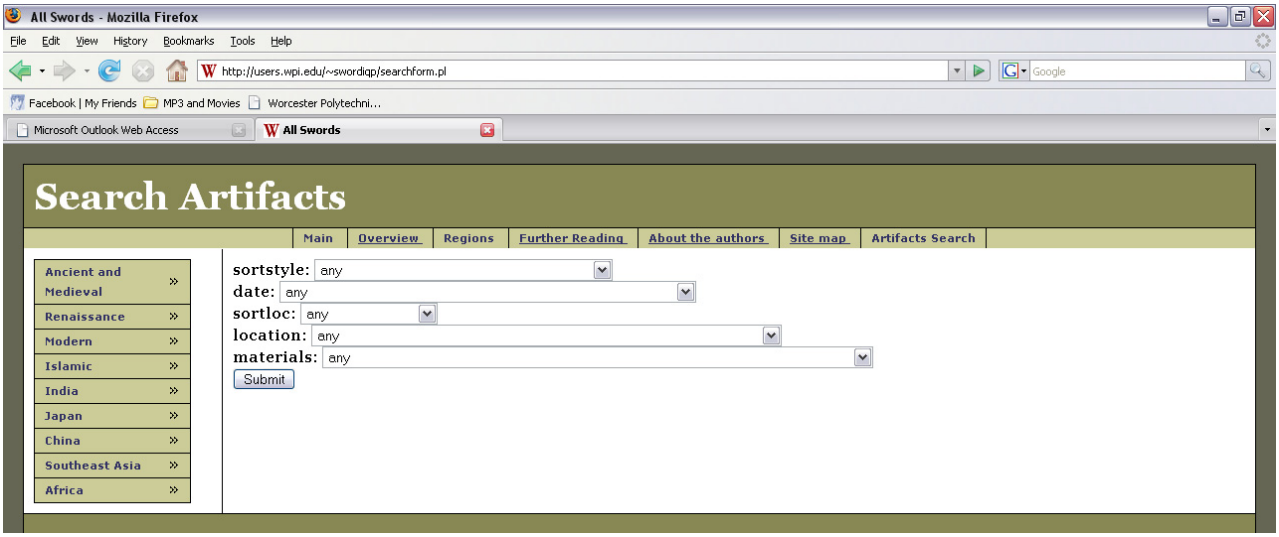
Ancient and Medieval Swords: Single-Handed
Edit
Main Overview Regions Further Reading About the authors Site map Artifacts Search
Ancient and Medieval
Renaissance
Modern
Islamic
India
Japan
China
Southeast Asia
Africa
Ancient and Medieval Europe
Grip-Tongue
Single-Handed
Hand-and-a-Half
Ancient and Medieval swords in the Higgins Armory
HAM 238.98 and HAM 2036.1
There were many different kinds of single-handed medieval swords. Most of them took on a cruciform shape, having a straight blade and cross guard that made a cross shape. These swords were made all over Europe for various purposes. The swords described here are some of the first designs that mark the transition from the Viking style of swords to the medieval style.
The medieval
HAM 238.98, 950-1050 C.E., probably from northern Europe. This artifact has an overall length of 79.8 cm and weighs 1lb 6 oz.
single-handed sword was first being developed when the bladesmiths in Europe were still using the pattern-welding technique. This way even though the blade smiths did not have access to enough high-quality metals, they could still produce high-quality swords. After 1050 C.E. new mines were opened in Europe and the bladesmiths of Europe finally had enough access to high-quality metal that they could just work the metal available, and they did not have to worry about correctly mixing and matching different quality metals.
Typical medieval single-handed swords had a flat broad blade around 76.2 ? 88.9 cm (30 - 35 inches) in length and weigh about 2 ? 3 lbs. The blades often included a fuller, a groove that ran down the middle of the blade and served to lighten the weapon. These swords had short grips to be used by one hand. The cross guard was narrow and longer than on swords previously found in Europe. The pommel was often a Brazil-nut's shaped, but could also be a disc.
By the time of this swords usage in Europe Christian had already begun to spread so these swords can often be found with Christian inscriptions, pagan symbols on the blade would indicate that the sword was made during an earlier time. Inscriptions on swords added nothing for its combat value so they are purely for the owner and the craftsmen. As such they will only have information or designs that are important to them. The weapons that they used would reflect their beliefs and what was important to them, which was now Christianity. There is some variety of blade designs for this basic sword but most are the same. Some have very sharp points while others are blunt. Overall the most common blade tip is to have a subtle rounded point, which is not very suited for thrusting. While this is a medieval weapon, plate armor would not be developed in Europe until the late thirteenth century, so a piercing weapon that could get through armor was not needed. The most common usage of the sword would be as a slashing weapon, which would require a more rounded blade as opposed to a sharp pointed shape.
Done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All Swords
Search Artifacts
Main Overview Regions Further Reading About the authors Site map Artifacts Search
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Renaissance
Modern
Islamic
India
Japan
China
Southeast Asia
Africa
sortstyle: any
date: any
sortloc: any
location: any
materials: any
Submit

Appendix D – Technical Documentation of Website

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********************************************************************************

  README file for setup of database, website, etc.

  In order to set up the website, the following must be accomplished:

  Permissions must be set. From the base directory of the website, this can
be
        done using the following commands:
  chmod 755 *.pl
  chmod 644 *.html
  chmod 644 *.menu
  chmod 644 ./images/*.jpg
  chmod 744 ./images/*.pl
  chmod 644 ./graphics/*
  chmod 644 ./css/*.css
  chmod 755 ./css/*.js
  chmod 644 ./css/*.gif

  The database must be loaded into your preffered database program. The
following
        directions are given for mysql, alter to suit.

  less mysqldump | mysql -hSERVER -uUSERNAME -pDATABASEPASSWORD DATABASENAME

  If this doesn't work, look at the documentation for mysql.

  After the database is loaded, you must edit config.pl to hold the right
values
        for your database, including password, username, server, and
databasename.


  **Perl files not running?**
  If the perl files (.pl) do not run on the server, try typing

  dos2unix *.pl

  at the command line on the unix server. This should convert the files
  from windows format to unix, and the server should then be able to run
  them.


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  README file for for folder ~/images

  This folder is meant to contain images of artifacts in the Higgins
collection.
  The filename syntax is anum-##.extension.

  Examples:
  No#.88.jpg
  no#.63.jpg
     976.JPG
    2184.PNG

  All of these examples are functional.

  Explanation:
  The reason that the filename must be of this format is this: the website
  contains several perl scripts that search through the images for those that
  relate to a given anum, and then those images are displayed on the website.
  If an image is not of the expected form, the script can't find it and the
  image will not be displayed on the relevant web page.

  Notes: If you wish to upload images that are not of artifacts, the proper
  place for them is the ~/graphics folder.

  Scripts:
  There are a couple of bash scripts in this folder. They are "thumb" and
"resize"
  To run either of these, type ./thumb or ./resize at the command prompt.

  What they do:
  thumb: Thumb makes a thumbnail of all the .jpg or .JPG files in the
~/images
  directory and places them in the ~/images/thumbnails directory. These
thumbnails
  are of size 200x200 pixels max.

  resize: Resize resizes all the files in the ~/images directory to a maximum
size
  of 600x600 pixels.


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  README file for for folder ~/graphics

  This folder is meant to contain images of that don't belong in the images
folder.

  This includes the masthead images and other decorative elements, as well as
  images used in the articles.

  Masthead images must named in the form "mastheadLOCATION.png", where
location is
  the "sortloc" of the region.

  Example sortlocs are:
  Europe, Ancient
  Europe 1500-1800
  Modern
  Africa
  Islam
  Japan

  These are case sensitive.

*******************************************************************************
```

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Appendix E – Project Proposal (Group)

1. Introduction

The Higgins Armory museum of Worcester, Massachusetts contains one of the best collections of weapons and armor in the United States. The museum has artifacts from all over the world going back to some of mans earliest attempts of constructing the tools of hunting and war. For this project we will be researching the history of the sword. Our group will focus our studies toward Europe, Africa, and Asia covering from the ancient world to the modern era. Our project will focus on researching how different people in different time periods made swords, designed them, and used them.

The dictionary defines a sword as being a weapon with a long metal blade and a hilt with a hand guard, used for thrusting or striking and now typically worn as part of ceremonial dress. From this we can see that the technical definition of a sword leaves a lot of room for flexibility. This is necessary since swords have taken on so many different designs through the ages. From the earliest weapons of bronze, to the most ornate and extravagant decorative pieces, swords have seen many different shapes and have had to fulfill more than just the needs of combat.

The Higgins Armory has eight different swords that date from the 14th century B.C.E. to the 6th century B.C.E. These swords come from many parts of Europe, but they all share two attributes in common. They are all made of bronze and are all designed like the type of sword used in Greece. During this period in history Greece was one of the most advanced areas in terms of politics, technology, and society. The swords from the Higgins collection show some of the impact Greece had across Europe. After the time of the Greeks the Romans came to be the greatest power of the European world. Just as other cultures the Romans also took many things

from the Greeks. However the Romans also began to improve upon the technologies themselves such as making swords out of steel.

The Higgins Armory has a collection of twenty-eight swords from different parts of Europe from the 4th century C.E. to the 15th century, commonly known as the Middle Ages. All of these swords are made from steel and iron that was developed by the Romans. However unlike the swords from before the Common Era, the Higgins collection shows that now many different types of swords began to appear across Europe. The Higgins collection from this time period includes multiple examples of blades of seax or sax swords (or long knife), the double-edged single-handed sword, the hand-and-a-half sword, and others. Whereas the sword was just a weapon before the Common Era, it now took on more symbolism and meaning to the people of Europe. Most of these swords have a longer shape with a hilt guard that makes the sword a cross shape, the same symbol as the Christian religion that the Romans helped to spread across Europe. The Higgins Armory also has an example of a bearing sword from between the 15th and 16th century; this type of sword was used for ceremonial purposes and not fighting. This new trend of importance in swords continues to develop into the Renaissance.

The Higgins Armory Museum has a collection of 123 swords from the early modern era, 1500-1800. The two most common swords from the Higgins Armory Museum are the rapier (18 swords), and the smallsword (20 swords). These swords were primarily constructed for civilian purposes and were used all across Europe. Rapiers of the early 1500s ranged from 0.9 meters to 1.3 meters and they weighed an average of 2.8 pounds. As the needs of the civilians changed, so did the swords. Rapiers became shorter and lighter and the cup-hilt became more popular.

The rapier was eventually replaced by the smallsword, which was much lighter and shorter than its predecessor. Smallswords were generally around 0.78 meters in length and they weighed an average of 1.1 pounds. The blade of a smallsword was either of a triangular cross-section or diamond cross-section.

In addition to the rapier and smallsword, the Museum also has seven hunting hangers and eight broadswords. Hunting hangers were used for hunting to kill the game once it had been wounded. The broadswords used in Early Modern Europe were derived from the medieval styles and refer to contemporary European straight double-edged swords, typically made with basket "hilts". As with the rapier and smallsword, the hunting hanger and broadsword were created to fulfill the needs of the early modern people and their shape, weight, and length changes throughout the time period to meet their purposes.

By 1800, advances in ranged combat and shifts in tactics had lessened the effectiveness of swords in the hands of infantry. However, cavalry wielding backswords, sabers, and other slashing swords were still considered useful against the slow-loading firearms of the 19th century. The Higgins Armory collection contains many sabers as well as various reproduction, ceremonial, and hunting swords from this period. In the 20th century, swords and other long-blade weapons have all but been abandoned in favor of firearms and concealable small-bladed weapons. Nevertheless, the processes and materials used in weapon-smithing, and consequently sword-smithing, are still being updated, especially in the area of carbon-steel alloys. As well, new ceremonial and reproduction blades are still being crafted by smiths. Despite the shifts in society, warfare, and technology, swords continue to be studied as weapons, as tools, and as symbols of honor.

The Higgins Armory has about a dozen swords from the Islamic regions, ranging in date from the 1500s through the 1800s, predominantly the 1800s. In these regions, the sword developed to fulfill both a functional and a symbolic capacity. The region shows a variety of sword types, from straight-edged blades similar to those of Europe to the curved swords for which it is known. One form of blade distinct to the Islamic region is the split-bladed curved sword, which is symbolic of the sword of Muhammad.

There are approximately three dozen swords from India and the neighboring regions in the Higgins Armory. These swords range in date from the 1600s to the early 1900s. Indian swords exhibit some unique features. Some, called *pata*, are a combination of blade and gauntlet. Others are broader at the tip than at the base, lending them an axe-like appearance. As regions of India adopted Islamic culture, the Islamic sword style melded with the local style, so that the Islamic split-bladed sword is also found here.

About twenty swords from Sub-saharan Africa are in the Higgins Armory. They range in date from the 1800s to the 1900s. African swords exhibit a wider variety of forms than Islamic and Indian swords. Their shapes range from straight-bladed, almost European styles to several-bladed items. The materials used in the swords are also more varied: iron is commonly used, in addition to steel.

China was the region where the first Asian civilization arose. This is why it had so much influence on other countries, just as Japan. China, for many centuries was more advanced than other societies. This is why China was creating swords very early, and was the first area in Asia to do so. There are 13 swords in the Higgins Armory from China, with the oldest one dating back to 1123 BCE.

Japan was closely tied to China in the beginning of its history, but through time has gone in and out of isolationist periods. It was during their isolation that the Japanese created a sword that was unlike anything else made in the world. The idea of the samurai with his katana is one the most people think of when they think of Japanese weapons. The Higgins Armory has 9 swords and fragments from Japan, almost half of which are katanas.

The Malay Archipelago is the primary region represented in the Higgins collection for Southeast Asia. Malaya, which is made up of modern day Malaysia, Indonesia, Borneo, and somewhat the Philippines, was highly connected through trade and a similar seafaring lifestyle. Although each culture differed slightly, there are still strong similarities in their styles of swords, the Philippines being the most distinct. The area was invaded by many other countries, including Spain, Britain, Japan, China, and the French. Higgins Armory has only a small collection of swords from the region. There are 2 (possibly 3) from Malaya, 3 (possibly 4) from the Philippines, and 1 from Borneo.

For our final project, which will help to educate and assist the greater public, we have chosen three different ways to demonstrate information. In order to make the online bibliography of the books available at the Higgins Armory library more practical we will reorganize the listings. By sorting the books by topic, language, and possibly even adding a keyword search feature, the file will become much more useful and it will be much easier to find the necessary research materials.

In order to improve the Higgins armory web site, our group thought it would be beneficial to expand upon the descriptions and photographs of the different swords. By creating separate pages for specific swords with more information about the characteristics of the particular swords we believe the information would become more easily accessible to the public.

We plan to focus most of our efforts for the final project into creating interactive touring displays for the swords exhibit that will be at WPI next year and touring the country in the years to come. By utilizing photography as well as other methods for visually displaying information we think that it will be worthwhile to make an exhibit that is more engaging than reading a description of each sword. People will be generally more interested in an interactive display and they will retain the information much better if they are genuinely engrossed in the exhibit.

2. Project Timeline

Term 1

Each week, each team member will submit a research subdocument on the assigned topic, along with any revisions required from previous weeks. The topics for each week will be as follows.

Ancient and Medieval Europe

Week 1: Background of ancient Greece and Rome.

Week 2: Sword type and construction used during the ancient period.

Week 3: Background of Medieval Europe.

Week 4: Types of swords used in Medieval Europe from the start of the Common Era to the 1300's including the seax, sax, double edged single-handed sword, and the Oakeshott's type XA and XI.

Week 5: Types of swords used in Medieval Europe from the 1300's to 1500 including the hand-and-a-half, broadsword, Lang Messer, bearing sword, short sword, two handed, and Katzbalge.

Week 6: Manufacture and construction of the medieval sword.

Week 7: Placing all documentation into an updated draft.

Early Modern Europe 1500-1800

Week 1: Background of early modern Europe 1500-1800

Week 2: Military

Week 3: The rapier

Week 4: Smallsword

Week 5: Miscellaneous swords not covered in Weeks 2-4

Week 6: Manufacturing

Week 7: Glossary and illustrations; pull together all documents into a complete updated draft.

Modern America and Europe 1800-Current

Week 1: History of America and Europe post-1800

Week 2: 19th Century Military History.

Week 3: Cavalry arms 1800-present

Week 4: Infantry-use and other functional swords.

Week 5: Ceremonial, dress, and hunting swords

Week 6: Materials and production, and reproduction swords

Week 7: Glossary and illustrations; pull together all documents into a complete updated draft.

China, Japan, and Southeast Asia

Week 1: History of China

Week 2: Chinese swords

Week 3: History of Japan

Week 4: Japanese swords

Week 5: History of Southeast Asia (Malay Archipelago and the Philippines)

Week 6: Swords from Southeast Asia (Malay Archipelago and the Philippines)

Week 7: Glossary and illustrations; pull together all documents into a complete updated draft.

Islam, India, and Africa

Week 1: General information about the Islamic Middle East (including Turkey and Persia)

Week 2: Islamic Swords

Week 3: General information about South Asia

Week 4: South Asian swords

Week 5: General information about Sub-Saharan Africa

Week 6: African swords

Week 7: Glossary and illustrations; pull together all documents into a complete updated draft.

As a group:

Week 5: Discuss our final product

Week 6: Decide on final product

Week 7: Update proposal

Term 2

The third term will be dedicated to finish research and writing from the second term. It is also important to have copyright permission notes sent out by the end of the term.
Primarily, this term will be given to artifact study and photo documentation.

Week 1:

- Orientation of proper handling and care of artifacts
- Discuss final project and components/layout of program

Week 2:

- Examining ancient and medieval swords (Brett).
- Brett will be researching artifacts HAM 238.10 and HAM 238.41.
- Jess will be researching Chinese bronze swords such as artifacts HAM 238.9, HAM 2327, and HAM 2326.
- Meghan will be researching
- Stacy will be researching
- Chris will be researching infantry swords such as artifacts HAM 1978.03.1.a and HAM 3574.a.

Week 3:

- Examining early modern European swords (Meghan).
- Brett will be researching artifacts HAM 220, HAM 238.97, HAM 238.95.
- Jess will be researching the Chinese Jian and Shuangjian such as artifacts HAM NO#.292, HAM 3277.a, and HAM 2111.a.
- Meghan will be researching
- Stacy will be researching

- Chris will be researching cavalry swords such as artifacts HAM 1852.a, HAM 3576.a, and HAM 315.

Week 4:

- Examining modern European and American swords (Chris).
- Brett will be researching artifacts HAM 238.98 and HAM 2036.1.
- Jess will be researching Chinese Hudiedao and Peidao such as artifacts HAM 3514 and HAM 2078.a.
- Meghan will be researching
- Stacy will be researching
- Chris will be researching naval swords such as artifacts HAM 2073.1 and HAM 3564.

Week 5:

- Examining Islamic, Indian, and African swords (Stacy).
- Brett will be researching artifacts HAM 2428 and HAM 1996.4.
- Jess will be researching Chinese Duandao and Dadao such as artifacts HAM 2074.a and HAM 2076.
- Meghan will be researching
- Stacy will be researching
- Chris will be researching dress swords such as artifacts HAM 3598.a, HAM 3459.a, and HAM 3560.a.

Week 6:

- Examining Chinese, Japanese, and Southeast Asian swords (Jess).
- Brett will be researching artifacts HAM 3133, HAM 3262 and HAM 1901.
- Jess will be researching the Japanese Katana, Wakizashi, and Kai-gunto such as HAM 1983.03.1.a, HAM 303.a, HAM 1860, HAM 2290.1, HAM 3778, and HAM 1982.03.
- Meghan will be researching
- Stacy will be researching
- Chris will be researching ceremonial swords such as artifacts HAM 2006.02.a, HAM 2006.02.b, and HAM 2248.

Week 7:

- Brett will be researching HAM 2964.2, HAM 3130, and HAM No#.75.
- Jess will be researching the Kampilan of Malaya, and from the Philippines the Talibon and Panabas such as artifacts HAM 2410, HAM 3143.12, HAM 2747.1.
- Meghan will be researching
- Stacy will be researching
- Chris will be researching reproduction swords such as artifacts HAM 1 and HAM 401.
- Return all loaned material
- Documentation of finalized architecture of final product with sample components
- Each team member to hand in a portfolio of materials submitted during the term.
- Team to submit all artifact documentation materials generated during the term
- Design and samples of final product

Term 3

This term will be spent pulling together the final product and report.

Week 1:

- Team to review all components and generate list of tasks remaining to be done.

Week 2:

- Team to submit drafts of introduction and final product.
- Bring draft to writing center for critiquing

Week 3:

- Team to submit drafts of introduction and final product.

Week 4:

- Team to submit drafts of introduction and final product.

Week 5:

- Complete draft of the IQP product and report

Week 6:

- Complete draft of the IQP product and report in electronic form (CD-rom)

Week 7: Due at the final meeting

- Final draft of general documents on the project subject
- One CDR form from each group member with personal information filled in
- 3 bound hard copies of the project report for the whole team (1 in color).
- 2 cd-roms containing an electronic version of the project report (MS Word and pdf versions), project proposal (MS Word only), and any electronic material created by the team (e.g. photographs, website).
- Portfolio of materials submitted during the term.
- Documentation of all permission letters sent and received.
- All loaned material.

3. Final Project Ideas

- Interactive map
- Mouse over timeline
- Audio clips about regions explaining the different swords
- Better front end for bibliography in excel
- Online database
- Virtual exhibition
- Presentation at Higgins Armory for the general public
- Writing a script for future presentations about swords
- Behind the scenes movie about Higgins and swords
- Interactive flash about sword shapes
- Matching game => which sword belongs to which region
- Photographs and descriptions to accompany touring exhibit
- Pamphlets for Higgins Armory with photographs and brief descriptions
- Update the card catalog in the Higgins Armory library

Appendix F – About the Authors

Chris Bass:

Chris is a junior at Worcester Polytechnic Institute, where he is studying computer science and psychology. He comes from Virginia Beach, Virginia, where he never actually bothered going to the beach, opting instead for a life of reading, gaming, and biking. In his free time he participates in ballroom dancing as well as playing video games. His favorite parts of the project were having open access to the Higgins library and being able to sit and talk about various swords in the collection.

Jessica Copp:

Jessica is originally from Berwick, Maine where there is more wildlife than people. She is currently a junior at Worcester Polytechnic Institute, where she plans to receive her bachelors of science in actuarial mathematics in 2008. She also plans to continue for a fifth year at WPI to get her masters degree in financial mathematics. Jessica really enjoyed getting hands on experience with the artifacts and analyzing them. In her free time she enjoys working/volunteering at a local daycare because sometimes it's relaxing to just go play with your friends.

Stacy Haponik:

Stacy is currently a senior at Worcester Polytechnic Institute. She plans to graduate in 2007 with a bachelors of science in mechanical engineering and a minor in computer science. She's not sure where she lives anymore, but claims to be from Possum Trot, Kentucky. Her hobbies include playing board games, reading science fiction, and hanging out with her friends.

Meghan Labounty:

Meghan is currently a junior at Worcester Polytechnic Institute and she will be graduating in 2008 with her bachelors of science in physics. She is from Amherst, New Hampshire and lives there with her mom, younger brother and her golden retriever Ginger. In her free time she enjoys reading and long walks on the beach. She really enjoyed this project and is glad she didn't accidentally break anything during it. She someday hopes to go to graduate school to concentrate in astrophysics.

Brett Levasseur:

Brett is from New Bedford, Massachusetts and is currently a junior at the Worcester Polytechnic Institute. He will be graduating in 2008 with a bachelors of science in computer science. Brett enjoyed the experience of examining the artifacts and working in a field outside of his major. Brett was also happy that his knowledge of computer science was a help to the project with his work on the bibliography.

From left to right: Chris, Meghan, Jessica, Stacy, Brett