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The Age of Armor

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<u>The Age of Armor</u>

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by

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Abstract

The project group created a twelve-minute videodocumentary about the evolution of armor from Ancient Greece through the Medieval period to the Renaissance with respect to society, technology and warfare. The videodocumentary is based on historical research, compiled by the group in a substantial report. The documentary, to be displayed at the Higgins Armory Museum in Worcester, MA, incorporates images of the museum's artifacts, historical and modern artwork, footage of armored re-enactors, and an original script and musical score.

Table of Contents

Introduction

The goal of this project was to create a documentary for public view at the Higgins Armory Museum. The Higgins Armory Museum, located in Worcester, MA, is "the only museum in the Western Hemisphere entirely devoted to the study and display of arms and armor". This museum features over 4,000 artifacts ranging from ancient times up to and including the Renaissance. Higgins displays many of its artifacts, and the museum also presents re-enactors and video documentaries made specifically for the museum. Our documentary discusses the changes in European armor from Ancient Greece through the Renaissance. The focus of this 12 minute documentary is the interconnectedness of society, war, technology, and armor. The documentary is to be used as an introduction to the collections at the museum, giving visitors a basic understanding of what they will be seeing as they explore the museum. All the historical information within the documentary is presented at a level understandable by a broad audience. The documentary can also be used in advertising material to promote the museum.

The main sections of our research, and of our documentary, were three different periods: Ancient, Medieval, and Renaissance. The Ancient period consists of Ancient Greece and Rome. Greece's styles for weapons and armor slowly changed over time, as the Greeks tended to hold onto weapons, armor, and combat styles that were effective, inexpensive to the government, and easy for the armies to learn. Until ca. 700 BCE, due to lack of metallurgical and technological advancement in arms and armor, the styles of combat and armorsmithing did not drastically change. The discovery of iron allowed for sturdier weapons at this time, but smelting technology was still too primitive to consistently remove impurities to forge suitable iron armor. Also around 700 BCE, Rome's formation began. Romans used many of the same styles of armor and combat that the Greeks did, and after centuries of successful military expeditions, they acquired a sizable control over the Mediterranean Sea. Using this new power, the Romans were able to create larger militaries, produce more and better arms and armor, and introduce new combat strategies that utilized both the large militaries and better arms and armor.

At the beginning of the medieval period, approximately 500 CE, European armor consisted of a debased form of Roman helmet and a chain mail shirt. Around 1200 CE, chain mail began to be supplemented by plate armor on the shins, knees, and elbows. Many factors likely contributed to this development. The crossbow, which was capable of piercing mail, was an increasingly powerful weapon. Improved infantry tactics were challenging the supremacy of knights on the battlefield. In addition, by 1300, thriving towns and commerce allowed for specialized craftsmen, improved metalworking, and greater production of steel and iron items. By 1400, the full suit of articulated armor was developed, though mail was still used to protect the armpits, backs of the elbows, knees, and groin, which were difficult to accommodate with

plate. By 1500 CE the full suit of body-encasing plate armor had developed and the image of the knight in shining armor was complete.

During the Renaissance period (~1500CE – 1700CE) war was viewed as any other topic: one that could be analyzed, quantified, and reduced to formulae. Warfare, army organization and size, and tactics all changed dramatically during this period. At the same time the introduction of gunpowder altered the battlefield again, making traditional fortifications and armor obsolete in many cases. These powerful new weapons and formations combined to bring about the end of the image of the singular Knight in combat, replacing it with a large hierarchy of organized rank and file soldiers and officers. Armor initially changed to accommodate the new weapons by becoming thicker, but eventually proved too costly, cumbersome, and ineffective and was discarded by the eighteenth century.

As a group, we successfully created a prototype documentary. Also, we collectively formed a substantial research paper, focusing on specific topics: history and culture, society and technology, warfare and combat, and weapons and armor. From this research paper, the group formed a script to be used in the video documentary. Furthermore, the group filmed two groups of re-enactors at a park nearby Higgins Armory Museum. Inside the museum, we captured stills and video footage of various artifacts. Also, we selected and recorded a narrator reading our script. In addition, we conducted and filmed an interview with the curator of the museum. Finally, we composed an original score of music for the documentary.

The documentary discusses various influences on the design of armor, such as the effect of civilian clothing on the styles of armor and the variations in armor designed to cope with the various concerns of the armor's wearer: infantry armor versus cavalry armor, for example. A timeline is laid out for the use of the crossbow and firearms on battlefields and their effects on

the development and decline of armor. The metallurgical and technological challenges of armor making are also explained.

The study of the progression of armor gives us the story of the evolution of a culture. Ancient Greek armor, such as the hoplite's shield and helmet, shaped the style of warfare, influencing even the Roman Empire. Plate armor marked the advancement of medieval society to the point at which the flourishing of medieval towns, improvements in metalworking technology, and the specialization of labor allowed for its development. The full harness of the medieval knight was a symbol of his place in chivalric society. The decline of armor and the symbolic knight, due to the widespread use of firearms and new tactics introduced in the Renaissance, completely changed the face of warfare for centuries to come.

The Ancient World

Introduction

> At last the armies met, with a clash of bucklers, spears and bronze-clad fighting men. The bosses of their shields collided and a great roar went up. The screams of the dying were mingled with the vaunts of their destroyers, and the earth ran with blood. (The Iliad, 4.446-456)

The history of humanity is filled with bloodshed, warfare, and honor. Throughout the ages, weapons, armor, and even warfare have evolved in astounding ways to suit society's needs. Many reasons exist for all the changes in these tools. Armor evolved through the need for protection. Weapons evolved to break through this protection. Warfare evolved with society, as society itself was evolving. No societies other than Ancient Greece and Rome can better show us how the Age of Armor began in Europe. These two societies were the beginning of the great cultures of the west. Greece's epic poems tell us of the glory of battle and the arms and armor of the time, and ancient artifacts and texts grant us the knowledge about how Greek warfare had changed and how some aspects of war remained the same, even until the Roman times. The Romans connect the ancient times to the medieval times and even to the Renaissance.

History and Society
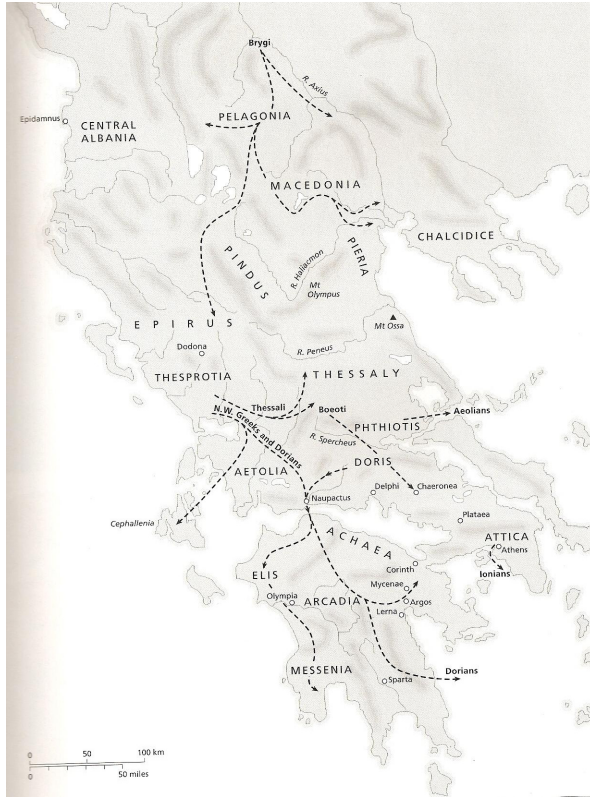
(*Migration map of Greece,* Cartledge, 45)

Originally, the Greeks, before the third millennium BCE, came from various parts of the Mediterranean Sea, such as western Turkey, Cyprus, and Phoenicia (Cartledge, 40-41). These peoples were highly influenced by Egyptians; they often traded goods, produce, and artifacts with them. Through this connection with Egyptians, the Greeks emulated some artistic styles, and even their pantheon may have been influenced by the Egyptians' polytheistic views (Cartledge, 48-49). In the second millennium BCE, the Greeks adopted a written language now referred to as Linear B (Cartledge, 37). Also around this time, in the seventeenth and sixteenth centuries, the Mycenaean kingdoms rose. It is thought that three or four hundred years later would have been the times of Homer's Trojan War. (Cartledge, 56)

By the 1200s, some event occurred that caused Greek society, economy, and politics to collapse. They lost their written language, and their population dwindled to very small numbers (Cartledge, 56-57).

This "Dark Age" lasted for a few hundred years, ending around the eighth century BCE. The people of Greece then began to form the idea of the city-state, or polis. These city-states were originally aristocracies and served to unify sections of Greece (Cartledge, 60). Around the seventh century BCE, hoplite warfare had been introduced and integrated into society in Greece. Hoplites were the heavy infantry of the Greek armies, and they consisted of any men that could afford the specific hoplite armor. (Sage, 25-27) Many of the city-states' aristocracies at this time were overthrown by tyrants, who used the hoplites to support and enforce their reign (Cartledge, 61). Tyranny was slowly overthrown over the next two centuries, and democracy was formed from its ashes (Cartledge, 145-146).
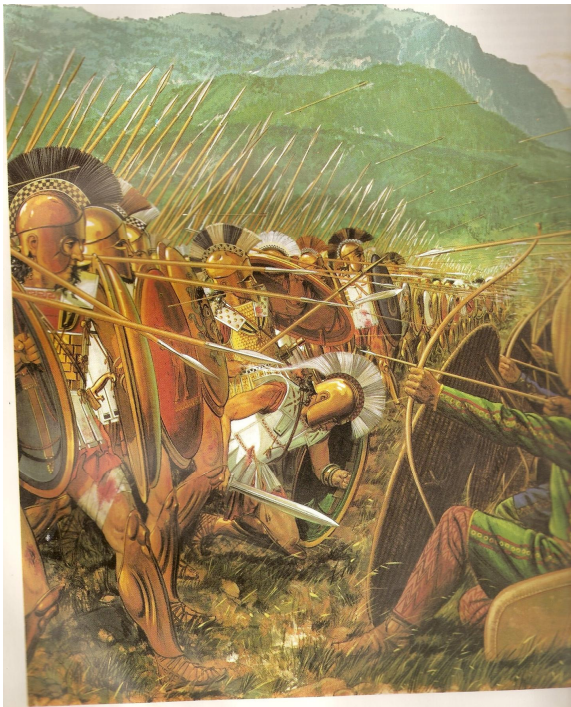
(*Battle of Thermopylae*, Connolly, 22)

By this time, the Greeks began to pay attention to a new threat: the Persian Empire. At the beginning of the fifth century BCE, Darius I, the Persian emperor, landed an army at Marathon in Greece in attempt to strike at Athens in 490 BCE. (Cartledge 64) The Athenians decided to try to obtain Spartan aid by sending a runner. The Spartans, in the middle of a festival, did not respond with their army until it was too late. When they arrived at Marathon, Athens had managed to defeat the Persians. (Connolly, 12) In 490 BCE, the Persians, led by their Emperor Darius I, were defeated, and his son, Xerxes, took over

command after Darius I passed away. (Cartledge, 64-65) By 480 BCE, Xerxes had gathered enough troops and resources to lead an invasion into Greece at the pass of Thermopylae. There, the Spartan King Leonidas, along with his 300 Spartan soldiers, resisted the 100,000 troops that Xerxes had brought. Soon after the Spartans' defeat, Xerxes led his troops to take over Attica, followed by Athens itself. (Cartledge 172-173)

Xerxes fought a naval battle at Salamis against Athens in 480 BCE. The trireme navy of Athens was the largest in all of Greece, and was easily able to defeat Xerxes's naval attack. After the Persians' defeat, Athens and the rest of Greece formed a naval alliance called the Delian League. Athens also made peace with Persia in order to focus their resources against Sparta. The conflicts between Athens and Sparta, called the Peloponnesian War, involved Spartan colonies in southern Italy as well as the Peloponnesian peninsula. Sparta managed to defeat the Athenian fleet in 404 BCE by creating a blockade and causing Athenians to starve, since they were no longer able to obtain resources outside their city. After this war, the Spartans took over Athens and ruled it with such a bloody fist that the Spartans decided to back out and allow Athens to reinstate its democracy. (Cartledge 64-67)

Culture

The Greeks believed in a pantheon of twelve gods and goddesses, each one representing different characteristics of humanity and the Greek way of life. Religion heavily influenced Greek society and

culture; there were specific rituals for birth, death, marriage, seasons, and even daily life. Even law and war were incorporated into religion; for example, the jurors of Athens needed to swear upon the gods' wrath to not lie (Cartledge, 321-324). One specific ceremony that still affects our world are the Olympic Games. Held in honor of Zeus every four years, the Olympic Games were a time of peace between the city-states of Greece, and all the city-states sent their best athletes to perform a number of events (Cartledge, 225-227). Aside from religion, philosophy and science were a large part of culture. The philosophers of ancient Greece wanted to figure out how and why the world was as it was (Cartledge, 290). Both the philosophers and scientists tended to use "speculative theorizing rather than structured observations and experiments to test and demonstrate their theories" (Cartledge, 291). Today, we still use some of the philosophy and science that the Greeks had developed.

Another interesting part of ancient Greek society and culture was their treatment of women. Women in Greece were able to be citizens of their city-states; however the women were not allowed to be involved politically, like the male citizens. Instead, the citizenship they held was only for them to bear and raise children who are also citizens (Cartledge 100). Young girls would be in choirs with young boys, especially in rituals. Female citizens played important roles in rituals that were connected to the goddesses Demeter and Kore; females involved in rituals were supposed to symbolize fertility as far as both the harvest and for human life (Cartledge 105).

Greek Warfare

The ancient Greeks' styles for warfare changed drastically over time. Early Greeks (pre-10th century), while still under a king, were very focused on the spoils of war. Whenever the armies pillaged another tribe or city, all the loot was brought before the king. Then, the king would take the majority for himself, and divvy up the remaining treasure among the soldiers. (Sage, 5) A passage from *The Iliad*

12

describes an argument between Achilles and Agamemnon, showing this distinct way of dividing up treasure:

> Achilles the great runner gave him [Agamemnon] a black look. 'You shameless schemer,' he cried, 'always aiming at a profitable deal! How can you expect any of the men to give you loyal service when you send them on a raid or into battle? It was no quarrel with the Trojan spearmen that brought *me* here to fight. They have never done *me* any harm. They have never lifted cow or horse of mine, nor ravaged any crop that the deep soil of Phthia grows to feed her men; for the roaring seas and many a dark range of mountains lie between us. The truth is that we joined the expedition to please you; yes, you unconscionable cur, to get satisfaction from the Trojans for Menelaus and yourself – a fact which you utterly ignore. And now comes this threat from you of all people to rob me of my prize, my hard-earned prize, which was a tribute from the ranks. It is not as though I am ever given as much as you when the Achaeans sack some thriving city of the Trojans. The heat and burden of the fighting fall on me, but when it comes to dealing out the loot, it is you that take the lion's share, leaving me to return exhausted from the field with something of my own, however small. So now I shall go back to Phthia. That is the best thing I can do – to sail home in my beaked ships. I see no point in staying here to be insulted while I pile up the wealth and luxuries for you.' (The Iliad, 1.148-170)

At this time, nobles were the main part of an army. Poorer people were usually unable to obtain the battle gear required to join the army, though they were still allowed to participate in combat if they had any equipment. (Sage, 6) Nobles were treated with equality, while the lower social classes were treated rather poorly, as portrayed in Odysseus's words to the Greek soldiers in the following passage:

> When he [Odysseus] came upon anyone of royal birth or high rank, he went up to him and made courteous attempts to restrain him. 'I should not think it right,' he said, 'to threaten you, sir, as I should a common man. But I do beg you to stand fast yourself and to make your followers do the same. (The Iliad, 2.188-203)

Some typical battle styles for the early Greeks involved melee, or hand-to-hand, combat, as well as missile, or ranged, combat. Typical weapons used were spears, swords, bows, and large thrown rocks. Also, soldiers usually were equipped with shields and helmets. (Sage, 11-13) Chariots were also utilized. The Greeks are thought to have obtained their chariot fighting style from the Hittites, which would mean that they had soldiers stand on the cart and use thrusting spears to assail their foes. Chariots were also used for escape strategies; two infantrymen would be on the cart, and one would be near the cart in close

combat, and if tides were not on their side, they would be able to make an easy escape. (Sage, 14-15)

Homer mentioned not only chariots, but fighting style and ideas of bravery of all sides in combat in a

passage from *The Iliad*:

> Thus the Trojans and Achaeans leapt at one another and destroyed. There was no thought of craven flight on either side. The ground by Cebriones bristled with sharp spears and feathered arrows that had leapt from the bowstring; many a huge rock crashed on the shields of those that fought about him; and there he lay, in a whirl of dust, great even in his fall, thinking no more of a charioteer's delights. (The Iliad 16.772-775)

When Greece's dark age occurred, around 1200 BCE, tribes and kingdoms fell apart. There are

few records of any specific battles from this time period. By 1000 BCE, near the mid-end of the dark age,

there was a major change from bronze weapons and armor to iron weapons and armor, starting with

swords, and then spears. Also, missile warfare was beginning to dominate over melee warfare. (Sage, 19-

20)

Hoplite Warfare and Phalanx Formation

(*Hoplites drawn on a plate*, HAM A&A Database)

After the dark ages, around the 8th century, the hoplon was introduced. The Greek hoplite is

named after this new style of shield. Hoplites were heavily armed infantrymen, armed with a hoplon

shield, bronze corselet, bronze Corinthian helmet, and a long thrusting spear, along with a sword. Hoplites were the primary focus of the phalanx military formation, which developed because of the development of the hoplon. The phalanx consisted of hoplites in a very close rectangular formation, several ranks deep. (Sage, 25-27)

[37] (*Phalanx formation*, Connolly 37)

The hoplites, being very resilient, or well-protected, due to their armor, along with their close phalanx formation, made a fairly tough, unmovable, and threatening group of soldiers. The idea for the phalanx formation is mentioned in *The Iliad*, although the idea of the hoplite had not been created, nor the hoplon:

> His words filled every one of them with daring, and the ranks dressed closer when they heard their prince. Their helmets and their bossed shields were as tightly packed as the blocks of stone that a mason fits together when he is building the wall of a high house and wishes to make sure of keeping out the wind. They stood so close together, shield to shield, helmet to helmet, man to man, that when they moved their heads the glittering peaks of their plumed helmets met. (The Iliad, 16.210-218)

There were some problems with hoplite/phalanx warfare. First of all, the heavy bronze corselets, shields, and helms restricted movement and visibility. The shields were an awkward shape and size and were not exceedingly maneuverable, and could basically only be used protect from attacks from the front

15

of the hoplite. Although this shield was designed to fight head on against spear-using enemies, these shields were relatively useless when it came to individual combat. (Hanson, 67) Also, the phalanx formation worked best on wide plains, and the Greek peninsula is a mostly mountainous, rugged region, which would have made it difficult to obtain the wanted effects. However the phalanx formation was still used due to its simplicity and its need for only a small amount of training to the soldiers (Hanson, 173).

Most Greek citizens received little or no military training, except for specific institutions that existed to transition young men into adulthood and full citizenship. The tactics were very simple due to the hoplite phalanx, so this tactic let the Greeks get by without a lot of combat training. The main exception were the Spartans, who lived in a very militarized society. (Sage, 35)
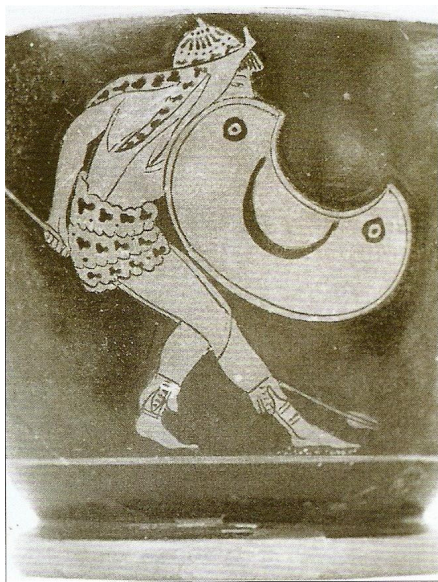
(*Thracian Peltast on a cup, ca. 480 BCE*, Cartledge, 186)

Hoplites were not the only types of warriors in ancient Greece. Lightly armored troops were a major part of warfare. They were used as close and ranged fighters, both mounted and not, and were also used to maneuver quickly and to attack other light armored troops. These troops were ineffective at defeating heavy-armored foes, and these soldiers usually were not involved in any turning points in any battles. (Sage, 40-42) Usually, lightly armored troops were the first lines in battle; they were the first to fight, as well as the first to die. Light-armored infantry were usually mercenaries from various tribes and

villages outside city-states, where the recent advances in weaponry and combat tactics had not yet reached. (Sage, 40-42)

Another breed of somewhat lightly-armored troops was involved in warfare. The peltast, also named after his shield (the pelte), wore only their shield for protection and used long thrusting spears, short javelins, swords, and daggers. These peltasts were placed between the light infantry and the hoplites. (Sage, 40-42) Peltasts were used for mobility, both running in and out of battle. The typical strategy for peltasts was to send them in front of the rest of the troops to throw javelins at the opponents and then run away from the enemy before they realized what hit them. (Connolly, 48) Cavalry was not utilized greatly by the Greeks until around the 6th century BCE, due to summer campaigns which had low supplies of water. Horses, for the most part, were not armored. Cavalry was mostly used to flank or get behind infantry for a rear attack. Also, horses were used for reconnaissance. (Sage, 46-47)

Campaigns

Early Greek war campaigns were short, lasting only during the summer months, and warriors provided their own supplies. Merchants from nearby neutral and friendly cities would travel with campaigns to sell arms, armor, and food at the war camps. (Sage, 55) Before the rise of city-states, kings or chiefs led military expeditions. By the 5th century, Athens, as well as other city-states, began using generals, who were not only the head of military but also the most important political office. This position represented the strong link between society and military in Ancient Greece. (Sage, 60) Sparta, however, kept their hereditary kings as their supreme commanders; however their power was only prominent in times of war. Otherwise, the Spartan assembly governed the state, and the citizens involved were able to vote upon any declaration of war. (Sage, 63)

A concern facing many Greek warriors was payment. These people were taking time out of their lives to fight wars, which were unprofitable for them. Originally, there was no payment system for

warriors; all the weapons the soldiers needed had to be privately bought. In Athens, it was the responsibility of a citizen to go to war for the city-state. By the 5th century BCE, military pay was set up a "food allowance", mainly to provide soldiers with money to buy food during the campaigns. A century later, they still had this "food allowance", but they also acquired a system of pay for both citizens and mercenaries, although it was not as substantial a pay as labor. (Sage, 58)

Another very interesting note about ancient Greek warfare is how their religion was tied into every military action the soldiers took. The Greeks honored their gods with rituals and sacrifices before battle, hoping to receive their wisdom to answer their questions about strategies and outcomes. Sheep and goats were the primary sacrifice, and there was often a herd of sacrificial sheep and goats brought along with a campaign. Also, sacrifices were often performed during their marches and before making camp or razing a village, again to appease the gods, but never more than three sacrifices were performed in a day. (Hanson 197-198)

<u>Greek Weapons</u>

In ancient Greece, weapons evolved over the ages. Before the dark ages of Greece, weapons and armor were forged of bronze or were cast in bronze, including swords, spearheads, and arrowheads (Sage, 7). Around 1000 BCE, well into the dark ages, iron was implemented for weapons, beginning with swords and spearheads (Sage, 19). When iron weaponry began to take hold in ancient Greece, swords were the first to change. There were a number of advantages to iron weaponry over bronze weaponry. First of all, iron was lighter, making the load on soldiers a little easier. Secondly, iron was less flexible than bronze, allowing for better durability and accuracy. Finally, iron edges were easier to maintain and to make. There was a problem with iron, though: iron was more difficult to produce than bronze; iron's high melting point would have been rather difficult, even impossible to reach, given the technology available to the Greeks. Bronze's elements, copper and tin, on the other hand, had a much lower melting point. Due to this fact, spearheads and arrowheads eventually reverted to bronze. Both spearheads and

arrowheads were fairly easy to produce and were often only used in one battle and were then lost. Swords, however, remained as iron, for the sword was expected to be used for the lifetime of its owner. (Snodgrass, 103-104)

The main weapons that the Greeks used throughout the ages were the spear, the sword, the bow, and the sling. Hoplite warfare also introduced new offensive techniques.

The Spear, Pre-Phalanx

(*Greek bronze spearhead, ca. 1050-600 BCE,* HAM 238.39)

The spear was used very frequently in Greek warfare. Spearheads were made of bronze. Before the dark ages, spearheads were tied onto the wooden shaft (the pole of the spear). During the dark ages, however, the tied-on spearheads were replaced by the hollow socket, which would allow the spearhead to be nailed into the shaft, providing more stability and aim for the spear. Spears were primarily thrusting weapons when used as a melee weapon. However, there were also throwing spears or javelins, some of which were able to perform both as a thrusting weapon and as a thrown weapon. (Snodgrass, 115)

The Sword, Pre-Phalanx

(*European bronze sword, ca. 1000-800 BCE; possibly Greek, Roman or Etruscan,* HAM 238.34)

Swords were common on the level of individual combat. Originally, at the beginning of the dark ages, swords were made of bronze, and the edges of the sword were parallel for the majority of the blade; the tip of the blade was smaller, and the base at the hilt tended to be slightly wider (Snodgrass, 93). By 600 BCE, however, swords evolved to become shorter, and the sword width decreased gradually from hilt to point instead of being mostly parallel (Snodgrass, 98).

Aside from swords, there were two other similar bladed weapons: the dagger and the dirk. Daggers in ancient Greece tended to be about a half foot at most in length, and dirks were longer, reaching to about a foot in length. Primarily, both of these weapons had a short reach and allowed only for thrusting. Greek swords, on the other hand, were designed to be used as both a cutting and thrusting weapon and were one to two feet in length, providing the necessary reach and stability to allow both slashing and thrusting. All three of these blades were usually cast from one piece of metal, including part of a hilt. Wood was then bolted to the hilt to allow an easy grip. (Snodgrass, 104)

Ranged Weaponry, Pre-Phalanx

The early Greeks not only used hand-to-hand warfare, but they also used "missile" or ranged warfare, using rocks, spears, and bows (Sage, 11-13). Ranged warfare, however, was not used in individual combat and was often considered weak. Homer represents perspective in *The Iliad*:

> Unperturbed, the mighty Diomedes answered him: 'Bowman and braggart, with your pretty lovelocks and your glad eye for the girls; if you faced me man to man with real weapons, you would find your bow and quiverful a poor defence. (The Iliad 11.384-390)

Around 900 - 700 BCE, missile warfare became more dominant. Soldiers carried multiple spears or javelins, and combat now began with a mass of thrown spears and javelins, followed by close combat with swords. (Sage, 19-21)
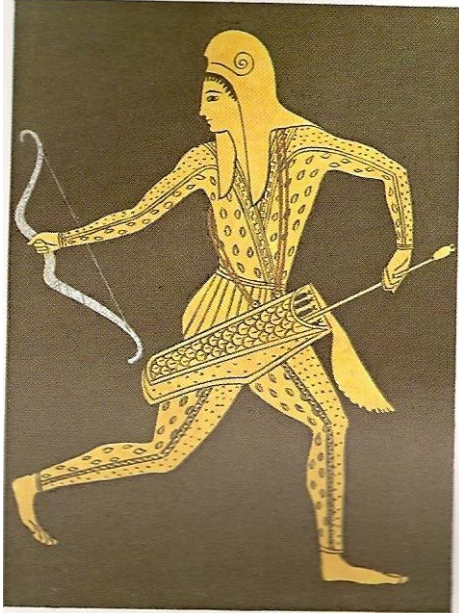
(*Greek archer drawn upon a plate, ca. 4ᵗʰ or 5ᵗʰ century BCE,*

Connolly, 51)

The old Mycenaean bows were made of a single piece of wood, and they were very restricted in power and range. At the time of their use (before the dark ages), they were not effective enough to be commonplace. (Sage, 10) As time went on, into the dark ages, new types of bows emerged: the self-bow, single curve bow, and double curve bow. All three of these bows were depicted throughout Greece's pottery; however, no samples remain, as bows were made of wood. (Snodgrass, 141)

Ammunition for the sling and bow were very varied. Around the beginning of the dark ages, arrowheads were typically rather long with two edges, and they often had barbs at the bottom. After the dark ages, arrowheads had evolved to have two to four edges, and many arrowheads now had hollow sockets, similar to spearheads. There was no single style for the design of arrowheads at any given time; since arrowheads only required a small amount of bronze and were also fairly easy to produce, arrowheads came in all imaginable shapes and sizes and were in large supply. (Snodgrass, 144-149) Sling bullets were made of a variety of materials. For the most part, however, sling bullets tended to be lead, hematite, or other rock. (Snodgrass, 167) Greek archery, however, was somewhat inferior to slings, in that sling bullets were not as much of a hassle to carry as arrows, and also, the range of bows were much more

restricted than the range of slings (Sage, 43-44). Cretians and Rhodians (people from the isles of Crete and Rhodes) were well trained in archery and slings, respectively. (Sage, 40-44) By the fourth century BCE, specialized archers and slingers were being hired from Thrace, Crete, and Rhodes. (Sage, 135-136) Scythians, another breed of people who excelled at archery, were able to strike a target from up to 150 meters away. Slingers from Rhodes, however, were able to outrange the bow by 200 meters. (Connolly, 48-49)

Other Offensive Equipment

Hoplite warfare introduced a new combat tactic: offensive armor. The hoplon, the shield hoplites used, was not just used as a barrier to protect the infantry from spears and arrows. Hoplites used their shields as an offensive object by pushing their opponents. (Hanson, 15) Other than shields, hoplite-phalanx warfare used the spear as the primary weapon. Although spears often shattered when the phalanxes of two opposing armies rushed at each other, spears were very effective when trying to pierce the corselet of another hoplite. The main targets of the spears were the opponent's neck or groin, which were usually unprotected. Unfortunately, the majority of the citizens of Greece were unable to purchase hoplite weapons and armor; hoplite gear was very expensive. (Sage, 30)

Greek Armor

Ancient Greek soldiers wore a variety of types of armor throughout the ages; surprisingly, there were no exceedingly drastic changes. The pattern for armor evolution was similar to the Greek's evolution of warfare: it seems to be that the ancient Greeks adopted certain types of armor that were successful, and they continued to use these armor types for a very long time. Comparing the way soldiers, such as hoplites, dressed for war to the way soldiers in the dark ages of Greece dressed, most of the armor remains similar in style and use. The following passage from *The Iliad* describes the full set of armor from before Homer's time:

> Atreides [Agamemnon] in a loud voice gave his troops the order to prepare for battle, and himself put on his gleaming bronze. He began by tying round his legs a pair of splendid greaves which were fitted with silver clips for the ankles. Next he put on his breast the cuirass that Cinyras had once presented to him as a friendly gift. News had reached Cinyras in a far-off Cyprus of the great Achaean expedition that was sailing for Troy, and he had sent this cuirass as a gracious offering to the King. It was made of parallel strips, ten of dark blue enamel, twelve of gold, and twenty of tin. On either side three snakes rose up in coils towards the opening for the neck. Their iridescent enamel made them look like the rainbow that the Son of Cronos hangs on a cloud as a portent to mankind below. Next, Agamemnon slung his sword from his shoulders. Golden studs glittered on the hilt, but the sheath was of silver, with a golden baldric attached. Then he took up his manly and man-covering shield, a nobly decorated piece, with its ten concentric rings of bronze, and twenty knobs of tin making a white circle round the dark enamel boss. The central figure on it was a grim Gorgon's head with awe-compelling eyes, and on either side of her, Panic and Rout were depicted. It was fitted with a silver baldric, round which a writhing snake of blue enamel twisted the three heads that grew from its single neck. On his head, Agamemnon put his helmet, with its four plates, its double crest and its horsehair plume nodding defiantly above; and finally he picked up a pair of strong and sharp bronze-headed spears. Beams from the bronze he wore flashed into the distant sky, and Athene and Here thundered in answer by way of salutation to the King of Golden Mycenae. (The Iliad, 11.15-46)

Greek infantrymen, throughout most of ancient Greece's time, wore helmets, a two-piece corselet, greaves for leg protection, and a shield.

The Helmet

Before the dark ages of Greece, two types of helmets were prominent: leather or bronze helms with plumes and leather boar-tusk helms. The helmets with plumes were not always a full helmet, and the types of plumes varied greatly. In some depictions, these plumed helmets only covered the top of the head and were mostly used as decoration; the plumes in this case would be a single strand or collection of hairs, most likely from horses. Other plumed helmets were designed to protect, as well as be visually elegant; plumes in this case would either be similar to the aforementioned plumes or would be multiple hairs across the top of the helm. (Snodgrass, 5-8) The other main type of helmet, the boar-tusk helm, was crafted from leather, and boar tusks were layered in rows (Sage, 9). The Greeks most likely chose boar tusks for their helmets as a symbol of honor in the hunt. Homer portrays Odysseus as wearing a boar-tusk helmet in the following passage:

> [Meriones] set a leather helmet on his [Odysseus's] head. Inside it there was a strong lining of interwoven straps, under which a felt cap had been sewn in. The outer rim was cunningly adorned on either side by a row of white and flashing boars' tusks. (The Iliad, 10.261-265)

(*Corinthian Helmet from ca. 550 BCE*, HAM 1134)

During the dark ages, a specific helmet emerged that was kept as a style for hoplite warfare. The Corinthian-style helmet was forged from a single piece of bronze, and this style of helmet is believed to first appear around 700 BCE (Sage, 26). This helmet had a specific identifiable shape related to the fact that it's "ridge-crest lay along the crown" (Snodgrass, 10). This helmet was typically worn by heavy

infantry, including hoplites. Since hoplite warfare did not require a great deal of mobility or peripheral vision, the Corinthian helmet was suitable; the helm's protection was more important than the consequences of weight and restricted vision that the helmet entailed. (Hanson, 67) However, after the 5th century, as part of making lighter, more mobile soldiers, the Greeks adopted a new type of helm called the pilos, which was a bronze conical helmet (Hanson, 64-65).

Body Armor

(*Bell corselet and helmet ca. 720 BCE*, Cartledge, 171)

Ancient Greek body armor did not undergo tremendous changes throughout the ages. The main suit of armor, the bronze corselet, was a two-piece suit, with a breastplate and a back-plate. This type of armor first appeared before the dark ages. (Sage, 26) This corselet was unique in that the shape of the suit of armor was that of a bell; the armor had an inward curve around the waist and a sharp outward curve at the bottom of the suit. The breastplate and back-plate were usually connected to each other by metal pins or rings through a hinge on the armor. This specific design lasted until the 6th century, and afterwards was only slightly modified. (Snodgrass, 73) The major change for this corselet was that the corselet evolved into a "muscled" corselet; the breastplate was designed to be the ideal muscular torso of a soldier. The old style still remained prominent, as these well-crafted and elegant pieces of armor were rather

expensive. However, these new muscular corselets lasted until end of the Roman era, often used by leaders of armies. (Connolly, 54)

Aside from the corselet, the Greeks used cloth armor. The linen cuirass, which was in use since the late Mycenaean period (near the end of the dark ages), was crafted from many layers of linen fabric glued together to make a thick, stiff shirt. This cuirass was designed to allow the wearer mobility by having the fabric cut where movement was necessary. A second layer of linen was added to cover unprotected spots from the first layer. Linen, although a suitable armor, often had metal scales or plates to help reinforce the armor. (Connolly, 59) In the mid 6th century BCE, due to its obvious light weight and flexibility, this linen cuirass replaced the metal bell corselet for the hoplite armor. (Connolly, 54)

(*6th Century BCE bronze greaves,* Connolly, 59)

There were other types of body armor other than the torso armor. Greaves, for example, were commonly used leg guards that first appeared around 675 BCE (Sage, 26). These bronze leg guards protected the bottom section of the leg, including calves and the kneecaps. Similar to the corselet, greaves underwent a change to an elegant, muscular design. (Connolly, 59) Aside from greaves, Greeks had various other body armor, such as vambraces (lower armguards), rerebraces (upper armguards), thigh-guards, shoulder-guards, and foot-guards (Snodgrass, 88). Typically, this additional armor was worn either if the individual desired it or if the specific city-state or tribe required its use (Sage, 26). However, due to the weight of the armor that a typical hoplite or heavy infantryman carried, typically

around 75 pounds (Cartledge 170), most of these extra pieces of armor were abandoned in the late 5th century (Hanson, 64-65).

The Shield

The shield was a type of armor that underwent a great deal of change in ancient Greece. Before the dark ages, shields were usually round and were made with either wood or layers of hide (Snodgrass, 37). Oftentimes, the shields were reinforced at the center, which was where the handgrip was placed. These single-handled round shields were not typically faced with bronze nor forged completely of bronze until the end of the dark ages. (Snodgrass, 51)

There was another type of shield during this time that lasted until the end of the dark ages: the tower shield (Snodgrass, 61). This shield was crafted in two different styles: a rectangular shape and a figure eight shape, called the dipylon. Both types of shields were approximately four feet in height and were held with a strap that was worn over the left shoulder called a telamon. (Sage, 9) Tower shields were typically "made of oxhide stretched over a wooden frame" (Sage, 9). Primarily, tower shields were useful for staying in one place and deflecting missiles; if a soldier moved fast while carrying a tower shield, the shield could be problematic, as is portrayed in *The Iliad*:

> The value of the man [Periphetes] enhanced the glory of his conqueror [Hector]. He had just
> turned to fly when he tripped against the rim of the shield which he carried to keep missiles off
> and which came down to his feet. Thrown off balance, he fell backwards, and as he reached the
> ground his helmet rang loudly on his temples. (The Iliad, 15.644-647)

Phalanx warfare brought a new shield: the hoplon. Hoplites were all equipped with this new technological advancement, which happens to be what made the whole phalanx warfare tactic possible. The hoplon first appeared around 700 BCE, and the Greeks experimented with this new shield for half a century to perfect the phalanx. (Sage, 26-27) The hoplon was three to four feet in diameter. Originally,

this shield was made with a wooden frame; leather was put over the frame, and a ring of bronze was around the circumference. The shield eventually was made either completely of bronze or was constructed of wood with a bronze face. The armband of the hoplon, called the porpax, was a detachable piece of leather. Hoplons had a leather string that went around the inside of the shield; hoplites held onto this "antilabe", which allowed for a stronger grip than a solitary handle. The antilabe also allowed the wielder to hold the shield longer and balance it easier. However, the antilabe did restrict the movement of the shield, disallowing the hoplon the function to protect the right side or back of the body; this issue was not at all problematic for the hoplite, as the hoplon's purpose was to protect from incoming spears, which would be in the right hand of the opponent. (Sage, 26) The hoplon weighed about twenty pounds (Cartledge, 170). Hoplons, as well as other shields, were often decorated with blazons, or marks of heraldry or popular images of the times; however, blazons were more common with hoplons than other types of shields (Snodgrass, 61-63).

Besides the hoplon, during the time of phalanx warfare, other shields were still in use for the lighter-armed troops. The single-handled round shields were still in use. Also, the pelte shield design was introduced for light-armed troops called peltasts. Peltes were constructed with wickerwork, and were therefore much lighter than the hoplon, providing proper maneuverability to the peltasts who wielded the peltes. (Cartledge, 175)

<u>Roman Overview</u>

The Romans, and their empire, were heavily influenced by Greek culture, as well as the other cultures around them. Rome was originally an Italic tribe that had grown to a fairly large size. The Etruscans from the north came to Italy in the seventh century BCE and united the Italic tribes under their rule, with the chief "city" being Rome. Etruscans had control over Rome for two more centuries. During this time, Romans tended to use weapons similar to the Greeks (spears, swords, daggers, and javelins) as well as axes; the Greeks had made colonies around various parts of Italy, and they spread their weapon

and armor technology. Their armor was breastplates, helmets, and round, single-handled shields. In the

sixth century, however, Romans adopted a new shield: the rectangular scutum, which was about three to

four feet in length, made of wood. By the fifth century BCE, the Etruscans lost their control of Rome due

to the Etruscans' conflicts with the Latins in southern Italy. Throughout the next two centuries, the

Romans learned to utilize phalanx warfare like the Greeks (with their own scutum instead of the hoplon)

in their conflicts with the Celtic and Samnite tribes. After defeating these aboriginal tribes, the Romans

attempted to conquer the Greek cities that remained in Italy. However, the Greek leader, Pyrrhus

managed to defeat the Romans the first time, at a cost of many soldiers (a Pyrrhic Victory). The Romans

were then able to take the Greek cities the next year. (Connolly, 87-97)

By the second century BCE, the seeds of the Roman Empire had been planted. In 160 BCE, the

Romans conquered Macedonia. Roman legions at this time consisted of 16,000-20,000 infantry and

1,500-2,500 cavalry. Half the infantry and the majority of the cavalry were Roman allies; the others were

Roman citizens. Each consul, or chief magistrate (of which there are two), would have access to two

legions. Lower class citizens served in the navy; middle class was in the infantry; upper class was in the

cavalry. Infantry used swords, javelins, pila (singular pilum), and spears as offensive equipment. Armor

was typically thick linen cuirasses, similar to the Greek style linen cuirasses. Leaders of the infantry

often wore a muscled bronze or iron two-piece corselet. (Connolly, 129-130) By 146 BCE, Rome

controlled the majority of the Mediterranean due to military successes. Julius Caesar was granted

consulship in 59 BCE. He sent expeditions to Britain and Germany. Caesar also conquered Gaul by 51

BCE. (Connolly, 210-211)

Due to Rome's expansion, the way legions were formed and the armor changed. By 200 CE,

legions only consisted of about 5,500 soldiers. Enlistment into a legion was now only allowed to Roman

citizens. In the eastern parts of the Roman Empire, however, Roman citizenship was spread much

thinner, and non-citizens were allowed to join the legions. (Connolly, 216-217) Infantry still used linen

cuirasses, but some soldiers used the *lorica segmentata*, which was a suit of layered metal flaps held

together by metal hooks and leather straps. Helmets now were being forged of iron, although bronze helmets were also still in use. (Connolly, 230) The cavalrymen at this time wore armor similar to the infantrymen. Their helmets, however, only left the eyes, nose, and mouth visible. They used horseshoes, saddles, and spurs on the horses. (Connolly, 235-236) By the third century CE, Roman troops had become weaker due to less military training, and often only used scaled mail shirts or chain mail, which is a shirt of interwoven rings of metal (Connolly, 258-259). In 337 CE, the Roman emperor Constantine split the army into two different types of troops: frontier troops and mobile forces. The frontier troops fortified locations at frontier zones. The mobile forces moved wherever they were needed. (Connolly, 253-254) Near the end of the empire, around the fifth century CE, Romans were relying too heavily on outside aid, and an army composed mostly of outsiders was able to overthrow the western part of the empire. The eastern part of the empire remained intact, as that part of the empire was economically stronger and was mostly immune to the quarrels from Europe as most of the eastern empire was in Asia Minor and northern Africa. (Connolly, 258)

<div align="center">Conclusion</div>

The fall of Rome caused unity to shatter across the western world, leading to the Dark Ages, or the Medieval Ages. Most of the technology and warfare tactics from Greece and Rome were lost. However, ideas from the past do rise again as the Age of Armor continues its course. The Medieval period continues using the same types of armor and weapons for a time, such as the sword, chain mail, the lorica, and iron and bronze helmets. The Renaissance brings back the Roman-style legions, as the thinkers of those days researched the past to improve the warfare tactics that they had at their time.

The past is a tool which the present can use to build its future. Although we have now moved past the Age of Armor, we still must reflect on the distant past of humanity, as we exist because of the wars of long ago, and we must observe what worked and what failed to work and use that knowledge to push humanity into the next age.

Genevieve Boman

The Medieval Period

Medieval History, Culture, Society, and Technology

In the centuries following the fall of the Roman Empire, a new class of warrior came to replace Roman centralized military organization in Europe. This warrior was the medieval knight. He was responsible for his own training and equipment and fought battles in the style of mounted shock combat. The medieval knight was supported by a social framework known as feudalism.

The origins of feudalism can be seen in the actions taken by Frankish "Mayor of the Palace" Charles Martel, his descendents, and the Carolingian emperor Charlemagne. Eighth century Gaul had an

> Feudalism

agricultural economy, and land was the most important form of income-bearing wealth. Mounted warriors could only be maintained in large numbers by funds resulting from land. So when the Frankish army shifted its focus from infantry to cavalry, Martel ruthlessly seized ecclesiastical lands, risking the wrath of the Church, and distributed them to retainers on the condition that they serve him on horseback. The failure of a retainer to fulfill his obligation to serve in the cavalry would result in the loss of his land. (White, 4) Under Charlemagne, all subjects were obligated to provide some form of military service. Charlemagne extracted mounted combatants from even the poorest members of society by organizing them into groups according to the size of their holdings and requiring each group to equip a mounted warrior. (White, 6) After he conquered the Lombards in 774, the only people in Western Europe in the 7th century who used the horse extensively in battle, Charlemagne recruited them into his already large cavalry (Edge, Paddock, 6, 8) Those who were economically unable to fight on horseback suffered from a social inferiority which later became a legal inferiority. Freedom was to become largely a matter of property (White, 30). The result of the shift to cavalry was that by the eighth century an armored cavalry elite had evolved, in both the social and military sense. The first knights were the mailed horsemen who

served under Charlemagne (Edge, Paddock, 8) and wherever the Carolingian realm spread, it brought its mode of fighting, feudal institutions, and the seeds of chivalry.

Roland pledges loyalty to Charlemagne

The feudal system existed in order to provide a lord with knights who protected him and fought for him in his military endeavors. The duty of a knight to serve his lord was the key to feudal institutions. In exchange for military service, knights were given land which enabled them to pay for their increasingly expensive equipment. The class of arms-bearing free men was re-divided as the knight was assimilated into the aristocracy. The military service of those who did not serve as mounted retainers became of minimal importance as the new mode of fighting destroyed the old Germanic idea that all free men were soldiers. (White, 31)

The importance of military power in feudalism was a response to the weakness of governmental authority. Without Rome to ward off raids or keep internal peace, a hierarchical system of personal relationships evolved to provide societal structure and protection for individuals. At the top of the pyramid were kings and upper nobility who had authority over large territories and populations, granting them a large political role at the national and international level. Below them were aristocrats who had limited authority over other aristocrats who, in turn, had authority over commoners. Although the aristocracy was highly stratified, it shared a common social image which associated a poor knight more closely with the powerful nobility than with the powerless commoners. After all, the powerful members

of the nobility and the knights were equally warriors by right of inheritance. The hierarchy of feudalism with its warrior aristocracy was the governmental system of the medieval period. (Singman, 3-4, 9)

The medieval knight dominated the battlefield. Fighting from horseback with lance, sword, and shield he was a formidable enemy. The Western knights during the First Crusade defeated Turkish and Arab horsemen without difficulty. The Byzantine historian Anna Comnena observed that the knights were "indomitable on horseback, irresistible in the first shock, but powerless when they have to fight on foot." This is an exaggeration as knights did fight effectively on foot during the crusades. However, on foot they were not the overwhelming force that they were when mounted. (Williams, 42).

The knight's horse was his most significant and effective weapon. This was made possible by improvements in the saddle, the invention of horseshoes which significantly extended the useful life of the horse, (Williams, 40) and the introduction of stirrups- which seem to have been introduced to Europe around the time that Charles Mantel re-worked his military. Stirrups may even have been the technological basis for his military reforms. (White, 27-28) Before the introduction of stirrups, the rider sat precariously in his seat and was much restricted in his methods of fighting. A mounted combatant was primarily a bowman and javelin hurler. Swordplay was extremely limited. The spear was wielded at the end of the arm and the blow delivered with the shoulder and biceps. A vastly more effective fighting style became possible with the inception of the stirrup. The knight could rest his lance between his upper arm and body and the blow was delivered with all the strength of his charging horse behind it. (White, 1-2) With the support offered by stirrups and new saddles which had a higher pommel and cantle, mounted warriors could use the saddle as a fighting platform to take their weight and hold them securely in place, greatly increasing the knight's efficiency.

The knight's combat style

Maciejowski Bible 1250-1260

As a result of the new mounted tactics, Frankish weapons drastically changed. The Carolingian wing-spear with a prominent cross-piece to prevent too deep penetration as well as the Germanic longsword for horsemen came into being in the eight century (White, 27). Armor became heavier to meet the new violence of mounted combat. The direction of history was set, with the knight leading the way on the battlefield.

The image of the knight in shining armor has its origins in the 1200s, when the knight's chain mail armor began to be supplemented by metal plates. Improving infantry tactics called for greater protection for the mounted warriors. (Higgins Armory, The Age of Armor, 10) The development of the crossbow, which had become a threat to knights by the twelfth century, was the first weapon capable of consistently piercing mail armor. As time progressed, crossbows were designed to be stiffer and thus, more powerful, calling for stronger and heavier armor. At some time in the fifteenth century, the steel bow came into use. (Williams, 48) Anna Comnena remarked that "not only can a crossbow bolt penetrate a buckler, but a man and his armour, right through." (Edge, Paddock, 35) Armorers began to "prove" their armor by firing a crossbow at it at point blank range. The resulting mark was a "proof" mark.

Plate Armor

By 1300, towns and commerce were thriving. This allowed for specialized craftsmen, improved metalworking, and greater production of steel and iron items. (Higgins Armory, The Age of Armor, 10) Italy and Germany developed distinctive styles of armor and regions of these two countries became major exporters of plate armor. (Edge, Paddock, 104-105)

The Italians came to possess superior metallurgy skills. (Williams, 331) Armor was mass produced in factories with specialized workers. By the 14th century, the city of Milan had attained such a technical level in the production of armor that its mail and plate were the most sought after in Europe. The Missaglia of Milan were the greatest armor makers of the 15th century. They employed vertical integration, taking an interest in the supply of raw materials and acquiring the right to exploit the mines and construct the furnaces for smelting. Their division of work and supervision by the master can be seen on each piece of armor. Each piece was marked by the workman who made it and also by the master who directed the assembly of the entire armor. (Williams, 57-58).

During the 14th century, larger plates, generally made of steel, began to appear. European armor became fundamentally different from armor used in other parts of the world; namely Islam, India, China, and Japan. All of these cultures continued to use armor made up of a large number of small plates or mail, rather than a rigid external covering. The best Italian armor made for knights in the 14th and 15th centuries was generally made of steel, and frequently heat-treated. (Williams 56)

By the early 14th century, given favorable local circumstances, knights were being defeated by infantry in Flanders, Switzerland, and Scotland. (Williams, 46) By the fifteenth century, the dominance of the knight on the battlefield was severely challenged. Knights were confronted by disciplined and better equipped professional foot soldiers armed with weapons capable of piercing and crushing the best armor. With the advent of gunpowder the knight stood as much a chance of being killed as the common soldier. (Edge, Paddock, 96-97) As the cost of gunpowder fell, guns gained ground over crossbows (Williams, 49). The wielders of these weapons were considered to be outside of the chivalrous code and were not worthy opponents of the knight. When confronted by the reality of death at the hands of a common soldier, chivalry could no longer sustain its high ideals. (Edge, Paddock, 97)

1400s firearm battle

As chivalry died on the battlefield, it was transferred to the tournament (Edge, Paddock, 98). At the end of the eleventh century and the beginning of the twelfth, we first begin to hear of tournaments. By the 1300s, specialized tournament armor was being produced. The new measure of skill and training required of knights found expression in the tournament. The early tournaments, which provided perfect training grounds for new techniques, were free-for-alls for teams of mounted knights. (Keen, Chivalry, 25). With the passage of time and the establishment of chivalry the tournament came to be a visible manifestation of the social and military superiority of the knight and an affirmation of his political power, social status, wealth, and glory.

Tournament, France, 1450-1500

Medieval Warfare and Combat

Traditionally, the cavalry charge is regarded as the classic tactic of medieval warfare (Prestwich, 325). The visual effect of a line of heavily armored men on large horses bearing flashing colorful banners and other heraldic symbols, lances aimed at the chest and charging at full force must have been overwhelming. However, the mounted warrior was not the only important component of field armies (Keen, 188). A cavalry backed up by infantry and archery was much more effective than cavalry alone.

Froissart Battle c1450-1500

Open battle, though sometimes intentionally sought, was generally avoided. Battle was potentially decisive, as full-scale battles often took place at the end of campaigns. They could, however, be costly and dangerous. The uncertainty of the outcome may also have been a factor which contributed to the infrequency of their occurrence. (Prestwich, 306-7). Captured members of the aristocracy were put to shame by having to buy back their freedom. It is less likely that death on the battlefield was a major deterrent. Although being pinned under one's horse, having one's bones and organs crushed by hand wielded weapons even through armor, a spear thrust through an eye, or being strangled under the weight of the bodies of one's fellows must have been unpleasant thoughts, the aristocratic warriors were chasing honor and glory. The socially inferior infantry might desert their leader. Knights were expected to have

The Chevauchée

undying loyalty. The Starhemberg Fechtbuch advised young knights "Practice knighthood and learn the Art that dignifies you, and brings you honor in wars."

In place of open battle, armies would engage in a chevauchée. This typical medieval tactic was a fast-moving raid by a mounted force, (Keen, 187) the objective of which was to destroy as much land, resources, and as many buildings belonging to the enemy as possible. Burning was the technique employed by troops. Wooden buildings with thatched roofs burnt up quickly. (Prestwich, 10) Towns, castles, and river crossings could be taken by surprise by a mounted force. Garrisons under siege could be more rapidly freed. (Keen, 197) Armies might already be mounted for a march, even if the intention was to dismount to fight; medieval armies were in a good position to engage in this blitzkrieg-like warfare (Keen, 187).

Medieval battles were short explosive events. Fighting in a full suit of 50-60 lbs armor was exhausting. It was rare for fighting to last more than a day (Prestwich, 11). The opening of battle was cacophonous. Combatants within earshot of each other screamed curses and oaths (Keegan, 99). Jordan Fantosme remarked of William the Lion's attempt to take Carlisle in 1173, "Great was the noise as the battle began; there was the ring of iron, and the clash of steel." (Prestwich, 323) To begin battle, long distance weapons, primarily archery were used. The arrow strikes of bowmen would punch through armor at close range and would still have had a demoralizing effect on combatants at long range. Animal cries of pain from the knight's horses would have risen above the metallic clatter. Then the heavy cavalry would charge, a bloody close-quarters mêlée involving knights and infantry would ensue, and then the final rout ended the battle. (Prestwich, 11) These, very general "steps" were characteristic of set-piece battles in which both sides had ample time to prepare their positions and decide on tactics. (Prestwich, 310)

| Battle |

The cavalry charge must have been an impressive sight. It was the particular characteristic of knightly combat which set knights apart from others on the battlefield. (Nicholson, 35) Formed into a tightly grouped squadron, the cavalry would carry their lances vertically, until lowering them towards the

| Cavalry charge |

end of the charge (Prestwich, 26). If the lance hit its target, it could go straight through a shield, chain mail armor, and through the body of an enemy. A properly executed cavalry charge could break the enemy's battle lines separating enemy ranks and enabling the infantry to cut down those who had been struck aside by the charge. (Nicholson, 102-3). Well timed charges delivered in disciplined close-order fashion, if backed up by infantry or combined with archery could be just as effective in the fifteenth century as they had been in the eleventh. (Keen, 187).

Maciejowski Bible, 1244-1254

The full-scale cavalry charge was not used as extensively as might be expected. It was a relatively inflexible tactic. If an enemy dispersed before impact, as did the Turkish light horsemen encountered by crusaders, the charge would come to a disordered halt. (Keen, 193). A cavalry charge was not always effective against archers (Nicholson, 103). Naturally pitted or soggy terrain could be deadly to a charging horse. Enemies could create their own obstacles to trip and injure horses. At Agincourt, archers protected themselves with a thicket of wooden spikes (Keegan, 90). It is also likely that developments in armor made the coordinated cavalry charge more difficult over time. For the knight of the later medieval ages, with a fully visored helmet, vision and hearing were significantly impaired. (Prestwich, 325) The cavalry charge was a risky attack.

When mêlées broke out on medieval battlefields, the combat of mass against mass really amounted to the sum of many individual fights. This was necessary due to the fact that the weapons wielded by individuals could only be used in close quarters. After his lance broke (lances broke easily),

Mêlées

(Prestwich, 26) a knight would draw his sword. A warrior fighting with lance, sword, dagger, mace, or battleaxe could only kill or wound within his reach.

Battle scene 1470

This also meant that space for the individual to maneuver was vital, and the danger of the mêlée was that space was limited. Masses meet at the frontlines, and re-enforcements coming from behind push the combatants at the center into each other. Being prevented from getting out of the way of blows or thrusts from one's opponent meant a sure loss of one's life.

Battle of Nancy 1477

Once a combatant was tripped by those around him or by bodies on the ground, it would be simple for an enemy still on his feet to stick a blade into a man on the ground through gaps in armor plates or a space in the visor of the helmet. (Keegan, 100-1) At Agincourt, when the archers ran out of arrows they took other hand-held weapons and attacked the infantry, hitting them in the backs of the knees in order to bring them to the ground (Keegan, 103).

Medieval armored combat incorporated the use of wrestling, sword and dagger fighting, and staff weapons. According to the Starhemberg Fechtbuch, a knight should

> Be a good grappler in wrestling;
>
> lance, spear, sword and falchion
>
> handle manfully,
>
> and foil them in your opponent's hands.

Weapons and combat

Dagger combat was virtually the same as unarmed wrestling. The dagger acted as an extension of the arm. Fighting techniques for staff weapons, such as the halberd, spear, and poleaxe were based on the techniques of the simple quarterstaff- a long wooden pole with blunt ends. Quarterstaff fighters typically began at a distance, making jabs at their opponent's face. Throws and attacks with the blunt end of the staff were follow-up moves. A combatant in plate or mail armor was protected against cutting and slicing attacks. Mail however, was vulnerable to thrusting attacks and plate armor had gaps through which a blade could fit. Increased accuracy was needed to hit these gaps. Long swords, favored by knights toward the end of the middle ages, were held with the main hand on the hilt, and the other hand on the middle of the blade, which was dulled. Thus, armored combatants used long swords as spears. Attacks were made using thrusts and parries in an attempt to get in close. The sword could also be turned around and the pommel and hilt used as a weapon. A skilled medieval swordsman used every part of the sword. (Martial Arts of the Middle Ages)

During campaign warfare, incidents of single combat often punctuated campaigning. With [glory] and honor in mind, knights engaged in highly individualistic jousts of war. Some were planned, some were unplanned. During an English chevauchée in 1359 into central France, the English and French armies drew up opposite each other. Knights and squires, with the permission of their commanders, jousted with their equals on the opposing side. Before the Battle of Halidon Hill in 1333 there was a planned fight between two knights of opposite sides.

Manesse unhorsing, Germany, 1340

As a particularly interesting example, a Scotsman fighting with the English in the 1370s once vaulted the barriers of a French town and engaged in single combat with any of the Frenchmen who wanted to test their skill against him. The French forbade anyone to kill him by archery. After a period of combat he high-jumped the barrier and returned to the English army. (Prestwich, 232). Aristocratic medieval combat, it seems, was marked by individualism.

It was standard practice to combine infantry, including archers, with heavy cavalry on the battlefield. However, the employment of foot soldiers had serious consequences for mobility. The chevauchée could only be conducted by mounted fighters. One solution to this problem was to supplement the elite cavalry with light cavalry or mounted infantry. The mounted archer first appears in records in the early 1330s. (Keen, 193-5) Yet, in the fourteenth century, we see armies built around foot soldiers, with little or no involvement of the warrior aristocracy. These armies were able to inflict

humiliating defeats on the elite knights through well-timed ambushes, ordered tactical formations, discipline, and the use of effective weaponry. The weapons which brought success to the infantry were largely a response to the heavy cavalry. Hafted weapons were designed for striking men-at-arms in the saddle and pulling them to the ground. Bowmen deployed in larger numbers were capable of producing an arrow storm. Some of the cavalry elite responded by abandoning their warhorses and fighting on foot. However, the heavily armored cavalry remained a formidable force into the fifteenth century, best used successfully in tandem with infantry: archers and pikemen. With the changing face of battle, knights lacking effective support were increasingly challenged in large-scale combat. (Keen, 202-7)

BL MS Royal 16 G IX Pike formation, 1470-1480

Medieval Weapons

The sword was the preferred weapon of knights throughout the medieval ages. Swords were worn by the elite regardless of any other primary weapon the knight might be using at the time. (Edge, Paddock, 49) Swords were a symbol of the military elite's power and status and had a mystical quality which evolved from the fusion of pagan and Christian rituals. (Keen, 199) The Vikings ascribed properties and names to their weapons, and the veneration with which the medieval sword came to be regarded may be due in part to Viking influence. (Edge, Paddock, 11) Largely due to the influence of the Crusades between 1096 and 1291, the simple cross-hilted sword became a symbol of the knight's Christian religion and was regarded as an instrument of God's will. As early sagas morphed into chivalric romances, the image of the knight and his sword was further enforced. The ancient practice of naming swords continued into the medieval ages: Roland's sword was called "Durendal", meaning enduring. Charlemagne's sword was named "Joyeuse" (Joyous). There was a widespread belief that the personal characteristics of a knight, such as his strength, courage, honor, and renown could be absorbed by his sword and that these characteristics would pass to the sword's subsequent owners. Even considered independent of their monetary cost (which was considerable), swords were therefore highly valued and handed down through generations. (Edge, Paddock, 25)

Through the eighth and ninth centuries, the long swords produced in the Carolingian Rhineland were particularly valued by the Byzantines and Saracens (Edge, Paddock, 11). The crucial change in sword design which took place in the ninth century is associated with the Rhineland sword makers. Elegantly tapered blades emerged, which shifted the center of gravity of the sword from the point to the hilt. This greatly improved the handling of the weapon. (Keen, 199) By the end of the ninth century, Scandinavia had become a manufacturing and trading center for swords which rivaled those made for export in the Rhineland. They were of the highest quality; flexible and shock-resistant. Viking tradition would become highly incorporated into the eleventh century medieval sword. Scandinavian warriors had

a reputation for military prowess that was much admired and widely emulated. Their principle and most prized combat weapon was the sword. (Edge, Paddock, 25)

The finest early swords were made using a technique called pattern-welding. This technique enabled smiths to overcome the technological problem of obtaining a length of tempered steel sufficiently free of forging flaws and other weaknesses. It also made it possible for smiths to make use of both good-quality and inferior iron; a necessity when "good-quality" iron was a scarce and valuable commodity. A pattern-welded blade could take a month to make and its value was said to be equivalent to 120 oxen or 15 slaves. These blades were made of multiple separate parts hammer-welded when white hot to forge all the constituent parts together. The center was formed of thin rods of malleable wrought iron tightly twisted together. Repeating patterns could be formed within the structure of the metal. After the blade was given its approximate shape, a broad shallow hollow was forged along the center on each side of the blade to both lighten and strengthen it. After it had been ground and filed into its final shape, the blade was heated and quenched to give the steel edge its hardness. The relatively soft iron in the center core prevented the blade from being liable to fracture. The pattern along the central fuller (the shallow hollow) could be enhanced with acid after polishing, the carburized parts showing up lighter than the softer iron. A letter describing pattern-welded swords was written in 520 AD by Cassiodorus, secretary of Theodoric the Ostrogoth, Emperor of Rome, to Thrasamund, King of the Varni, acknowleding a gift of swords.

> You have sent us swords capable even of cutting through armor. They are more precious for the iron of which they are made than for the gold that enriches them… The admirably hollowed middle part of their blades seems to be veined and patterned. There is the play of so many different shadows that one would think the metal is interlaced with elements of different colors.

(Edge, Paddock, 26-27)

Although pattern-welded blades continued to be produced in Europe until about 1050, from the late eighth century Viking smiths developed the technology to make blades of homogenous steel that equaled or even surpassed the performance of the pattern-welded blades. Lighter, tougher, more sharply-

tapered blades that were better able to pierce mail were developed. Swords became less blade-heavy, enabling them to be used with more speed and dexterity. (Edge, Paddock, 25-27)

The spear was the staff-weapon of a foot soldier; the lance was the staff weapon of a mounted knight. From the fourth to the tenth centuries there was very little to distinguish between the two. Spears were the most common weapons of the middle ages, and a combination of spear and shield use formed the most popular type of combat. (Edge, Paddock, 29) A heavy thrusting spear was developed in the eighth and ninth centuries which had lugs at its base to prevent it from penetrating too far. The lugs were necessary because, with the introduction of stirrups and a saddle with a higher pommel and cantle, the weight and speed of a knight's charging horse could be channeled into a lance strike. (Edge, Paddock, 11) The Carolingians used this type of winged spear-head. The Bayeux Tapestry depicts spears, probably derived from the Carolingian form, with single, double, or triple cross-pieces at the base of the blade-head. Spears are shown being used as couched lances held under the right arm, as weapons carried over and under-hand to stab at an enemy's defenses, and as javelins hurtled through the air, sometimes from horseback. However, spears seem to have been primarily an infantry weapon. (Edge, Paddock, 29-30)

Bayeux Tapestry 1075-1090

As the spear evolved into a weapon for the cavalry, it increased in length. By the thirteenth century, it had become a "lance", rarely less than ten feet long, with a head of iron or steel. Foreshadowing the traditional knight's lance of later centuries, Norman knights carried couched lances

with thick shafts. These were stout, long, thrusting weapons with a steel head of either a thin triangular form or with a double-edged leaf blade. Even these early lances were used in the typical all-out cavalry charges of mounted knights. (Edge, Paddock, 30)

By 1300 the lance was about 12 feet long with a slender steel head. The fifteenth century lance would be even larger. It was fitted with a flat disk-like hand guard called a vamplate, and a grapper. The grapper stopped the lance from being forced back under the arm when couched. When the lance rest was introduced, the grapper would engage against the lance rest, instead of resting against the armpit. This allowed the knight to better secure the lance. (Edge, Paddock, 88)

Use of the sword and spear was universal in Europe during the eleventh century. However, other weapons varied in popularity. The battle-axe was a favorite in Scandinavian kingdoms. It is found in Frankish graves from the mid-fifth century to the beginning of the seventh (Contamine, 176). The battle-axes found on Anglo-Saxon sites are the smaller, single-handed type known as "skeggox" which could be used in hand-to-hand combat or could be thrown as a missile weapon. By the eleventh century, the most popular battle-axe was the Scandinavian broad-axe. This axe could be 4-5 feet long and measured up to ten inches between the upper and lower points of the blade. It was capable of severing limbs and heads, as the Bayeux Tapestry illustrates.

11th cen. battle axe

The axe was largely an infantry weapon, lacking the implications of social status which the sword carried. There were also practical difficulties to swinging a large axe from horseback. However, the axe was incredibly effective in battle and was therefore used by dismounted knights and noblemen as well as by common soldiers. It was particularly effective against mail armor and could crush as well as cut. Typically wielded with two hands, the warrior depended upon his own skill to defend himself, or occasionally, fought alongside a companion armed with a shield and sword or spear. (Eventually, with the development of plate armor, the shield was no longer needed.) The Normans seem to have favored a shorter shaft and smaller axe head than the traditional Viking two-handed broad-axe, probably due to the

prevalence of cavalry in their armies. Elsewhere in Europe, the axe does not appear to have become popular until the twelfth and thirteenth centuries. (Edge, Paddock, 31-32)

In the eleventh century, the mace was still in its formative years. In its early form it was a simple club or cudgel, probably made of wood. Also seen in contemporary art is a slim straight-shafted weapon, presumably made of metal. It appears to be a forerunner of the all-metal maces of later centuries. These weapons were especially effective against mail armor. Blows could shatter bones without even breaking a rivet in the victim's mail. (Edge, Paddock, 32) The form of both the mace and battle-axe remained largely unchanged through the twelfth century. (Edge, Paddock, 49)

> 11th cen. mace

Daggers in the twelfth century were developing into the basic form that they were to take for at least the next five centuries. Daggers were used initially by common foot soldiers, and the term itself was just coming into use in the twelfth century. Relatively early in the medieval period, it came to signify knives that were used specifically for fighting. Typically they were gripped in the hand with the blade pointing downward. Attacks were made with a stabbing motion. Daggers often resembled miniature swords. (Edge, Paddock, 48) The use of daggers or knives in battle does not seem to have become necessary or popular until the thirteenth century when "quillon" daggers began to appear as part of the standard equipment of knights. These were worn on the side opposite the knight's sword, which was generally on the left. (Edge, Paddock, 36, 62)

> 12th cen. Daggers

Weapons of the thirteenth century were characterized by modifications designed to increase their effectiveness against armored opponents. The need for greater cutting power led to the creation of the "sword of war." The knight's sword increased in weight and length. Heavy cross-guards and weightier pommels balanced the weight of the blade, and a slightly longer grip allowed for the use of both hands. At the end of the century, a new type of sword appeared which would become very popular in the following century. It was designed specifically for thrusting and had a sharp pointed blade. These two swords were supplemented by a single-edged sword called a falchion which was shaped like a modern machete. It was

> 13th century

popular among all social classes due to the great cleaving power achieved by the widening of the blade towards the point. In addition to these weapons, the mace gained popularity with the knightly class since it was capable of crushing the developing armor defenses. (Edge, Paddock, 62-63)

The Crusades had encouraged the use of agriculturally based weapons which gave rise to increasingly effective staff weapons in the thirteenth century. The lance and spear, which remained virtually unchanged in this century, were supplemented by an array of weapons based on the hedging bill, the scythe, the flail, and the pitchfork. (Edge, Paddock, 63-64)

Weaponry of the fourteenth century is characterized by its penetrative or crushing abilities. Maces

14th century

became more heavily flanged and made of steel; capable of inflicting injuries through armor and crushing helmets. Short war hammers had sharp rear spikes. The axe, which became popular once more among the aristocracy due to improvements in armor, was occasionally supplemented by a short rear spike on the axe head. (Edge, Paddock, 88-89)

From the beginning of the fourteenth century, new varieties of swords began to emerge in response to the increasing robustness of armor. These were designed either for heavy cutting blows, or were specifically for thrusting. Long bladed swords of war which could sever a limb continued to be popular, but an intermediate type developed that was designed both to cut and thrust. Exclusive thrusting swords had sharply tapered blades. By 1360, a portion of the blade near the hilt was left blunt so that the index finger could be wrapped over the guard giving the wielder more control over the point. These swords generally had elongated pommels allowing a hand to be placed behind the pommel to increase the force of a thrust. (Edge, Paddock, 87)

Three types of infantry weapons were responsible for crushing defeats in the fourteenth century: the pike, spear, and halberd. Rows of pikes set against the ground were used to stop the charges of knights. (Williams 44) As the centuries progressed, the shaft of the spear grew longer. Eventually it reached 16 feet and two hands were required to wield it. Pikes of this length were used effectively against

cavalry in the fifteenth and sixteenth centuries. The halberd consisted of a cleaver-like blade with a rear spike and a spike on top. This weapon could be used in a number of ways. The blade could be used for cutting, the spike for thrusting, and the lug at the rear was used to hook a knight as he passed and pull him off of his horse. (Edge, Paddock, 89)

Fifteenth century swords and daggers were used mostly for thrusting attacks. The fifteenth century sword was a lightened version of the "cut and thrust" variety popular in the fourteenth century. Hand-and-a-half purely thrusting swords with elongated pommels and narrow blades were intended to be thrust into the gaps of the increasingly sophisticated plate armor of the fifteenth century. The upper six inches were blunted to allow a grip for the left hand so that the sword could be shortened for close-quarters combat. (Edge, Paddock, 124)

15th century

Germany 1400-1500

Armored Longsoword, 1450-1475

During this century, shortened swords replaced the long knives of the infantry. It was from the hilts of these swords that the rapiers of the 16th and 17th centuries developed. Due to the sophistication of plate armor, falchions were no longer popular weapons; they morphed into elaborately decorated weapons for the nobility. Daggers were exclusively of the rondel or ballock form, and were designed, not for cutting, but for punching through plate and mail. The dagger was reserved primarily for a *coup de grâce*. (Edge, Paddock, 125)

It was increasingly common in the fifteenth century for men-at-arms to fight on foot. Since shields had gone out of use, both hands were free to wield weapons. Maces were made entirely of iron and steel. The sharply pointed flanges were pierced to look like Gothic tracery, in keeping with the

popularity of the Gothic style during this period. Single handed axes remained in use, though they were never very popular. The war hammer came to closely resemble a miniature version of the pollaxe. (Edge, Paddock, 128)

The knightly weapon, the pollaxe, evolved from the two-handed axe and halberd of the fourteenth century. The pollaxe was capable of piercing and shattering the best plate armor. It consisted of many different combinations of beak, hammer, or axe head mounted on a 4-6 foot shaft, with a spike at top and bottom. Guards were fitted to protect the wielder's hands from weapons sliding down the shaft. These weapons could be used to hack, thrust, and parry with great speed and accuracy. They were used both on the battlefield and in foot tourneys. (Edge, Paddock, 127-8)

Talhoffer Pollaxe 1450

The effectiveness of the bow was well known by the start of the Middle Ages. There is little evidence that the Saxons made any great use of the bow in warfare. The sword and spear were the weapons of warriors. Other European lands continued to maintain a strong tradition of archery, as is apparent in the sagas of the Norsemen. However, most of the archers depicted in the Bayeux Tapestry appear to be relatively poor, humble men, clad in civilian clothing. Early bows were similar in form and shape to their later descendents. They were shorter in length than the longbow or "English" bow at the height of its popularity. The bow string was only pulled back to the chest- rather than the ear as was the case with the longbow- possibly indicating a less flexible or weaker stave. (Edge, Paddock, 33)

The bow

In twelfth century Wales, the foundations were being laid for a new generation of more deadly "manual" bows. These were not yet the smoothly contoured yew longbows of the Battles of Agincourt or Crécy, but they were potentially more deadly than the crossbows of the time due to their extremely rapid rate of fire and great range. For the time being, their use was confined within the borders of their native land. (Edge, Paddock, 49) But in the fourteenth century, the longbow was to make England the paramount military nation in Europe. At short range, the English longbow could even penetrate plate armor, and its rate of fire was unmatched (Edge, Paddock, 65, 69) The longbow retained its pre-eminent position among the arms of the English infantry until the end of the fifteenth century, and was used as a military weapon up to the seventeenth century. (Edge, Paddock, 89, 129)

Despite all the power of the English longbow of the 14th century, the crossbow had a longer-term impact on medieval warfare. Possibly stemming from the bows of the Saracens, who were famous for their archery, the crossbow was the most popular form of bow in twelfth century Europe. (Edge, Paddock, 36, 49) One great advantage that crossbows had over longbows was that they did not require years of constant training in order to be effectively used. (Edge, Paddock, 91) Crossbows took longer to load and had a slower rate of fire, but they had a much higher penetrative ability than longbows. (Edge, Paddock, 91) They may have been the principle factor responsible for the development of the great helm and plate armor in the thirteenth century. (Keen, 205) The crossbow was considered to be so deadly, that in 1139 Pope Innocent II issued his famous "anathema" against the "deadly art, hated by God, of crossbowmen and archers". However, the crossbow was so effective in war that the edict was largely ignored. (Edge, Paddock, 49)

Over time, the bow of the crossbow was made more powerful. Early crossbows would almost certainly have had a wooden stave. They would have been liable to warping or snapping and could not deliver a bolt with tremendous power, as could their more powerful descendents.

It is likely that many crossbow staves were of "composite" structure by the end of the eleventh century. (Edge, Paddock, 36) Simply making a bow thicker does not make it more powerful. Overall stiffness must be increased, rather than thickness. Horn or whalebone, which resist compression, were placed on the inside of composite bows. Animal sinew, which resists extension, was placed on the outside of a wooden bow and the whole thing was glued together and made waterproof with a skin covering. (Williams, 48) The Crusades brought knowledge of composite bow staves and the methods of their construction to most of Europe in the thirteenth century, and did much to establish their popularity. (Edge, Paddock, 36, 49)

By the thirteenth century, composite crossbows had become too powerful to span by hand. The crossbow stock was fitted with a stirrup into which the crossbowman placed his foot. In order to span the bow, the crossbowman knelt down and placed the hook he wore attached to his belt over the string, and stood up, keeping the crossbow in position with his foot. (Edge, Paddock, 64) By the 14th century, the crossbowman's belt might be improved by incorporating a pulley or lever. (Williams, 48)

By the middle of the fourteenth century, the composite bow stave was being replaced by an even more powerful stave made of steel. This bow needed to be spanned by a mechanical device. A windlass with a system of pulleys, or a cranequin, which involved reduction gearing, were required. (Williams, 49) The effectiveness of this bow is illustrated by the fact that "armor of proof"- which was proven by shooting a crossbow quarrel at it- emerged in the fourteenth century. (Edge, Paddock, 91)

Crossbow and cranequin c. 1480-1500

The bow was eventually eclipsed by the handgun. The weight of the steel crossbow largely restricted its use to siege warfare. In 1482, steel crossbows cost twice as much as a handgun. Given the increasing effectiveness of guns and their greater power, it is no surprise that crossbows had disappeared from battlefields by the early 16th century. (Williams 49)

Though the sword was the favorite weapon of the knight throughout the medieval ages, many other weapons rose and fell in various levels of popularity. As armor became more sophisticated, hand-held weapons ceased to be used primarily for cutting, and were re-designed for thrusting attacks. The design of bows was changed over the centuries to make them more powerful. These efforts culminated in the steel crossbow of the fifteenth century, which was eventually superseded by gunpowder weapons.

Weapons Conclusion

Medieval Armor

The earliest form taken by medieval armor was that of debased Roman armor. The Bayeux

Tapestry depicts helmets similar to late Roman spangenhelms. These were segmented helmets built around a framework of bronze or iron strips with panels of iron riveted onto the main frame. Most of the warriors in the tapestry wear close-fitting mail hoods called "coifs" underneath their helmets, made in one with the mail hauberk. A mail hauberk was a chain mail shirt put on over the head, and split in the front and back to allow the wearer to ride a horse. Hauberks were also constructed from overlapping metal scales sewn, laced, or riveted to an underlying garment of leather or cloth. (Edge, Paddock, 17-21)

The main body armor of the early Middle Ages was the hauberk, birnie, or knee-length mail shirt. This scheme was predominant throughout Europe and remained virtually unchanged throughout the eleventh century. The eighth century saga *Beowulf* describes the Geats:

> Each tough hand-linked coat of mail sparkled, and the shimmering ringlets of iron
> clinked in their corselets. When they arrived in armor at the hall, the sea-beaten
> men… seated themselves on the bench, their corselets rang.

(Edge, Paddock, 9)

Early hauberks were made of riveted mail and weighed about 31 lbs. The sleeves extended to mid-way down the forearm; the wrists were covered with cloth or leather. Early Anglo-Saxon manuscripts imply that the mail shirt was rare and highly prized. Only leaders or important warriors possessed one, and, like swords, they were often given names. "Banded" mail may represent alternate rows of riveted rings and rings made by punching complete closed circles of metal from a thin sheet of iron. In Europe from the fourteenth century onward however, it is extremely rare to find mail that is not entirely riveted. (Edge, Paddock, 19-21) The flexibility of this mail armor could be an advantage, but was decidedly a disadvantage in the face of bludgeoning weapons. The only defensive measure was to wear increasingly thick padded garments under the mail. The mail links could also be forced open by piercing weapons. (Edge, Paddock, 33)

Maciejowski Bible, ca. 1244-1254

The warrior's legs do not appear to have been protected at all in the eleventh century. Only important figures wore "chausses", which were mail leggings. There is no evidence of plate leg defenses, despite the use of iron greaves in the ninth century. (Edge, Paddock, 22)

Changes to medieval armor came very slowly at first (Prestwich, 18). The armor worn throughout Europe in the eleventh century continued to be used virtually unchanged during most of the twelfth

12th century

century. The conical helmet shape of the Normans continued to be used throughout Europe with few variations until the middle of the century. The skull then became more rounded. However, towards the end of the century, a flatter-topped helmet became popular. This was somewhat impractical, especially after the glancing surface offered by the previous helmet. Contemporary illustrations show similar topped helmets being cut in half by a powerful downward blow. (Edge, Paddock, 44)

The body armor of the twelfth century still consisted primarily of a mail or scale hauberk with a connected coif. Mail chausses became more common by the middle of the century and the foot was now more commonly protected with mail. The sleeves of the hauberk became longer, ending in mail gloves with a slit at the writs to permit the hands to be withdrawn. The palms were covered with cloth or leather. Surcoats, long usually sleeveless full-skirted gowns which the knight wore over his armor, appeared in

this century, possibly as a result of the crusades. A white surcoat could lessen the intensity of the heat of the sun in the Middle East. (Edge, Paddock, 45)

"Soft" armors were in use by the mid-twelfth century. Defenses of thickly padded, quilted cloth were cheap and comfortable in comparison with metal armors. Early evidence for their use is, however, inconclusive. (Edge, Paddock, 21-22) In addition, the precise nature of these garments cannot be ascertained, as the terms "gambeson", "aketon", and "pourpoint" which all describe soft armors, tended to be used arbitrarily. (Edge, Paddock, 46)

In the thirteenth century, the equipment of a knight consisted of a mail hauberk with a coif and mufflers, mail chausses, and a helmet of some form. The great helm, which extended downward to protect the wearer's neck, was given a taper, presumably as a result of the flat-topped helmet's inability to stop a sword blow. The great helm was fitted with a crest which served to identify the knight in battle. Crests took the form of pennons and free-standing devices in the form of stylized animals and birds. They were often brightly painted or gilded. When a crest was not worn, the great helm was often adorned with a coronet appropriate to the rank of the wearer. A padded cap was worn under the helm and either over or under a mail coif in order to spread the weight of the helm more evenly over the head. The basinet, a small hemispherical skull cap began to replace the conical helmet. It was worn under the great helm or on its own over the coif. The end of the twelfth century also saw the development of the kettle hat, so called because of its resemblance to a medieval cauldron, or kettle. The kettle hat was used extensively by the knightly class and was often worn with a basinet and mail coif underneath. Because the kettle hat offered protection from a downward cut but preserved all around vision, it was the favorite of the common soldier until the middle of the fifteenth century. The brim helped to deflect missiles from the face, making it particularly useful in siege work. (Edge, Paddock, 53-55)

Although the mail hauberk remained the main body defense of the thirteenth century, mail alone was found to be an inadequate defense for the body from the end of the twelfth century. A rigid defense

13th century

called a cuirasse, which was at first made of leather, was worn between the hauberk and surcoat. The surcoat was occasionally reinforced by rectangular steel plates riveted inside in vertical rows three plates deep. (Edge, Paddock, 56-7)

In the thirteenth century, the terms "aketon", "gambeson", and "pourpoint" seem to have become more distinct. The evidence suggests that "aketon" referred to the quilted and padded garments worn under mail, while gambesons were worn over mail or instead of it. "Pourpoint" probably refers to any garment for the upper body to which the hose were attached. All of these garments were vertically quilted. Aketons had long sleeves and reached to the knees. Gambesons were often worn by common soldiers. They were often referred to as being covered in silk and embroidered or emblazoned. (Edge, Paddock, 57)

During the thirteenth century we see the appearance of poleyns- cup shaped plates of steel designed to protect the knee cap, schynbalds- shin guards of steel, couters- plates to protect the elbows, and separate gauntlets for the hands. Leg defenses developed in advance of those for the arm, because the legs of the mounted knight were particularly vulnerable. The poleyns and schynbalds were strapped to the knees and shins over the mail chausses. Schynbalds however, did not appear until the end of the century. Couters were strapped to the hauberk over the elbows. They were also extremely rare before the end of the century. Steel plated gauntlets are first mentioned in 1296. However, the vast majority of knights continued to use mufflers of mail. Separate gauntlets were probably developed because the chain mail muffler did not provide adequate protection for the sword hand. (Edge, Paddock, 58-60)

Maciejowski Bible, ca. 1244-1254.

A better-off common soldier of the thirteenth century wore a full hauberk reaching to the knee with a mail coif or a short-sleeved habergeon. A basinet or kettle hat was usually worn with both. Infantry wore either a sleeveless gambeson with stiff collar and arm openings or a knee-length gambeson with full sleeves. The infantry had no leg defenses as this would inhibit their mobility on the battlefield. Because they were neither mounted nor as heavily armored as the knights, agility was very important for the infantry. It was common throughout the thirteenth century for infantrymen, especially the poorer members and peasant levy, to go into battle completely unprotected. The longbowmen at Agincourt had only a small shield of about 1 foot in diameter with which to protect themselves. (Edge, Paddock, 65)

Throughout the fourteenth century the great helm continued to be worn by knights over a basinet and varied little in general form. However, after about 1350, its use was generally restricted to tournaments. This probably had to do with its restriction of the knight's head movement and breathing. Weight was also a consideration, although the helm weighed much less than it appeared to: only five or six pounds. Still, the lighter basinet was more practical for battle (Prestwich, 23). Crests continued to be worn in this century. (Edge, Paddock, 69-71)

14th century

The most common form of body armor in the fourteenth century was a cloth or leather garment lined with plates. The fourteenth-century coat of plates developed from the reinforced surcoat of the thirteenth century. Coats of plates were generally T-shaped garments with a hole in the center through which the wearer put his head. The front and side of the garment were lined with plates which wrapped

around the wearer and met at the back where they were fastened with buckles and laces. By the 1350s we begin to see the evolution of a single large plate covering the upper chest, accompanied by smaller plates to cover the shoulders. By the 1360s this plate covered the chest as far as the diaphragm and horizontal hoops of iron or steel were riveted to cloth to form skirts of iron, waist lames. Then, by the 1370s, the waist lames had disappeared in favor of a breastplate which finished at the top of the hips and a skirt or fauld of horizontal lames. By the last two decades of the century, an independent breast plate worn over the coat of plates was common. In Italy and Germany it was sometimes worn independently with a short fauld and without any form of backplate. (Edge, Paddock, 73-76)

During the latter part of the fourteenth century, the brigandine, a descendent of the coat of plates, was developed. It used much smaller plates which could be articulated over each other to give greater flexibility. These plates were riveted to a canvas garment which was then covered in a fine material. Two L-shaped plates were used to protect the chest and lungs. (Edge, Paddock, 76-77)

An additional form of body armor, the coat armor, was also worn in the fourteenth century. They were often used to display the wearer's coat of arms to aid in identification on the battle field. Coat armor was worn in different forms in different countries. In general, it was a tight fitting padded garment without sleeves which reached just below the hips. (Edge, Paddock, 77)

Though the fourteenth century knight continued to wear his hauberk or habergeon under his armor, it was during this century that the components of the full plate harness appeared. Gutter shaped plates were attached to the upper and lower arm and couters protected the elbows. In England, spaulders, or shoulder defenses, were permanently attached to the upper arm defenses. The upper arm defenses were hinged down one side and strapped together across the other. From the middle of the century, the hourglass shaped plate gauntlet appeared. Schynbalds were replaced by full and demi greaves and the first plate cuisses- thigh defenses- appeared. Plate sabatons of overlapping horizontal lames shaped to fit the pointed shoes of the period appeared at this time. These replaced the sabatons constructed of small plates

riveted to cloth. Poleyns developed a heart-shaped side wing designed to protect the tendons at the back of the knee. By the last quarter of the century, the upper leg defenses consisted of a single plate which protected the front of the thigh, and a hinged side plate for the outside of the leg. A small articulating lame was riveted to the bottom of the main plate to allow the poleyn to pivot. The poleyn had a lower lame which either strapped over, or was attached to the greave. The lames of the sabaton articulate from a large plate shaped to the instep. All of these plates overlap in a downward direction. (Edge, Paddock, 80-83)

Fourteenth century armor was decorated with cloth coverings of the finest materials: silk, damask, and velvet. Painted heraldic designs and applied and engraved adornments were common. Embellishments of applied bands or motifs of latten or silver gilt were used sometimes as simple bands around the main edge of the armor or as elaborately molded and delicate decorations. From about 1300 the basinet could be encrusted with gold, pearls, and precious stones. The armor of the richer man-at-arms could be quite ostentatious. (Edge, Paddock, 85-6)

Armor manufacture can be said to have reached its zenith in the fifteenth century. The best

15th century

armors were made specifically to fit their owners, although armor could also be bought "off-the-peg". The metal itself was thickest over its most vulnerable points. The breastplate was invariably thicker than the back, and the helmet skull was made thicker in the front. The steel was often harder on the outside than on the inside. Generally, a good armor was heavier on the left hand side, where most attacks were directed. (Edge, Paddock, 134)

With the beginning of the fifteenth century, we see the emergence of "white armor". White armor was a complete harness of plate worn over the clothes to emphasize the appearance of the armor itself. For this type of armor, plate covered nearly every part of the knight's body; except for places that were very difficult to accommodate with plate, such as the armpits, elbows, backs of the knees, and groin. It was increasingly rare for a complete mail habergeon to be worn under the armor. From this point, armor

production and design were dominated by two separate schools: the Italian style of armor, centered on Milan, and the German style. These two dominant styles eclipsed any local variants. (Edge, Paddock, 99, 118)

Italian and German armors differed from each other in a number of ways. The German Gothic style was marked by attenuated angular lines and fluted surfaces. Fluting echoed the pleating of the gowns of the knight's civilian clothing. By 1480, in accordance with contemporary German fashion, the pointed toes of the sabaton- the foot protection- had become so exaggerated that additional long pointed pieces were added which had to be removed for fighting on foot (Edge, Paddock, 104). Applied decoration, usually in the form of gilt latten borders, was fairly common on German armors up to the end of the fifteenth century. (Edge, Paddock, 121 Conversely, Italian armorers favored rounded, more plain designs. This gave the armor a utilitarian and robust appearance. Italian armors, particularly the arm defenses, were more heavily defended on the left side. (Edge, Paddock, 105) It is interesting to note that the Italian barbuta helmet of this period closely resembled the simplistic Greek Corinthian helmets of classical antiquity (Edge, Paddock, 107). The foot defense, in contrast with the German style, consisted of a mail covered shoe (Edge, Paddock, 109).

The variations between Italian and German armor no doubt reflect different cultural styles. However, differences in military contexts may also help to explain the stylistic differences. Smooth rounded plates designed to deflect sword and lance blows best suited the mounted combat style of the Italian condottieri. North of the Alps, however, the greater threat of longbows and crossbows lent itself to armor with grooved and rippled surfaces. Similarly, the choice of helmet appears to have depended upon battlefield conditions. A particularly long-tailed sallet was preferred by the English, French, and Burgundians. In Italy, the barbuta, celata, and armet were favored. (Keen, 206) Both the barbuta and celata had rounded skulls with a keel shaped top and reached almost to the shoulders at the back and sides. They were fitted to the nape of the neck and had an averted edge at the back. The armet had cheek pieces shaped to the jaw, a "wrapper" which covered the lower half of the chin, and a pivoted visor which closed the face opening. The armet remained popular into the sixteenth century. (Edge, Paddock, 105-6)

The trade routes between Germany and Italy met at Flanders. Here, we see armors of a mixture of German and Italian style. They were probably made by Italian armorers working under the protection of the Dukes of Burgundy or local armorers working in the Italian style. The plates were usually fluted and sometimes cusped rather than spiked in keeping with the German fashion. The tassets, pauldrons, and couters however, were all of Italian form. It was in armor of this type, or in armor of purely Italian fashion, that the nobility of England fought in the Wars of the Roses. This hybrid armor appears in English monumental effigies from the middle of the century which may depict either English-made armors, or Flemish imports. (Edge, Paddock, 110)

A few good-quality armors were painted with depictions of saints or coats of arms. Simple engraving, confined to the borders, was used to decorate armors in the fifteenth century. Heraldic crests were increasingly replaced by a plume of feathers issuing from a large spherical ornament on the knight's helmet. Armors, and especially helmets, continued to be covered in rich material and garnished with jewels and gold. Despite the emergence of white armors, there were still many knights wearing cloth garments over their armor. These garments could be heraldic, or simply made out of a costly fabric. In a

letter written by Sir John Paston from Calais to his brother in the year 1473, he says "I praye yow sende me a newe vestment off whyght damaske… I wyll make an armyng doblett off it, thow I sholde an other tyme gyff a longe gown of velvett ffor another vestment" (Edge, Paddock, 117). But as the century progressed and warfare became less chivalrous, ease of identification of a knight ceased to be an advantage and fewer knights bore their heraldic devices on their outer garments. (Edge, Paddock, 121-3)

Throughout the fifteenth century, the knight wore a padded garment beneath his armor. These were likely similar to the linings in a number of fifteenth century pieces of armor which are made of quilted linen and padded with tow, wool, or a similar stuffing. These garments had long sleeves, probably a collar, and reached to just below the hip, depending upon the type of the armor with which they were to be worn. (Edge, Paddock, 115, 117)

By the fifteenth century, brigandines were extremely popular and were worn by all classes of soldier. Even some of the elite wore them in place of plate, as they were lighter and much more flexible. (Edge, Paddock, 118) Brigandines were also worn as a light armor by men who did not expect to go into battle, or who where traveling in unfriendly but not openly hostile territory. (Edge, Paddock, 120)

Towards the end of the fourteenth century, the first piece of plate armor designed specifically for the joust appeared. It was the "frog-mouthed" helmet, which remained the most common form of headpiece for the joust until the third decade of the sixteenth century. This helmet was heavier than the war helmet of the time, and the vision slit was adequate for the more limited sight and mobility requirements of the joust. Fifteenth century examples had breaths pierced in the front, but the left side was kept smooth. Broad glancing surfaces were designed to deflect the opponent's lance; deflection was as important as preventing penetration. (Edge, Paddock, 157-8)

Tournament

English military roll tourneybook 1448

During the fifteenth century, armor was becoming more and more specialized for specific tournament events. By the mid-fifteenth century, specialized armors were created for the joust. And, although field armor was occasionally used for the joust, harnesses designed for the joust were never seen on the battlefield. By the late fifteenth century, tournament armor had become much heavier than armor designed for war. It could weigh as much as 100 lbs, in contrast with 60 lbs for war armor. For the tourney, however, which was a form of mêlée in which groups of knights fought each other, field armor seems to have been worn throughout Europe. It could be supplemented by reinforces which were removed for battlefield combat. For the tilt, a joust run with a low wall in-between the charging knights, the left side of the armor was invariably the side which took the blows. High quality tilt armor was made thicker and heavier on that side. Reinforces were also added to the left side to make it stronger. The Rennen, a form of joust, seems to have been a comparatively light course, and was run wearing only a light half-armor or brigandine. (Edge, Paddock, 162, 164, 166, 168)

As the middle ages progressed, armor evolved. After the fall of the Roman Empire, medieval armor took the form of late Roman armor: spangenhelms and chain mail. Chain mail was light and flexible compared to later plate armor, but it was only capable of protecting against cutting attacks. In the thirteenth century, chain mail was supplemented by plate. Through the fourteenth century, plate was used more extensively in armor, and the components of the all-plate harness began to be developed. The armorer perfected his craft in the fifteenth century with the emergence of white armor. This

Armor Conclusion

comprehensive exposed plate harness is the armor which dominates our thoughts when we think of the

medieval knight in "shining armor".

The Renaissance Period

Renaissance Society

"The Painter will produce pictures of little merit if he takes the works of others as his standard; but if he will apply himself to learn from the objects of nature, he will produce good results. This we see was the case with the painters who came after the [classical] time of the Romans, for they continually imitated each other, and from age to age their art steadily declined"

-From Leonardo da Vinc's notebook (Hunt 27)

<u>Humanism and the Arts</u>

The Renaissance saw the beginning of the Humanist movement, originally an intellectual approach believed that every human individual had the potential to live a good life and should work to use their talents to the fullest possible extent. The Humanist term began as a way to describe scholars who worked to revive and publish classical works, most notably from ancient Greece and Rome, and valued a new form of education based on them and involving topics such as Latin, Greek, astronomy, geography, and even physical education rather than on the standard approach involving study of the works of the Church or simple mercantile math.

The creative arts saw a tremendous resurgence in activity with the renaissance. Painting and sculpture took on a new style, attempting to display the realism and detail embodied by the renaissance movement. Many of the most famous pieces from the period date to the 15th and 16th centuries and comprise works

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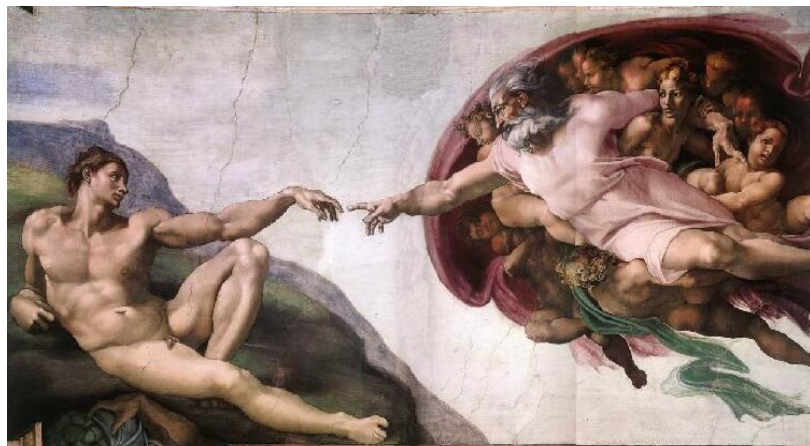
1 Image: Creation of Adam, from the Sistine Chapel by Michelangelo. Retrieved from http://mv.vatican.va/3_EN/pages/x-Schede/CSNs/CSNs_V_StCentr_06_big.html

such as Donatello (Sometimes known as the founder of modern sculpture), Leonardo da Vinci (Known for various works including the Last Supper in 1497 and the Mona Lisa in 1504), and Michelangelo (Whose work included the ceiling of the Sistine Chapel in 1512). Architectural styles also changed to emphasize symmetry, proportion and geometry while reviving classical elements of Roman and Green designs. Examples of literature from the period supported individualism, and range from the works of Dante on religion to Shakespeare's expansive collection of plays. (Hunt 2-3)

The Scientific Revolution

The desire to understand the world was at the core of Renaissance thinking, and so science also saw a major revival in the period. Most notable, perhaps, is the invention of the Scientific Method of experimentation and observation, the methods of which were applied to question all aspects of the world and are still used in modern science. Work in the field of astronomy by Copernicus and later Galileo, overturned the Earth centered view held since classical Greece and led to a new view of the universe and the discovery of the Telescope allowed the theories to be honed significantly (Though it was not until the late 17th century that Isaac Newton discovered why the system worked as it did in his work with gravity and forces). Discoveries in the areas of anatomy and physiology overturned many of the myths and inaccuracies perpetuated by classical authorities such as Aristotle, and were also used as a basis for much of the realistic art of the time. The invention of the microscope by Leeuwenhoek in the mid 17th century opened the way for even greater study. The invention of the printing press in England in 1476 was also an extremely important and influential advance, helping to quickly spread classical literature and more modern works throughout Europe. (Hunt 76-79)

Government and Nations

The nature of government throughout Europe underwent drastic changes during the 15th and 16th centuries. During the Middle Ages governance was based on personal holdings and inheritance of noble and royal families, where loyalty and service were due to a feudal lord regardless of nationality. Wars were waged using feudal obligations to build forces based on unskilled peasants to trained knights who fought in exchange for smaller land holdings or fiefdoms. Kings were said to be chosen by God, and the Church held substantial power over governments. (Hunt p33)

The Renaissance saw the reemergence and spread of nationalism. More powerful rulers began to overshadow lesser nobles, writings on the theory of government (Machiavelli's for example) were widely discussed and studied, and states began to conform more to geographical borders and become more nationally consolidated . Examples of this can be seen in England losing the last of its land holdings in France in the mid 16th century, Frances border conforming to the Alps and Pyrenees in the 16th century, and Switzerland and later the Netherlands defining themselves with a national identity. Nationalist ideas were often personified in the now powerful single kings of these new nations, or in powerful imagery and ideas such as that of Joan of Arc in France or Scottish resistance to English claims. War became a more massive and expensive undertaking, with nations requiring well trained troops or mercenaries to handle the new tactics and weapons of the time. And while kings did not release the idea that they were Gods appointees, they became more resistant to political influences from the Church and Pope. (Hunt 33-35) The influence of the Church was further weakened by other factors, such as its inability to explain the disaster of the Black Plague and its effect even on the pious, the scientific revolution and its alternative viewpoints, and the splits caused by the Reformation movement and the Protestants (Most notably Martin Luther and his 95 theses in 1517 and the writings of John Calvin later in the 16th century). (Hunt 55-56)

Renaissance Warfare

"...the European art of war combined different arms and formations in the 16th century. Cavalry, light and heavy

artillery, pikemen, and arquebus-carrying infantrymen are accompanied by supply wagons that could double as

emergency field fortification around the encamped army's perimeter. Flags projecting above the array of pikes

signified subordinate units of command, which allowed maneuver on the battlefield. This is an idealized portrait: in

practice guns could seldom keep up with marching troops, and ground was almost never flat enough to permit an

army to move forward in such a broad front formation."

- Leonhardt Fronsperger, Von Wagenburgs und die Feldlager (McNeill 95)

"Instead of raising young boys to play with wooden horses or dolls and toy carts, order six thousand models

(wooden or pottery) of horsemen, arquebusiers and pikemen, also model cannon, castles and towns. "With these

little models you can carry out and explain [the tactics of warfare]… in such a way by the age of ten… instead of

having passed the time uselessly, they will have formed the habit of thinking of themselves as a soldier or a

captain."

– Jean de Tavannes, 1596 (Hale 144)

Warfare, army organization, and tactics all changed radically during the renaissance. Along with the obvious effects of new firearm technology were the new ways of thinking introduced with the renaissance. War was seen as any another topic, one that could be analyzed, quantified, and reduced to formulas. Siege engines and the design of fortifications, for example, depended on geometric calculation. Gunpowder was an important part of this reform, where it played an important role in the new planning and tactics. (Arnold 19)

Siege Warfare and Defense

2 Image: A&A BL MS Royal 14 E IV Siege, 1470-1480

The first and most visible change to warfare in the renaissance period was the introduction of large scale gunpowder weapons. The powerful and showy weapons quickly advanced to dominate many armies and smashed through many of the standard defensive fortifications of the time. As an example, in 1494 a French force reduced to rubble in eight hours a fortress in Naples that had recently withstood a seven year siege. (McNeill 89)

In siege warfare, continual fire was important to keep the besieged from rebuilding or fortifying the bombarded position. Gun crews were trained to work in rotations: Load, aim, fire, sponge, scrape, and reload with minimal time to allow the heated barrel to cool. Unfortunately, the expanding and contracting overused metal often eventually gave way, sometimes merely blowing the muzzle off of a gun and other times failing catastrophically and possibly injuring or killing dozens of attackers. Siege warfare was also anything but cheap, with a contemporary estimate of an average force at firing over three thousand shots per day, using more than sixteen tons of gunpowder, and a single 50-pound cannon employing a force of three bombardiers and fifteen assistants.(Arnold 33) Even moving a full cannon was a tremendous undertaking, requiring as many as 20 horses or oxen over ideal terrain and a large winch, tackle and tripod system of unloading and loading the cannon from its traveling cradle to a firing carriage. As an interesting note, many large scale offensive operations were held during the grass growing season to alleviate some of the tons of animal fodder they needed daily. The transport was often hazardous as well, with hazards such as weak bridges and muddy roads miring advance and

retreat to the point that rushed armies were known to bury or even break up artillery pieces for later recasting. (Arnold 34) The initial costs were staggering as well, with a 50-pound cannon and carriage costing about as much as a month's wages for 1,500 infantrymen in 1595. (Arnold 44)
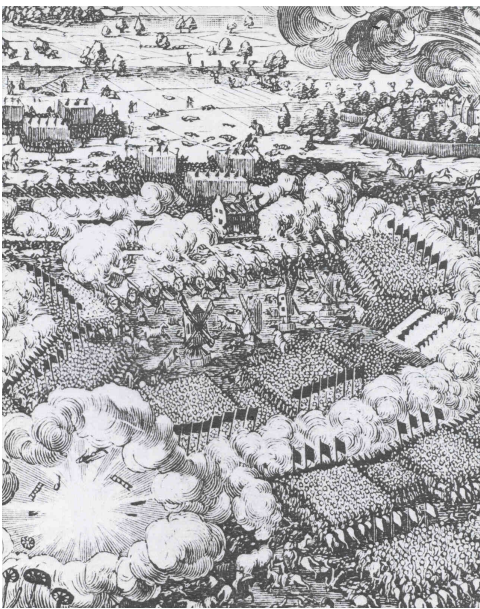
The first defensive response to the massive firepower was the obvious: build stronger castles. The new fortifications with walls meters thick and surrounded by sturdy towers with their own artillery had problems of their own though, mainly their inability to provide adequate defensive fire while being protected from long range bombardment by an embankment, their vulnerability to new gunpowder mines placed under their base, and their high cost. The main alternative to the costly new towers was based on earthwork ditches and mounds and additions to existing defenses (Such as shoring up existing walls with piled earth, wood, timber, and even wool) to attempt to lessen the impact of and deflect incoming fire. Standard vertical defenses like gates and towers were also shortened to make them more difficult targets and earthwork defenses were often constructed in lieu of artillery towers to provide defensive fire. In the *Art of War* Machiavelli even noted that peasants could be considered the best soldiers because of their familiarity to working with a spade and shovel (Soldiers often despised manual labor and refused to dig, even for extra wages). (Arnold 35-41)

Analyzing the problem of defense from the renaissance view, as one that boiled down to angles and lines of fire, produced another important defensive marvel in the angle bastion, an inset arrangement of cannons and towers that provided almost complete coverage of infantry approaches to a fortress that became a standard in design by the mid 16th century. It is important to note however that while theoretical marvels of design and planning, the angle bastion was not perfect in application. An experienced Huguenot captain even wrote 'impoverished fortifications

of earth were "no less defensible" than an expensive stone citadel designed by the priciest Italian engineer'. (Arnold 45-47)

Changes to Infantry Organization

However the ideas behind the bastion, the way of thinking and the formulas of flanking and fields of fire, also translated to infantry tactics. The greatest example of early reform came from France, where in 1534 King Francis I worked to completely re-model his army to the old Roman system of Legions (In keeping with the renaissance view of recovering ancient ideas), drawing from their organization and tradition of disciplined native troops led by native autocracy.(Arnold 55) Other examples of Renaissance armies learning from antiquity abound, including Francesco Patrizi's 1595 *Military Parallels* which worked to accommodate 'the various customs and regulations of the ancients' to firearm warfare. Well trained and nationally devoted native forces were appealing to leaders in a time when much soldiering was a haphazard mercenary affair, where economic troubles and mutinies often abounded. (Arnold 58-59, McNeil 107) Reformers were after an entire overhaul of the military regime, not just new tactical tricks: Professional infantry should march in step, be ordered in regular grid formations

3 Image: A&A 17c battle, square formations

of ranks and files, and they should be constantly managed by a strict hierarchy of officers. (Arnold 66) This sort of control was especially important as the size of armies increased; French forces doubled in size from 25,000 to 50,000 between 1480 and 1558 as an example. (Hale 62-63)

A new infantry culture formed across Europe over the turn of the 15th century, focused on these ideas of 'order, pattern, form, precision and repetition'. (Arnold 66) The core of these new units was the Pikeman, arranged in regular squares. Despite its seemingly simple design, the pike is a heavy and unwieldy weapon and training for effectively using it in groups was difficult. Organized training progressed from smaller supervised groups to small formations of a dozen or so up through full battalion formations involving hundreds or even thousands, moving in step to a drum beat (A new innovation at the time). Guns slowly became another standard of the infantry formations, supplanting the crossbow in part for psychological and fashionable reasons and in part practical ones (Simple firearms were cheaper than crossbows, and an infantryman could carry more ammunition for them). (Arnold 72) European militaries embraced gunpowder with its loud booming and black smoke. It became a point of pride and nobles and officers often included displays of firearms in military parades and drill and even other occasions. (Arnold 32)

Infantry firearms truly began in the late 15th century with the Arquebus, a simple firearm with an innovation in reliability and accuracy in its matchlock mechanism of firing. After the mid sixteenth century the musket, a heavier firearm that often required a supporting mount, became more common. An account dating to 1591 by Humphrey Barwick stated that a musket ball could penetrate the best armor at 200 yards, and ordinary armor at twice that range.(Arnold 75) Of course accuracy with early firearms was an issue, with accurate musket range given as anywhere from 60 paces (A little under 180ft) to about 200 yards. (Arnold 31, 73)

Tactics adjusted to the new weaponry, incorporating it in the same way as bowed weapons and combining them with the established rank and file pike tactics and persisting even as the ratio between muskets and pikes shifted towards the firearm. Slow-loading firearm infantry were vulnerable to quick cavalry advances, whereas the pike square had basically been

invented to disperse them, so combining the two tactics worked well. The attachment of firearms to a pike square was a problem unto itself, and many solutions were advanced based on the military architecture and flanking fire tactics of the time. Robbert Barret, in his 1598 *Theory of Modern War* described "A well framed battle or squadron of pikes, well impaled with shot and angled with squadrons of Muskets, seems a Castle… [and if] framed of expert and resolute men, is of a wonderful force". (Arnold 80) The countermarch, a system where men advanced to the front of the column, fired, and then retreated to the end of the line through spacing between rows to reload, allowed block formations to maintain almost continual fire, even when moving. Over time, along with advances in minimized loading times, the countermarch formation led the way to the thinner, longer line formations of the next few centuries. (Arnold 78-81, McNeill 94)

The Decline of the Knight

This transformation also had direct effects on the traditional armored knightly elite. The standard view of close in mounted combat being the most honorable and superior form was challenged by its increasing obsolescence, especially in the face of strong pike formations and the proliferation of ranged weapons that could pierce standard armor. The military elite also quickly became part of the new officer leadership model, leading by proxy in a system where personal battlefield example was much less important than tactical generalship. Warfare, among those of higher status, became more of an intellectual problem than an athletic one. (Arnold 87-88) Also waning was the traditional outlook of aristocratic warfare: To fight for renown over other goals, even going so far as to avoid danger unless there were spectators present to notice the individual bravery. (Arnold 94) Some of the mingling changes were particularly interesting,

such as the German Reiter: Armored cavalry that carried a brace of loaded pistols into battle and fought in a style reminiscent of the countermarch. (Arnold 98-99)

It did take several generations for the mounted combatant to lose his position at the forefront of war, and with good reason. Tradition aside, the mounted combated was a fearsome opponent: Highly trained and well armed, riding powerful horses bred for war, and wearing the best defensive protection available. Armor manufacture reached its height during the renaissance, well balanced and fully articulated works of overlapping plates, and a well made suit could deflect or blunt most lance, crossbow, and early firearm strikes. (Arnold 90)

Firearms Abroad

Europeans were somewhat unique in their take on firearms and the new tactics of warfare. Elsewhere, the quick advancement of defensive technologies did not occur at the same pace and large 'gunpowder empires' were formed where the drive to advance stagnated while in Europe constant competition led to an ongoing arms race and the fast spread of innovations. When nearby neighbors clashed with Europeans on land, such as the conflicts with Russian and Ottoman forces in the second half of the 16th century, they were often handily defeated. In the Mediterranean Sea, Europeans adapted cannons to their new, heavier, all-weather ships to turn them into floating gun platforms. The newly armed ships were incredibly devastating to the light ships of the time, and continued to be a major force for centuries when no defense against them on the open sea was forthcoming. The new sea supremacy along with the advances on land helped pave the way for centuries of worldwide European imperialism. (McNeill 100)

Renaissance Weaponry

The armies and soldiers of the renaissance period used many different types of weapons, both old and new for the time. The following is a general overview of the most common types of weaponry associated with and used during the Renaissance period.
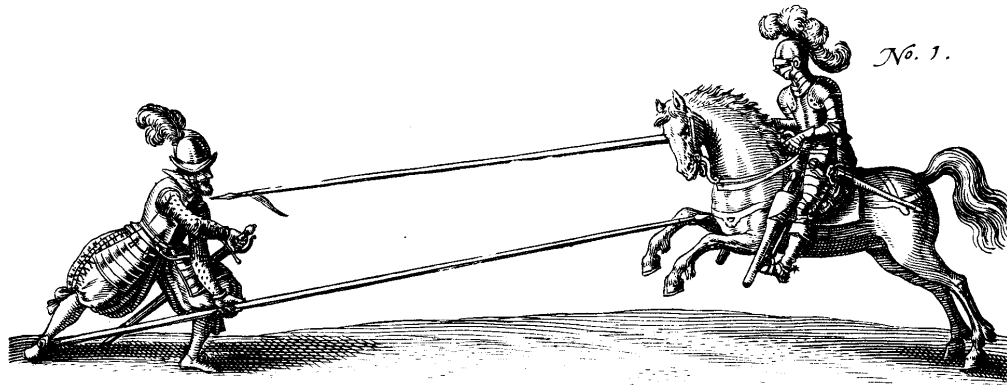
4 Pike and lance, 1616 (Intro to arms and armor ppt)

The pike

The pike, simple pole weapon, was the infantry's answer to the lance and cavalry charges it accompanied. As long as sixteen to twenty-two feet and tapered to reduce weight (Anglo 166), the pike was topped by a single spike or similar headpiece and the haft was occasionally reinforced with metal straps to prevent the head being severed. Several styles of use evolved through the period, from holding the pike above the head to bracing it against a soldier's foot to help in receiving a charge. (Jherek 3-5)

The pike was popularized in the early 15th century by the Swiss, who quickly adopted it into their primary formation. A series of decisive victories with its use led to its spread through the continent.

When combined with the disciplined and organized formations of the renaissance period, a collection of pikemen (often numbering over a thousand) created a bristling wall of points (With square formations often as many as five points were forward of the first rank of men per file) that nothing could

safely approach. Ordered formations were essential, as any break in the line could be exploited by a charging horse or infantryman with more maneuverable weapon to advance past the tips of the pikes and render them ineffective. The main counters to pike squares included using another pike square against them and disruptive ranged attacks with projectile weapons. (Jherek 3-4)

5 Pike, early 17th century (HAM 169)

The lance

Another simple pole weapon, the lance was a long spear (Commonly up to 16 feet long) used for thrusting by cavalry. Various designs existed, including hollow lances to reduce weight and increase possible length and fragile lances designed to limit injury in tournaments. (Anglo 250, 219)

The lance was usually carried upright, resting in a small pouch or on the soldier's thigh. During an advance it was placed in a rest and lowered smoothly near the end of a charge to reduce tip movement and increase accuracy. (Anglo 250) Various other techniques existed as well, including tying the lance butt to the saddle of a soldier's horse instead of using a traditional rest. (Anglo 219) A lance could only be used a single time, on first contact with the enemy, because barring a complete miss or glancing blow lances almost always shattered on contact from the forces involved. (Arnold 93)

The lance is one of the distinctive weapons of the mounted man at arms, designed to deliver devastating power to the target of a cavalry charge. Although the lance was usually non-lethal against armored targets unless it perfectly struck the neck or head, it still often injured or dismounted the opponent (allowing infantry to finish them off), or was used against the opponents mount. (Jherek 11,

Arnold 92) A large and often unwieldy weapon, it required great skill and training in both its use and horsemanship to handle effectively. By the late 17th century the lance had lost much of its battlefield role, but was still an important part of displays of martial prowess through jousting. (Arnold 92-94)
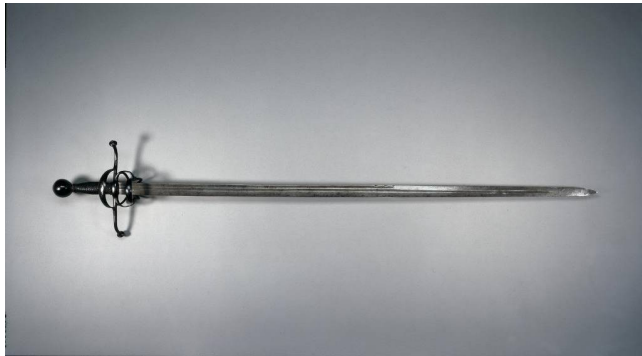

Image: Rapier, A&A CMA 1916.1719

Swords

During the renaissance period, the sword moved from the most popular weapon (during the medieval period) to a favored secondary weapon of both infantry and cavalry after the lance and pike respectively. (Bull 96) By the fourteenth century the average length of the sword had grown to around 50 inches. With the advent of plate armor period came rigid swords and combat techniques that moved towards emphasizing stabbing attacks and disabling the opponent. (IQP 67, 71) Large two handed swords became popular for infantry use against pole weapons during the 15th and 16th centuries. (HAM 635) Narrow straight thrusting swords also became prominent during the period, beginning in southern Europe in the 16th century, and developed into the rapier. (Bull 96)

The long-sword was the mounted knights favored sword, due to its versatility. Weighing 2 to 5 pounds with a 35 to 40 inch blade and large handle, the sword could be used in one or two hands and was useful in mounted and unmounted combat against both armored and unarmored opponents. (IQP 70) When mounted the sword could be used to cut or thrust against both cavalry and infantry, and favorite

tactics included attacking mounted opponents from their left 'blind side' and targeting the reins needed to control his mount. (Jherek 11)

The Bayonet

Introduced in the mid to late 17th century, the bayonet was essentially a simple round handled knife that fit snugly into a gun barrel (Later versions overcame the barrel-blocking problem and were attached in a socket beneath the barrel). This light and cheap simple device turned a standard musket or arquebus into an impromptu spear, allowing firearm infantry to quickly mount a solid defense against a charging opponent or to attack in close quarters or when out of ammunition. The widespread adoption of the bayonet near the end of the renaissance period was one of the major influences behind the removal of pikemen from armies and the decreasing use of swords. (Bull 105)

Artillery: Cannons

"…the French brought a much handier engine made of bronze, called cannon, which they had charged with heavy iron balls, smaller without comparison than those of stone made use of heretofore, and drove them on carriages with horses, not with oxen, as was the custom in Italy… the balls flew so quick, and were impelled with such force, that as much execution was done in a few hours, as formerly, in Italy in the like number of days." – Francesco Guicciardin, early 16th century (Jherek 13-14)

6 Image: A&A Siege of Orleans, 1475)

The first real evidence of gunpowder and cannon technology appeared in the middle of the fourteenth century, with an illustration of a simple bulbous weapon explosively firing a large arrow against a tower gate. Interestingly, late medieval siege equipment such as the catapult was often more accurate and effective than early cannon. However, the flashy and exciting gunpowder weapons captured the popular eye and replaced the older weapons of war by the mid fifteenth century where advances (such as the invention of corned gunpowder and the switch from stone to iron shot) quickly made the cannon more effective. (Arnold 24-26)

Early guns were constructed of wrought iron and reinforced with metal hoops, and were often dangerous, known to burst apart and weaken over time. Later bronze guns, cast whole using methods developed for cathedral bell-making, were as much as ten times as expensive but were much less likely to burst or explode and allowed larger charges to be used. Advances in metalworking in the sixteenth century later allowed cheap and reliable cast-iron cannons to be built. Cannon designs also changed, moving from early gigantic stone throwing bombards and mortars to smaller, leaner forms (Though many siege cannons remained quite large) and from breech loading to muzzle loading. Other advances included trunnions (metal projections that allowed easy elevating of the gun), and improvements in carriage design (2 wheeled platforms that made for a stable firing position, could be transformed for transport with the addition of 2 wheels, and were a vast improvement over the previously common practice of using sleds or simply wedging a cannon into place with timber). (Arnold 27-28)

Siege cannons usually fired balls of 50 to 100 pounds, weighed from 5 to 10 tons, and had an effective maximum range of about 4 to 6 thousand paces (about twelve to eighteen thousand feet). (Arnold 31) A siege cannon could be expected to fire around 80 times per day, use over 1.5 tons of gunpowder, and required a firing team of 3 master bombardiers and 15 assistants to operate. (Arnold 33) A sizable sieging force could often overpower standard medieval fortifications in a matter of hours, as opposed to the months previously required.

In contrast, lighter cannon for use on the battlefield fired balls of roughly 12 to 15 pounds, weighed 1 to 2 tons, and could at maximum fire just over 3 thousand paces (9000 feet). (Arnold 28, 31) One of the main uses of small artillery on the battlefield was to break up tight enemy pike squares, where cannon firing on pinned or unprotected formations could produce tens of casualties with a single shot. (Jherek 4)

Infantry firearms: Arquebus and Musket

7 Image: Musketeer, 1615, Intro to arms and armor ppt

Early infantry firearms appeared in the mid 14th century and were essentially simple metal tubes, closed at one end. These tubes were filled with gunpowder and then the shot (Earlier a metal arrow, later a ball) and fired by lighting the powder through a 'touch hole' punched in the side with a hot wire or smoldering wick. Early 'handgonnes' were braced against the chest and the operator often had to look away from his intended target to find the touch hole, making for issues of recoil and general accuracy. (Jherek 5)

The first major advance came with the introduction of the serpentine lock (and later the matchlock) in 1411. The matchlock is a simple device that holds a slow burning match and lowered it into

the touch hole when a lever (trigger) was pulled. The new technology allowed the gun to be braced against the shoulder, limiting the effect of recoil and allowing for more powerful charges, and increased accuracy by handling the ignition while the target remained in a gunner's sight and allowing the gun to be supported with both hands. The matchlock remained the primary weapon of infantry, despite later advances attempting to bypass the need for a lit match, including the wheelock (Similar to a modern lighter, was popularly used in pistols for cavalry) in 1515 and the firelock in the 1550s (A mechanism using spring loaded flint and steel over a priming pan of powder). (Jherek 5-6)

The arquebus was a muzzle-loaded matchlock firearm invented in the mid 15th century and in major use by the early 16th century. Its name originated as the It weighed around ten pounds, had a barrel about three feet long, and typically fired a half ounce lead ball. (Jherek 6) The musket came into being in the early 16th century, and was essentially a larger version of the arquebus. Early versions weighed as much as thirty pounds (The weight later decreased to closer to fifteen pounds), included a barrel that was up to five feet in length, and fired approximately two ounce lead balls. The musket was often so heavy that a soldier had to carry a forked rest on which to support it and it was even operated by a team of two on occasion, but it had obvious advantages in range and destructive power. (Jherek 5-6, Bull 87) An account from 1591 by Humphrey Barwick stated that a musket ball could penetrate the best armor at 200 yards, and ordinary armor at twice that range.(Arnold 75) Of course accuracy with early firearms was an issue, with accurate musket range given as anywhere from 60 paces (A little under 180ft) to a maximum of about 200 yards. (Arnold 31, 73) Over time the number of arquebuses in use declined and the number of muskets increased. However, the weight of muskets continued to decrease over time, eventually making the firearms nearly synonymous. (Jherek 6)

An interesting development for small firearms was their later adoption by cavalry. Pistols (large by modern standards, up to two feet in length and weighing over five pounds) using the new firing mechanisms appeared around the 1540s, and spread as a way for cavalry to attack a pike formation. A mounted pistoleer often carried two or three loaded pistols into battle in

holsters on the saddle, firing at close range in an attempt to avoid accuracy issues. The pistol came to replace the lance in some cases for its superior shock value, armor penetration, range, and effectiveness even when stationary. (Jherek 12-13)

Crossbows

Staples of medieval warfare, the crossbow provided many times the impact force of standard bows and could be used effectively with simple training. Surprisingly, crossbows were still a common sight into the 16th century, long after the introduction of firearms. (Jherek 5) A crossbow could be fired with as much force as early infantry firearms, could be aimed with greater accuracy, and had a similar range and rate of fire. The crossbow was eventually supplanted by gunpowder weapons as the era progressed, in part for psychological and fashionable reasons and in part practical ones (simple tube firearms were cheaper than the complicated crossbow, and an infantryman could carry more ammunition for them) (Arnold 72)

Renaissance Armor

The early 16th century and the sweeping changes taking place across the battlefields of Europe put increasing pressure on the usefulness of armor. The vast changes in military and social organization and the increasing firepower available brought out questions about the practicality of the traditional singular armored and mounted man at arms. The primary method of protection during the renaissance was metal plate armor, usually made of steel, which did an excellent job of distributing blows and preventing slashing, cutting, and piercing injuries. A well made suit would deflect everything but an extremely well aimed lance, crossbow bolt, or even arquebus shot. It is ironic that at a time when the craftsmanship of armor was at its height, with full suits of elaborate and well made articulated plates, and a time where our traditional 'Knight in Shining Armor' imagery comes from that armor was losing its place militarily and

craftsmen were focusing more on style and decoration. (Age of Armor 49, Arnold 90) However, even after the decline armor was seen as a traditional symbol of power and nobility, and was worn symbolically for some time. (Lacombe 158)

Types of Armor Worn

A typical footsoldier from the beginning of the renaissance, around the end of the 15th century, would wear an open-faced solid plate helmet, a mail jacket and a leather brigandine vest to which metal plates were riveted. (Bull 82)

During the renaissance, the amount of armor worn depended on a soldier's job. Pikemen, halberdiers, and other hand-to-hand and melee combatants were slow to discard their armor and wore a breastplate, backplate, 'tassets' (thigh and groin protection), and arm defenses. Firearm carrying infantry wore little major protection, often only a helmet. Cavalry were divided into heavy and light classes, with heavy lance-carrying cavalry wearing full three-quarter plate suits and heavy leather leg protection and lighter cavalry, often armed with ranged weaponry like pistols, wore only a helmet and breastplate or less. (Bull 88) Cavalry horses also often wore plate barding, covering their head, neck, chest and hindquarters. (Arnold 92)

Use and the eventual discarding of armor

The main problem for the culture of armor was the advent of the firearm (and earlier, the crossbow) and the pike, with which regular infantryman could deter armored cavalry charges and kill even the most well trained and armored knight. (Bull 87)

The initial trend of the period was similar to that taking place in fortifications faced with artillery; simply build thicker and stronger armor. Armors were often given grades of 'pistol-proof' or 'musket proof', and many armorers tested their pieces against firearms and left the dents and marks as proof of their resilience. (Arnold 90) This thickening meant, however, that the armor (breastplates in particular) became increasingly heavy and cumbersome to protect from the small arms fire. This added weight was compensated for in many areas by discarding much of the leg and foot protection. (Lacombe 156) Even at its protective peak combat armor was never over-encumbering, and even in full plate a man-at-arms could mount his horse, raise both arms above his head,

and maneuver and turn sufficiently in the saddle. (Tournament armor was a different case entirely, being much more burdensome and constrictive to the point that the helmet was sometimes bolted to the breastplate. Such suits were not intended for actual combat however.) (Arnold 92)

8 Image: Three-Quarter Field Armor, 1575-1600, A&A: AIC 1982.2102

This trend of discarding continued with infantry, where a movement against armor was also taking place. In the 17th century the Swedish leader Gustavus Adolphus was one of the first to question armor's value to infantry as something '…which deprived the soldier of his freedom of movement, and seriously affected his spirits; and all this to no purpose, since his armor did not secure the soldier against musket balls…'. (Lacomb 157) Many soldiers of the time agreed with this line of thinking, often seeing their armor (which they usually had to pay for themselves) as an old-fashioned and unnecessary encumbrance against the new weapons of the age. Some soldiers were even said to develop long-term maladies and deformations from wearing their armor habitually. In response many soldiers fell into the habit of only arming themselves at the moment of battle, used excuses such as surprise to appear without it, or even wore only their cloth tabard covering to hide their missing defense. In the mid 17th century Adolphus and other leaders began to lessen the armor worn, beginning by removing all of the limb

protection (Which was considered useless against firearms, and not worth the weight) and leaving only light torso armor and a helmet. This left the soldiers with armor that was still effective against swords and bayonets while lightening the load and costs involved and increasing freedom of movement and convenience. (Lacombe 157-160)

These changes are easily seen in the 'New Model' English infantry established in 1644. Two thirds of the new forces were equipped with muskets and one third was pikemen, but none wore any form of armor. The New Model cavalry wore only breast and back plates and pot helmets. In the 18th century linear musket formations and the bayonet displaced the pike, and with it the last armor worn by regular infantry. (Bull 100-107)

Design and Style

Military armor for the common soldier became increasingly slab like and utilitarian with its mass production across Europe as the era progressed. More prestigious workshops also existed, importing skilled craftsmen to make armor for nobility and royalty. The design of higher quality armor styles changed often, following the changing tastes of non-military fashions (As can be seen in the changing footwear: In the 1400s foot armor resembled pointed leather shoes of the time, while in the 1500s broad flat toed 'Cow's-mouth' style shoes became popular and armor changed to match). As the period progressed the armorer's craft became more artistic, focused more on parades and tournaments (which became immensely popular in the late 16th century) than on warfare. (Bull 88, 93) Some apparent flourishes even served a dual purpose, such as the fluted and folded Maximilian style in the early 16th century, which added stiffness and strength for little weight (But was difficult and time consuming to produce). (Arnold 90)

Conclusion

The group completed the previous research document during A-term of the 08-09 school year. Using this research, the group picked out the prominent trends in armor development which relate to the Higgins Armory collections. Using these prominent trends, the group drafted an initial script for the documentary. After multiple iterations, editing for length, language, and content, a final, concise script was produced. This script was designed to present historical information on a level understandable by a broad audience.

Using the script as a starting point, the group began to obtain footage for the documentary, including images from Higgins Armory's database, video footage of live re-enactors, photographs taken by the group of Higgins artifacts, and other online and literary sources. The group then edited the documentary using Adobe Premiere Pro. The narrator, Ian J. Morse, read the script, and was recorded by the group. The sound files from the narration were used in the iterations for the documentary. Music composed by the group was also added in later iterations.

As the group conducted research, we discovered that concrete historical fact is not always ascertainable and there are fundamental disagreements between historians. For example, why did thick plate armor develop only in Europe and not in Asia, where presumably the same technology and battle conditions were present? The answer to this question is not known with certainty. The group had to find a way to deal with these uncertainties in order to present a factual documentary to the public. All uncertainties were presented as such. Many of them were originally explained through interview segments with a subject-matter expert, Professor Jeffrey Forgeng. Though, out of time constraints, much of the interview was eventually cut out.

After the conclusion of the PQP, we lost the member of our group who was intended to be in charge of researching documentary filmmaking. As a result, the remaining group members became responsible for the technical aspects of designing and editing the documentary without the benefits of previous experience with the involved software and hardware. In addition, we had hardware issues with some of the recording equipment borrowed from the WPI ATC which resulted in lower than expected quality video and sound on our interview and artifact footage. Finally, due to a software update of Adobe Premiere Pro on the WPI Movie Lab computers previous iterations of the documentary footage were incompatible. This set the group back by a week in time spent remaking much of the footage.

The subjects studied during the initial term of research were both too broad and too detailed. Many of the topics covered in depth in the research were not relevant to the final documentary, and much of the detail was rendered unnecessary. The broad nature of the research did aid in understanding the 'bigger picture' around our topic, but many of the fringe topics should not have been given as much time. More focus should have been placed on armor specifically, instead of leaving it for the last week of research and fourth of the paper. In future projects, we suggest that groups realize that the 12-15 minute time constraints on the documentary do not provide room for a large number of broad topics and restrict their research accordingly. As far as resources were concerned, Inter-library loans took longer than first anticipated, pushing valuable research back by at least a week. More or easier access to the Higgins library would also have been very useful early on.

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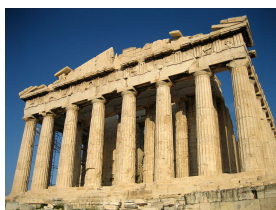Achilles_in_Corfu_Achilleion.jpg>

Dendra Panoply
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Peter Connolly, "Greece and Rome at War" (Prentice-Hall, 1981)
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Appendix A: Team Biographies

Genevieve Boman

My name is Genevieve Boman and I am a physics major from Racine, Wisconsin. Upon completion of this project, I am in my Junior year at WPI. I will be completing my MQP at MIT Lincoln Laboratory next year. Among many other things, I am a scientist, a writer, a rock music lover, an environmentalist, and a dancer. Given the choice, I would like to spend most of my time outside, surrounded by nature, writing an astrophysics thesis, or listening to music and dancing. I love going to contra dances, and I am a member of the WPI ballroom dance team. I have been involved in pre-professional ballet summer programs and Irish Dancing Championships. I like old architectural structures, particularly European castles and cathedrals. I have been fortunate enough to have had the chance to travel to Spain and Italy and to spend time in a number of such buildings. I have been fascinated by the medieval time period for as long as I can remember.

Tamlyn Miller

Tamlyn Miller is an Interactive Media and Game Development major and Music minor at Worcester Polytechnic Institute. He often thinks of ideas for video games and how to present a story to viewers. He also enjoys composing music for various purposes, including for his a cappella singing group, the Audiophiles, and for his projects. Since he was young, Tamlyn was interested in Greek mythology and history. With this interest and with his ability to present both story and music, he felt that he would be a good asset to this IQP team.

Gregory Sheaffer

My name is Gregory Sheaffer, and I am a Computer Science major at Worchester Polytechnic Institute from Scotia, NY. European history is an area of great interest to me, especially technology, and I am a member of the School Society for Medieval Arts and Sciences.

Appendix B: Documentary Script

At the Higgins Armory Museum in Worcester, Massachusetts, you will see one of the western hemisphere's largest collections of armor.

Through the ages, warriors charged into the heat of battle, relying on their armor to keep them alive. Kings and noblemen hired smiths to forge new and stronger armor so their armies could achieve victory over their enemies. Join us as we travel from Ancient Greece through the Middle Ages and into the Renaissance to explore how armor helped to shape the course of history.

By the time of the legendary Trojan War around 1500 BC, the ancient Greeks had learned the art of making bronze, a metallic compound created by melting copper and tin together. Bronze is stronger than both copper and tin, and the early Greeks used this durable metal to forge weapons and armor.

The early Greek kingdoms collapsed around 1200 BC, but Greek metalworking technology continued to develop. During the following centuries, the Greeks began to experiment with a new metal for arms and armor: iron. Iron is stronger and lighter than bronze, but it has a high melting point, and early metalworkers could not purify iron ore by melting it as they did with copper and tin. Early iron had impurities running lengthwise in the metal, like the grain of wood. These impurities could cause iron to break apart when struck through the grain, making it unsuitable for armor but useful for thrusting weapons, which only had to be strong in one

direction. The Greeks learned to make weapons of iron, but they still preferred bronze for their armor.

(Prof. Forgeng's answer about the reason for going back to bronze from iron)

The classic Greek city-states began to take shape around 700 BC. At this time, a new style of warfare arose, based on the phalanx, a closely packed, heavily armored squad of infantrymen. These infantrymen, called hoplites, were named for their large round shield, the hoplon. Hoplites wore a helmet forged from a single sheet of bronze. Known today as a "Corinthian" helmet, this style of helmet had restricted vision, but this drawback barely affected hoplites, who were trained to rush straight into battle against an opposing phalanx. The armored hoplites proved their worth in the battles of the Persian Wars, such as Thermopylae in 480 BC, where the Spartan King Leonidas and his three hundred men held off the Persian armies.

Greek culture spread through trade and colonization around the northern Mediterranean. One of the areas most influenced was Italy, where local tribes, including the early Romans, adopted versions of Greek arms and armor. During the final centuries BC, as the Romans grew from tribe to republic to empire, they also developed their metalworking skills and began forging the first iron armor. Roman legionaries wore an iron helmet and a lorica segmentata, a suit of iron bands held together by leather straps.

By the late years of the Roman Empire, around 300 AD, the mail shirt had become the standard

armor of the Roman soldier. Mail consisted of riveted links of iron, interwoven to form a

protective garment, which could weigh up to 40 pounds. After the collapse of the Roman Empire

by 500 AD, Roman arms and armor continued in use in the barbarian kingdoms of the early

Middle Ages.

The mail shirt remained the armor of choice for medieval warriors, as described in the

epic of *Beowulf* :

> Each tough hand-linked coat of mail sparkled, and the shimmering
>
> ringlets of iron clinked in their corselets. When they arrived in armor
>
> at the hall, the sea-beaten men… seated themselves on the
>
> bench, their corselets rang.

Most of what we know about armor of this period comes from artwork, since few

physical examples have survived. The Bayeux Tapestry, made around 1075, shortly before the

First Crusade, is an important source of information on the armor worn by early knights. They

wear close-fitting mail hoods beneath helmets similar to those of late Rome. The hood is

connected to a mail shirt which was put on over the head and split in the front and back to allow

the wearer to ride a horse. A row of such charging knights was used to break enemy lines on

medieval battlefields.

Mail armor protected the knight from cutting attacks, but did not keep him safe from

stabbing or blunt force strikes. Tapered piercing weapons could force their way through the

links. The flexibility of mail armor allowed the warrior freedom of movement, but left him vulnerable to blows from bludgeoning weapons like the war hammar, which could crush bones and organs right through the mail.

 Out of these threats to the life of the medieval warrior, a new form of armor was soon to be born.

The image of the knight in shining armor has its origins in the 1200s, when plate armor was first added to the knight's mail defenses.

(Interview clip in which the causes for the development of plate are explained.)

By the mid-1200s, knights were strapping on kneeguards of iron plate or hardened leather. Plate armor for the arms developed soon after. Similar plates were being worn on the chest and back, though they are harder to detect in medieval artwork, since they were hidden under a decorative cloth overgarment. By about 1330, plate reinforcements for all the main parts of the body were in general use. Over the rest of the century, the plates grew in size, and came to be jointed to each other instead of being riveted inside a fabric shell. In the early 1400s, the fabric was discarded, and the knight in shining armor had come into being.

The complete suit of plate was known as "white armor," worn without any cloth covering to emphasize the beauty of the armor itself.

The Gothic style of Germany was marked by pointed lines and fluted, or grooved, surfaces. The pointy, elongated look of gothic armor evokes the image of gothic cathedrals and

the ribbing on the armor is similar to the ribbed vaulting inside the cathedrals. Fluting echoed the pleating of the gowns of the knight's civilian clothing.

The design of higher quality armor followed the changing tastes of civilian fashions. Footwear was an example: During the 1400s the armor shoe, or sabaton, resembled the pointed leather shoes of the time. When broad-toed shoes came into fashion in the 1500s, sabatons changed to match.

Soldiers wore different armor depending on their role in combat. Mounted warriors wore the most armor, giving them maximum protection without slowing them down in battle, since their horse carried the burden. A full horseman's armor might weigh as much as 60 to 70 pounds. Cavalry horses also often wore plate barding, covering their head, neck, chest and hindquarters. Pikemen, halberdiers, and other close-combat footsoldiers wore helmets and breastplates, with somewhat lighter armor on their arms and thighs. They wore no armor on their lower legs, since it would slow them down on the march. Bowmen wore only light protection on their head and torso, since they needed good visibility and mobility to use their weapons. Specialized tournament armor provided extra protection at the cost of added weight and reduced mobility: a suit of tournament armor could weigh as much as 100 pounds.

(Possibly include Interview segment on wearing armor)

Well-made armor did not greatly restrict the wearer's freedom of movement: it was carefully tailored, and designed to move the way the human body moves. Endurance was more of an issue than mobility. The lack of ventilation made heat exhaustion a real risk given the exertion of battle. Vision was very limited to the sides and below, so a combat helmet was

designed to move freely. The choice of helmet required a tradeoff between protection, visibility, and airflow.

A suit of full plate armor was difficult to put on by oneself, making servants an essential part of a knight's equipment. With their aid, a knight could be ready for battle in 15 minutes.

Solid plate armor, made of iron or steel, did an excellent job of distributing blows and preventing slashing, cutting, piercing, and even crushing injuries. A well made suit would deflect everything but an extremely well aimed spear or crossbow bolt, but by the late Middle Ages a new weapon was appearing on the battlefield that would eventually bring an end to the age of armor.

Effective infantry firearms began to appear during the 1400s with the invention of the matchlock firing mechanism. Joined with square pike formations, troops equipped with firearms were protected from cavalry and other infantry and could fire devastating barrages that could pierce plate armor at 200 yards. By the early 1500s, these early muskets were beginning to change the outcome of battle.

The initial response to the new technology was simple: build thicker and stronger armor. Armors were often given grades of 'pistol-proof' or 'musket proof', and many armorers tested their pieces against firearms and left the dents and marks as proof of their resilience. This thickening meant that the armor became increasingly heavy and cumbersome. Foot and leg protection were discarded to make up for the extra weight from breastplates and helmets. By the mid-1500s, heavy cavalry were wearing 'three-quarter' suits of armor which protected them only to the knees.

During this period the increasing size of armies and advances like the blast furnace led to larger scale production of armor than ever before. Because of the large quantities produced, much of the armor that has survived to the present day came from the 1500s and 1600s.

By the late 1500s, soldiers and strategists alike were questioning the value of armor that was expensive, heavy, cumbersome, and often did not provide sufficient protection from firearms. Individual soldiers, who had to shoulder most of the cost and inconvenience, took the initiative by discarding their arm and leg armor. By the early 1600s, the pikeman was wearing a "half-armor" that protected only his head and torso. By the late 1600s, even this armor was falling out of use, and by 1700 armor had largely vanished from the battlefield. Some specialized cavalry continued to wear helmets and torso armor into the 1800s, but armor no longer played a major role in warfare.

Even after armor's military decline, the image of the knight in shining armor remained powerful in western society. Noblemen displayed old suits of armor in their stately homes, and museums began to collect armor for public display. The Higgins Armory Museum is home to over 4000 artifacts from across the centuries and around the world. Come explore our Great Hall to rediscover the timeless legacy of the legendary age of armor.

Appendix C: Documentary Credits

The Age of Armor

<u>Written, Edited, and Directed by</u>

Genevieve Boman

Tamlyn Miller

Gregory Sheaffer

<u>Narrated by</u>

Ian J Morse

<u>Cast</u>

Mark Boyajian

Michael Heenan

Eli Huebner

Quinton Johansen

Mark Millman

Dave Mitchell

Randi Richert

Bill Short

Andy Volpe

<u>Camera</u>

Genevieve Boman

Jeffrey Forgeng

Tamlyn Miller

Gregory Sheaffer

Bill Short

Research Consultation

Jeffrey Forgeng

Music

Tamlyn Miller

Additional Contributions

Higgins Armory Museum

Higgins Armory Sword Guild

Worcester Polytechnic Institute

Academic Technology Center, WPI

Special Thanks

Professor Jeffrey Forgeng

If you would like to learn more about the history of armor visit

www.Higgins.org

Appendix D: Original Proposal

This group will research the creation, implementation, and evolution of armor throughout several time periods, culminating in both a robust research paper and a short video documentary to be shown at Higgins Armory Museum. Equally important to the armor itself will be the manner in which the culture, society, and technology surrounding it impacted its use. Three distinct eras will be looked at, each by a single group member, while the fourth student will focus on researching documentary filmmaking and video editing procedures.

The first group member will research the arms and armor of ancient times, predating 500 AD. As most of the ancient artifacts in the Higgins Armory Museum are from pre-Roman times, the focus of the research will be on the ancient Mediterranean and European cultures. Combat techniques, used in the wars from which these artifacts originate, and political changes of the era, such as the rise and fall of democracy in ancient Greece, will also be looked at. Finally, this group member will research medieval music, as well as arrange and compose music in a medieval style, to be used in the documentary.

Moving forward, the second group member will research the arms and armor of Europe between the years 500-1500 A.D, beginning with chain mail and moving to the gradual introduction of plate armor in the thirteenth century, as a response to the widespread use of piercing and bludgeoning weaponry. Key subtopics include factors that lead to the transition to heavier, fuller suits of armor and the introduction of heraldry as a form of battlefield communication. Elements of medieval society, such as feudalism, manorialism, and knighthood, also reflected what was necessary in order to equip a knight for battle. These social structures will therefore be examined in relation to their effects on arms and armor.

Advancing further, the third group member will focus on European armor during the Renaissance era (1500 AD to ~1700 AD). Possible subtopics will include technological advances in areas such as metallurgy, and relevant cultural topics including the transition away from many medieval structures, the enlightenment, and the scientific revolution. Also important will be a discussion of the factors leading to

the phasing out of armor during this period, especially the widespread introduction of firearms to the battlefield. The Higgins Armory collection will be especially useful for this time period as a majority of it is from the Renaissance era.

The whole group will be responsible for becoming experts in the fields of documentary production and film editing; the group's two primary tasks will be the evaluation of the previous group's documentary project and independent study into various topics of filmmaking & editing.

The independent research will help individual group members gain insight into both the technical and artistic sides of documentary filmmaking, focusing on topics such as camera work, film pacing, the famous "Ken Burns Effect," film editing techniques, and the use of video editing software - Apple's Final Cut Express 4, in particular

Subtopics: Ancient through post 1500 A.D.

1. History/Culture/Society/Technology
    a) Overview and evolution of culture and society
    b) Government
    c) Overview and evolution of technology as it relates to
    the production of arms and armor
    d) Historical occurrences that had an effect on arms and armor
2. Warfare/Combat
    a) Combat styles, tactics
    b) Army types and sizes
    c) Training procedures
    d) Evolution of warfare
    e) Who actually fought, and why?
3. Weapons
    a) Types of weapons
    b) When/where they were used
    c) How they were used
    d) Who owned them?
    e) How weapons were made, materials, processes, who made
    them?
    f) Advance of firearms
4. Armor
    a) Types and evolution of armor, materials, styles
    a) Who used armor, and in what context?
    b) How did the armor work? What protection did it provide, or not
    provide? Did it hinder the combatant in any way?
    d) Who made armor?

Appendix E: Plan of work

Plan of Work

A Term

Deliverables

- **Individual research documents**

- **Working video outline, script, and sample**

Week 1

Group:
- *Read resources and begin note outline.*
- *Request Source materials through Inter-Library loan.*
- *Outline of video contents*
- *Watch a documentary*
- *Assemble individual subtopic lists for week 2-5*

Week 2

Group:
 Talk to film/editing consultant
 Research and write on elements of documentaries and general filmmaking

Ancient: Research History/culture/society/technology

Medieval: Research History/culture/society/technology

Renaissance: Research History/culture/society/technology

Week 3

Group:
 Update Filming/Editing SOP

Ancient: Warfare/combat

Medieval: Warfare/combat

Renaissance: Warfare/combat

Week 4

> *Group:*
>> *Watch a documentary*

Ancient: Weapons

Medieval: Weapons

Renaissance: Weapons

Week 5

> *Group:*
>> *Film a talking head*

Ancient: Armor

Medieval: Armor

Renaissance: Armor

Week 6

> *Group:*
> - *Prepare full draft for individual Research*
> - *Prepare revised video outline*
> - *Provide video sample*
> - *Task list for B Term*
> - *Schedule filming*

Week 7

> *Group:*
> - *Update Proposal*
> - *Draft video script*
> - *Update video SOP*

B Term

Deliverables

- **Full video draft for review**

Week 1

> *Group:*
> - *Revise script*
> - *Film*
> - *Determine 2 narrators*
> - *Hands-on armor session*

Week 2

Group:
- *Revise script*
- *Edit existing film*
- *Film*
- *Gather stills*
- *ID music and permission process*

Week 3

Group:
- *Finalize script*
- *Edit film*
- *Film*
- *Photo objects*

Week 4

Group:
- *Record Narrators*
- *Design intro image and credits/other graphics*
- *Edit film*

Week 5

Group:
- *Edit film*
- *Compile credits list*

Week 6

Group:
- *Continue editing video*
- *Task list for C Term*

Week 7

Group:
- *Finish editing film – Full draft in place*
- *Revised plan of work*
- *Make sure research document is all pulled together and revised*
- *Take film to Ed. Dept. for review*

C Term

Deliverables

- **Final completed video**

Week 1

Group:
- *Brainstorm introduction*

Week 2

Group:
- *Write introduction*
- *Brainstorm conclusion*
- *Write appendices*

Week 3

Group:
- *Write Conclusion*
- *Team bios/photos*

Week 4

Group:
- *Prepare Final Report for Submission*
- *Abstract and Acknowledgements*

Week 5

Group:
- *Complete Electronic Version of Project*

Week 6

Group:
- *Submit project on disks*

Week 7

Group:
- *Finalize and turn in everything*