

# Clad in Steel: The Evolution of Armor and Weapons in Medieval Europe

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Honors Thesis

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The sun rose over Northern France on October 25, 1415 to reveal two armies, one fighting for England, one for France. As the English advanced in good order toward their enemies, the sun at their backs, the steel plate of their knights seemed to shine in the morning light, even as the shafts of their archers cast shadows on the ground. The unprepared French forces hurried to strap on their armor plates and lock their visors into place, hoping these would protect them from the lethal rain their enemies brought against them, and hurried across the sodden field to meet the glistening blades of their foes, even as arrows descended upon them like hail. The slaughter that followed, which has come to be known as the battle of Agincourt, remains one of the most iconic and infamous engagements of the Middle Ages, with archers and knights in shining armor slaughtering each other in the thousands. For many of these soldiers, armor and skill were their only defenses against the assaults of their enemies, so it was fortunate that by the time of Agincourt armor design had become truly impressive. But how did this armor evolve to this point? What pushed armorers to continually improve their designs? And what weapons were brought to bear against it? All are important questions, and all deserve to be treated in depth.

The evolution of armor, of course, is a complicated topic. When thinking of the Middle Ages, one of the first things that comes to mind for many is the image of the knight clad head to toe in a suit of gleaming steel plate. Indeed, the legendary plate armor worn by knights has become largely inseparable from their image and has inspired many tales throughout the centuries. It is therefore important to remember that plate was largely a phenomenon in Western Europe, with many of the most iconic engagements in which it was seen occurring in France and the British Isles.<sup>1</sup> Even then, this armor was not always worn, and in fact for most of the years

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<sup>1</sup> It was also present in Eastern Europe, but on the whole the West saw more of it.

during which knights were a dominant force on battlefields plate was a rare sight, only becoming widespread in the 13<sup>th</sup>-15<sup>th</sup> centuries. And no wonder, for the skill and resources which went into producing such magnificent suits of armor are difficult to comprehend. That said, it is only rarely throughout history that soldiers have gone into battle without any sort of armor, for in the chaotic environment of battle such equipment was often all that stood between a soldier and death. Thus, the history of both armor and weapons is essential to a fuller understanding of the history of war.

In light of this importance, it is remarkable how little work has been done on charting the history of soldiers' equipment in the Middle Ages. While there have been chapters and articles written on both armor and weapons, such as John Clements' invaluable article "Medieval Armor: Plated Perfection,"<sup>2</sup> and one can easily trace the developmental path of both through these, rarely is the impetus for this development ever mentioned. That is not to say that armor has been ignored in recent scholarship, but rather that it has been discussed largely in terms of how it came about, rather than why. Indeed, Kelly DeVries,<sup>3</sup> Anne Curry,<sup>4</sup> Michael Prestwich,<sup>5</sup> and John France<sup>6</sup> have all written on the subject, describing in great detail the traits and developmental patterns of medieval equipment. Ewart Oakshott<sup>7</sup> has also contributed immensely to the classification of such equipment, and his typology remains the prime method of classifying medieval swords.

When armor has been considered outside of a purely developmental standpoint, it has been primarily in regards to its effectiveness against contemporary weapons, with the longbow in

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<sup>2</sup> John Clements, "Medieval Armor: Plated Perfection," in *Military History* 22 (2005).

<sup>3</sup> Kelly DeVries, *Medieval Military Technology* (Ontario: Broadview Press, 1992).

<sup>4</sup> Anne Curry and Malcolm Mercer, ed., *The Battle of Agincourt*, (New Haven: Yale University Press, 2015).

<sup>5</sup> Michael Prestwich, *Armies and Warfare in the Middle Ages: The English Experience* (New Haven and London: Yale University Press, 1996).

<sup>6</sup> John France, *Western Warfare in the Age of the Crusades* (Ithaca: Cornell University Press, 1999).

<sup>7</sup> Ewart Oakshott, *A Knight and His Weapons* (Chester Springs: Dufour Editions, 1997).

particular taking precedence.<sup>8</sup> Kelly DeVries, John Keegan, and Claude Gaier have all written in support of armor's effectiveness against longbows, with the battle of Agincourt being a particular focus, and their findings are supported by modern tests undertaken by the Royal Armouries. However, Clifford J. Rogers and Robert Hardy have both written books and articles arguing, among other things, for the supremacy of English longbows over contemporary armor through this period,<sup>9</sup> and the efficacy of the longbow remains a widely-accepted thesis.<sup>10</sup> Many proponents of the longbow's effectiveness, such as Hardy<sup>11</sup> and Jim Bradbury, however, are generally more interested in the tactical, social, and economic concerns behind the successful mass-deployment of archers than with an ability to penetrate the best armor of the day, and while the topic is addressed, it is not emphasized.

Where, then, did the sudden and rapid change in armor designs during the 13<sup>th</sup> century come from? After all, the evolution of armor from scale and chain to plate was a gradual process, and undoubtedly a very complex one. Moreover, such a shift as that from mail to plate armor was demanding in both the skill and resources required. As such, why would armorers bother to change unless there was demand for it? And why would warriors demand change in armor styles

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<sup>8</sup> This has proven to be a divisive issue among military historians, and while it is generally agreed that high-quality 16<sup>th</sup> and even late-15<sup>th</sup> century plate armor was largely invulnerable to arrow fire the jury is still very much out on their effectiveness in 14<sup>th</sup> and 15<sup>th</sup> century battles. It does not help that the issue is tied up in the "military revolution" debate, with proponents of a late-medieval military revolution often advocating for the importance of the longbow as part of a broader revolution in weapons technology which had a profound impact on late medieval war and society. Opponents of the military revolution thesis are naturally not receptive this argument.

<sup>9</sup> Clifford J. Rogers, "The development of the longbow in late medieval England and "technological determinism," *Journal of Medieval History* 37(3), (September, 2011), 321-341.

<sup>10</sup> For most of the twentieth century the effectiveness of a longbow against armor, particularly one firing bodkin arrows, was taken for granted. Only in the late 20<sup>th</sup> century did this start to be widely challenged, with new interpretations of medieval sources, backed up by the results of recent physical tests, suggesting that longbows have in fact been given more credit than they deserved.

<sup>11</sup> Hardy has written an excellent book entitled *Longbow: A Social and Military History* in which he examines the place of the longbow in medieval England, both in terms of its tactical efficacy and its social significance. He also very helpfully explains how it came into use, and it is surprising to learn that this iconic weapon of the English army was actually a Welsh invention.

and patterns which had served them well for centuries unless they were no longer effective? An obvious answer is that mail armor was no longer effective against the type of weapons employed against it. In particular, early forms of armor, specifically mail, were ineffective against the penetrative capabilities of arrows and bolts, and by the 12<sup>th</sup> and 13<sup>th</sup> centuries these weapons were becoming increasingly common throughout Europe. Thus the rising proliferation of bows and crossbows on medieval battlefields played a large role in stimulating the shift away from mail, as better armor was needed to protect soldiers against the power of both. Fortunately, rising technological and economic standards allowed armorers to respond to this call and produce increasingly sophisticated plate designs. But when plate began to appear on the battlefield, melee weapon designs raced to catch up, and this interplay between offensive and defensive technology eventually resulted in the legendary plate of the late Middle Ages, a process which was largely completed by the end of the 15<sup>th</sup> century and which eventually enabled warriors fortunate enough to own the best armor of the day to stand up to enemy missile fire.<sup>12</sup> Indeed, many of the aspects of late medieval plate armor, such as the angled visor and the bevor, can be seen to cover the weaknesses of earlier armor models, thereby making them less vulnerable to contemporary weapon designs, just as weapon designs clearly adapted in ways suited to counter the strengths of armor.

### Ancient Precedents

When examining this gradual development of both armor and weapons, it is useful to take at least a brief look at their pre-medieval incarnations in order to understand the origins of

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<sup>12</sup> Armor development did continue after this point, but the general trends had been firmly established by the end of the 15<sup>th</sup> century, and most 16<sup>th</sup> century suits of plate were essentially more sophisticated variants of earlier patterns. Additionally, there were substantial variations in design across Europe, and it would be impossible to cover all of them in a study of this size. As such, I will be focusing primarily on England and France.

medieval designs. From there, the Bayeux Tapestry provides an excellent starting point for a study. The Tapestry's detailed images of 11<sup>th</sup> century armor and weapons supply an excellent example of the state and effectiveness of military technology at the time, as well as a platform from which to examine their weaknesses. The actual development of plate proceeds naturally from this point, as in turn do the revolutionary new weapon designs. All of this, of course, concludes with the final appearance of the masterwork plate of the 16<sup>th</sup> century, and its subsequent disappearance due to firearms.

When looking at ancient examples of armor, it is important to keep in mind that ancient wars were very different from medieval ones. Armies were much larger, with great civilizations such as Greece, Carthage, and Rome regularly fielding armies or fleets numbering in the tens of thousands, and forces exceeding 100,000, while rare, were not unprecedented. Medieval armies, by contrast, were much smaller, usually numbering below 10,000 for much of the period. Heavy infantry, armed with spears, swords, or pikes, were the backbone of ancient western armies, with cavalry usually acting in a supporting or flanking role. This importance, combined with the great technological and infrastructural sophistication of the ancient Mediterranean, allowed ancient soldiers to be extremely well equipped, and many medieval sword, spear, and armor designs had their origins in the ancient world.

Armor, it must be understood, was not a medieval invention, nor did plate armor develop out of nowhere. The tradition of armor production dated back thousands of years. In fact, there is some evidence of simple forms of armor being worn by prehistoric men when they fought.<sup>13</sup> There is also concrete textual evidence of sophisticated armor designs in use by the Greeks as

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<sup>13</sup> DeVries, *Technology*, 50.

early as the 12<sup>th</sup> or 13<sup>th</sup> century BC in Homer's *Iliad*, with the description of Agamemnon's armor, comprising "goodly greaves" and "the breastplate which Cinyras had once given him as a guest-gift."<sup>14</sup> Plate helmets had come into use certainly by the fourth century BC and were common throughout the Mediterranean [Figure 1]. The helmet shown, designed in the South Italian-Corinthian type, is made of bronze and appears to be constructed of a single piece of metal.

Body armor was also fairly developed in the ancient world, as both Greeks and Romans had early forms of plate at their disposal. Early bronze plate can in fact be found dating from the 15<sup>th</sup> century BC, in the case of the Dendra Panoply. Ancient plate became significantly more advanced under the Romans, however, with the use of their famous *lorica laminata*. This armor, made from interlocking bronze, iron, or even mild steel bands, was in use by the Roman legions in the first century AD [Figure 2] and would have provided both impressive protection and mobility. However, by the fourth century this sophisticated and expensive armor had largely disappeared and was replaced primarily by cheaper mail designs.<sup>15</sup> Plate was not to be seen again for many centuries.

It is important to acknowledge that the presence of any type of armor did not result purely from a need for it. It goes without saying that any king or general would want his troops to be outfitted as well as they could possibly be, as the better equipped soldiers are, the more effective they generally are in battle. Unfortunately, practical considerations often prevent equipping soldiers thus. A key factor in the appearance of plate armor was the infrastructural sophistication needed to produce it. The Romans, and many of the Greek kingdoms and city-states before them,

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<sup>14</sup> Homer, *Iliad*, ed. Stephanie Lynn Budin (San Diego: Canterbury Classics, 2011), 147.

<sup>15</sup> DeVries, *Technology*, 54.

had extremely sophisticated infrastructures. This sophistication, and the resulting demand for specialization, would have allowed for the presence of smiths and metallurgists with the skills and time to produce advanced sets of armor such as the Roman *laminata*. With the collapse of Imperial authority in the West and the resulting decreases in population—especially urban—much of this infrastructure was lost, which likely had a major influence on the sophistication of armor designs in Western Europe.

After the collapse of the Western Roman Empire, armor seems to have become rather scarce in western Europe. Only in the Carolingian period, beginning in the late 8<sup>th</sup> century, did quality armor truly proliferate. Indeed, by 805 Charlemagne required every capable male who owned sufficient property to have his own armor and to serve as a horseman in his army.<sup>16</sup> This resulted in a well-equipped class of heavy cavalry. All of these soldiers would have worn a garment called a *byrnie*, which would have covered much of the body, including the upper arms and legs, and would have at least incorporated mail.<sup>17</sup> Various types of solid metal helmets would have been worn by cavalry, including the *spangenhelm* [Figure 3]. Cavalry made up an abnormally large portion of Carolingian armies, granting them excellent mobility, and their superior equipment, combined with impressive training and discipline, allowed them to outfight many of their foes.<sup>18</sup> Not all Carolingian troops were so well equipped, of course, and many of the poor men who fought on foot would have had no more than a sword and shield.<sup>19</sup> That said, it helped that most of their enemies were no better off, and it is important to remember that there

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<sup>16</sup> Simon Coupland, "Carolingian Arms and Armor in the Ninth Century," *Warfare in the Dark Ages*, ed. John France and Kelly DeVries (Burlington: Ashgate, 2008), 38-39.

<sup>17</sup> Coupland, "Arms and Armor," 40.

<sup>18</sup> Bernard S. Bachrach, *Early Carolingian Warfare: Prelude to Empire* (Philadelphia: University of Pennsylvania Press, 2001), 183.

<sup>19</sup> Bachrach, *Warfare*, 55.



were also a solid core of well-disciplined heavy infantry, and the heavy cavalry were perfectly capable of dismounting and fighting on foot if the need arose.<sup>20</sup>

The success of Charlemagne's armies spoke to the effectiveness of their equipment policies, and these policies were rapidly adopted by foreign nations.<sup>21</sup> In fact, so rapidly did these policies spread that armor similar to Carolingian models could be seen throughout Europe in the hands of everyone from Spaniards to Vikings, and it is largely at this point that armor remained through the 11<sup>th</sup> century.

### The Bayeux Tapestry

It is unfortunate that no known examples of mail armor survive from the 11<sup>th</sup> century. Mail, by its very nature, is less solid and resilient than plate and so does not hold up nearly as well to the stresses of time. Add this to the fact that mail armor was often repurposed and reused until it was no longer serviceable and it is not surprising that we are so lacking in examples. With this in mind, the best place to start an examination of central-medieval armor is with the Bayeux Tapestry. The Tapestry is made of linen and stitched in worsted, and it depicts the events for two years leading up to the Battle of Hastings in the Norman conquest of Anglo-Saxon England, including the battle itself in 1066. Likely created within ten years of Hastings, the Tapestry is an unequalled source for examining the equipment used at the time of the Norman conquest. While the Tapestry is admittedly somewhat lacking in the precise detail desirable for evaluating the war gear of 11<sup>th</sup> century soldiers, it nonetheless provides a faithful and consistent—if somewhat

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<sup>20</sup> Bachrach, *Warfare*, 183.

<sup>21</sup> DeVries, *Technology*, 62.

simple—rendition of the weapons and armor in use and is an excellent place to see the starting-point for plate armor development.

Now, it is important to remember that, while the Bayeux Tapestry depicts a decisive, large-scale battle, such actions were relatively rare in this period. 11<sup>th</sup> century war in Western Europe focused largely on raids and sieges, as it had for much, if not all, of the early Middle Ages. Battles, after all, were often decisive, and this made them extremely risky, for losses were difficult to replace and a single crushing defeat could spell ruin for a ruler. As such, battles normally only happened when both sides agreed to fight.<sup>22</sup> Furthermore, 11<sup>th</sup> century armies lacked the sophisticated administrative framework and recruitment system of their ancient counterparts, and so were correspondingly smaller and generally less well equipped. In fact, most warriors were not professional soldiers, but rather levies who were brought together to fight for a certain period. These troops often formed the infantry component of armies, and were generally commanded by a nobleman or one of his knights. These knights, the best equipped troops in the army, usually formed its cavalry element, and were indispensable due to their great mobility and power, as well as their formidable skill. The very loose and unprofessional nature of such armies, however, often left them fairly undisciplined and highly dependent upon dynamic leadership by their commanders. That is not to say that these armies were incapable of discipline, only that such discipline, especially from the levies for whom war was not a lifestyle, could not always be counted upon.

Before getting into the Tapestry, a brief description of the Battle of Hastings is in order. The battle was fought on October 14, 1066, between the forces of King Harold of England and

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<sup>22</sup> France, *Warfare*, 155.

Duke William of Normandy. The English force, consisting entirely of infantry, took up a position atop a steep hill, with muddy ground below them. The Normans advanced in three divisions, or “battles,” with each division drawn up with archers in front, infantry behind, and knights in the rear.<sup>23</sup> The Normans opened with volleys of missile fire, but it is not clear that these were effective, and the Tapestry does not show archers having a major role early in the battle. After this, Norman troops advanced up the hill and engaged the English forces in close, suffering considerable difficulties. The Norman knights appear to have been a decisive factor, as they engaged in numerous feigned retreats, during which English forces broke ranks and pursued them, before turning upon and slaughtering their pursuers in a series of minor charges. Such charges were a central trait of knightly combat at this period, and were far more common than the single massed charge of popular myth.<sup>24</sup> Shortly thereafter, the English army routed when King Harold was killed, emphasizing the central importance of the commander to his army’s cohesion.

At any rate, the Bayeux Tapestry depicts several scenes which feature warriors in mail, but the Battle of Hastings is a particularly valuable scene due to the appearance of large numbers of both mounted and unmounted soldiers. Both Normans and Anglo-Saxons wear mail hauberks with forearm-length sleeves as well as leggings.<sup>25</sup> The warriors also wear a softer material, possibly leather or some sort of cloth, on their lower legs below the mail leggings, and their hands appear to be bare. In several cases, high ranking individuals are depicted with a square section on the upper chest of their hauberk. It is *possible* that this is a representation of an early

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<sup>23</sup> William of Poitiers, *Deeds of William, Duke of Normans and King of the English*, trans. R.H.C. Davis and Marjorie Chibnall (Oxford: Clarendon Press, 1998), 127.

<sup>24</sup> France, *Warfare*, 161.

<sup>25</sup> Lucien Musset, *The Bayeux Tapestry*, trans. Richard Rex (Woodbridge: The Boydell Press, 2005), 46.

breastplate, which would account for its exclusivity to the elite, or it may have been something else entirely, such as a detachable flap.<sup>26</sup> Truthfully, it is impossible to tell, and it would be irresponsible to take this as irrefutable evidence of basic plate being in service by the 11<sup>th</sup> century. Even so, mail armor would have provided respectable protection for the warriors wearing it, both infantry and knights, as the entirety of the torso and the majority of both the arms and the legs would be covered. Additionally, Duke William and several other Norman elites are shown wearing mail chausses which cover their lower legs as well, although this feature appears to be quite rare [Figure 4].

The mail leggings are of particular note because of the essential nature of protection for the groin and inside leg, which if struck would lead a warrior to bleed to death rapidly. As such, leggings were included in hauberks as a matter of course, as can be seen by the fact that every mail-clad soldier on the tapestry wears them. In spite of their defensive utility, mail leggings would have been immeasurably problematic for mounted warriors on account of their being both extremely uncomfortable to wear while mounted and very damaging to saddles.<sup>27</sup> Fortunately, Ian Pierce addresses this problem with the suggestion that knights solved this problem by wearing hauberks with knee-length skirts split both fore and aft, which can be seen in Figure 4.<sup>28</sup> The skirted hauberk would have been both easier to mount in and more comfortable, without significantly reducing protection for a mounted warrior. Pierce states that when mounted, the skirts rest in such a way as to give the impression of leggings being worn, which would account for the fact that all the warriors depicted in the tapestry appear to be wearing leggings, even the

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<sup>26</sup> Musset, *Tapestry*, 46.

<sup>27</sup> Ian Pierce, "Arms, Armour and Warfare in the Eleventh Century," *Medieval Warfare 1000-1300*, ed. John France (Hampshire: Ashgate Publishing Ltd, 2006), 64.

<sup>28</sup> Pierce, "Arms", 64.

mounted ones.<sup>29</sup> However, this interpretation is in no way certain, and it is possible that the apparent use of mail chausses by the Norman cavalry is simply an inaccurate depiction on the part of the Tapestry's creators.<sup>30</sup>

The heads of the warriors shown in the Bayeux Tapestry are also protected, almost universally by coifs of mail. The coif was an essential part of a warrior's armor as it protected both the head and the neck, making decapitating blows more difficult to achieve, and it could easily deflect glancing blows to the head. However, the flexible nature of mail made it largely ineffective against percussive weapons such as maces, leaving a warrior's head highly susceptible to blunt trauma. For this reason, as well as for the added protection conferred, most knights and many foot soldiers chose to wear helmets over their coifs.<sup>31</sup> The helmets shown on the Bayeux tapestry are of a conical design, sometimes referred to as a nasal due to the metal bar extending down over the face and covering the nose.<sup>32</sup> Some examples of this type of helmet include an extension in the back, possibly as a sort of neck-guard.<sup>33</sup> This sort of helmet had been in service for centuries, popular throughout barbarian Europe and even seeing service in the late Roman army. An example of this type of helm, specifically the helmet of St. Wenceslas, can be seen in Figure 5.

Nasal helms were of a simple but generally effective design, with the rounded conical shape of the helmet serving to easily deflect either downward or horizontal sword blows and the nasal protecting much of the upper face.<sup>34</sup> Considering the popularity of swords evidenced on the

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<sup>29</sup> Pierce, "Arms", 64.

<sup>30</sup> Musset, *Tapestry*, 46.

<sup>31</sup> Pierce, "Arms," 64.

<sup>32</sup> Musset, *Tapestry*, 45.

<sup>33</sup> Pierce, "Arms," 67.

<sup>34</sup> Pierce, "Arms," 69.

Bayeux Tapestry, this was a wise investment. Indeed, it stands to reason that a main cause for the nasal helm's long-term popularity was its effectiveness, as well as its relatively simple design which allowed for it to be manufactured in large numbers without great difficulty. The open design also allowed for excellent visibility even as the nasal protected much of the face from slashing blows. In fact, the basic design of the nasal helm, with some notable changes, remained in service among infantry into the late Middle Ages. However, the open nature of the helm's face made it highly vulnerable to thrusts from spears, swords or daggers and provided little protection against missile weapons, and the cheeks and neck were entirely unprotected.<sup>35</sup> It would also be a mistake to assume that such helmets were infallible, as William of Poitiers reports that "Shields, helmets, hauberks were cut by [Duke William's] furious and flashing blade."<sup>36</sup>

Speaking of weapons, the Bayeux Tapestry also provides excellent insight into the weapons used by 11<sup>th</sup> century armies. By far the most common weapons seen on the Tapestry are the axe, spear, and sword. While shortbows do appear, there are only six archers shown on the Tapestry proper, with one of these being a lightly-clad horse archer, although a great many more are shown in the lower margin.

Axes are common in both one and two-handed variants, with the smaller one-handed weapons often serving as throwing axes. Such axes can be seen in the hands of a number of the Anglo-Saxon huscarls depicted on the Tapestry, who are often shown swinging them at the mounted Norman knights [Figure 6]. Indeed, the axe remained popular as an infantry weapon through the thirteenth century, although the warrior wielding it was admittedly highly vulnerable when raising it to swing.

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<sup>35</sup> Musset, *Tapestry*, 45.

<sup>36</sup> William of Poitiers, *Deeds*, 145.

Swords, of course, were among the most common medieval weapons. They had been extremely popular for centuries, being common in both the Roman army and the barbarian forces which invaded Europe, and they remained common at the time of the Norman conquest. Figure 7 shows two Norman knights wielding swords against Anglo-Saxon huscarls, and a broken sword can be seen in the lower border. It is worth noting that one of these knights is slashing at the neck of his enemy, likely hoping for a decapitating blow, while the other raises his sword to strike. This clearly demonstrates the intent behind this weapon's use, as contemporary longswords were designed largely for slashing, a trait which can be found in their construction. Figure 8 shows a tenth-century blade, the type of which would likely have been seen at Hastings. The sword is clearly broad and flat-bladed, being of a uniform width until it tapers to a point at the tip. This design creates a heavy blade capable of delivering a large amount of force from anywhere along its edge, making it ideal for slashing at a target. Figure 9 shows a 12<sup>th</sup> or early 13<sup>th</sup> century sword of similar design. Such swords, used well, could prove remarkably effective, for it is described by William of Poitiers how at Hastings "breaches were cut in several places [in the English line] by the swords of the Norman knights,"<sup>37</sup> and many of the English troops holding that line would have been equipped with mail armor. That said, mail was far from useless and could under the proper circumstances provide good protection.

Ian Pierce describes in great detail the defensive properties of mail, explaining how "the protection which mail offers depends upon the force of a blow being distributed over a large area. Thus the blow is significantly absorbed by the mail."<sup>38</sup> The necessary consequences of this are that while areas such as the chest and abdomen are well protected by a large amount of rings,

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<sup>37</sup> William of Poitiers, *Deeds*, 131.

<sup>38</sup> Pierce, "Arms," 66.

more compact places such as the arms, shoulders, neck, and even head do not distribute the force as effectively. This means that a powerfully-delivered slashing attack from a heavy blade to any of these places could easily result in mail being cleaved. Naturally, swords of the time period were designed with this in mind.

Of course, if mail was always easily penetrated, no one would have bothered to wear it. The fact that it was consistently used for so many centuries speaks volumes to its effectiveness. It has already been mentioned how mail could effectively stop slashing blows to the chest or abdomen, and warriors would regularly wear heavily padded garments underneath their hauberks to help absorb the shock of weapon blows, be they from blunt or bladed weapons.<sup>39</sup> There are numerous examples from the late 11<sup>th</sup> and early 12<sup>th</sup> centuries of knights, nobles, and other warriors receiving several strong blows and surviving, thanks to their mail.<sup>40</sup> William of Poitiers also makes mention of the Norman Count Eustace, shortly after the battle of Hastings, being “struck a resounding blow between the shoulders,” and nevertheless surviving the battle.<sup>41</sup> It is unlikely this would have happened were it not for his mail.

### Beginnings of Plate

Even in the twelfth century, however, some changes began to appear. In a rather sudden development, soldiers began to reinforce their mail armor with solid metal plates, which had not been seen on battlefields in any quantity for almost a thousand years. While plate would truly spread during the 13<sup>th</sup> century, some early elements began to appear late in the 12<sup>th</sup>. What is

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<sup>39</sup> Pierce, “Arms,” 66.

<sup>40</sup> France, *Warfare*, 29.

<sup>41</sup> William of Poitiers, *Deeds*, 139.



particularly interesting about this is why it happened. Why should soldiers suddenly begin upgrading armor that had served them well for centuries? The answer, of course, is multi-faceted. Specifically, technological change allowed for the creation of newer, better types of armor, which had not previously been possible to make. Just as importantly, though, new weapons came onto the field which could defeat mail armor quite easily, and these required new designs to counter.

A factor which cannot be ignored in explaining the appearance of plate is the expansion of the European metalworking industry in the late 12<sup>th</sup> century. Larger furnaces allowed for the production of greater masses of iron, or even steel, though this was exceedingly expensive.<sup>42</sup> The greater supply of iron would have increased its availability to smiths and likely driven prices down, making armor more affordable to many. This, coupled with the rising demand for armor and weapons and the expansion of cities and commerce, would have given smiths both the means and the motivation to create new kinds of better, more sophisticated armor.<sup>43</sup> It is also worth considering that the forging of plate armor is a complex and skill-intensive process, and one with which 12<sup>th</sup> century smiths would have had no real experience. Logically, it would have taken them time to work out the necessary processes, which may partially account for the lack of real plate development in the 12<sup>th</sup> century.<sup>44</sup>

That said, technological innovation was not the only reason for the appearance of basic plate. Simply put, mail armor was proving increasingly inadequate against the weapons it was required to defend against, but it is true that the first plate reinforcements were also not optimal for defending against arrows and quarrels. In fact, plate reinforcements in the early to mid-

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<sup>42</sup> France, *Warfare*, 30.

<sup>43</sup> France, *Warfare*, 32-33.

<sup>44</sup> France, *Warfare*, 31.

thirteenth century focused primarily on the knees, shins, and elbows: areas not very heavily exposed to missile fire, and they came in the form of small supplementary plates, usually worn under the hauberk.<sup>45</sup> However, these plates did mitigate some of the weaknesses of mail armor. For example, the shins in particular, being distant from the arms and upper body, were naturally more difficult to cover with a shield and thereby more vulnerable to sword and spear strikes. Thus, plate greaves covering the shins are one of the few examples of 12<sup>th</sup> century plate that we possess.<sup>46</sup> Covering these locations with plates would have improved the defense against such attacks, thereby responding to some of the weaknesses of the mail hauberk.

War was also changing in the 12<sup>th</sup> and 13<sup>th</sup> centuries. While pitched battles remained rare, armies were becoming progressively more sophisticated and professional. That is not to say that 13<sup>th</sup> century forces could accurately be termed professional armies, but the level of discipline and organization was increasing rapidly. The army of the Third Crusade, led by Richard I and supported by superbly organized supply chains, was able to attain a remarkable level of discipline and cohesion, and Flemish infantry forces during the Flemish rebellion were consistently able to maintain their battle order against the onslaught of French knights. The increasing reliance on common soldiers during this period was a pivotal point in medieval war, and their deployment, supported by new advances in weapons technology, became an effective counter to the strength of the knightly cavalry. That is not to suggest that knights became obsolete by any means, as their decisive role at the battle of Arsuf in 1191 clearly shows, but infantry levies were increasingly able to hold their own, and it is in this context that better armor became all the more important.

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<sup>45</sup> Claude Blair, *European Armour* (London: B.T. Bastford Ltd. 1958), 38.

<sup>46</sup> Prestwich, *Armies*, 21.

Arsuf actually serves as an excellent case study in the effectiveness of a well-led and supplied army in the late 12<sup>th</sup> to early 13<sup>th</sup> century. While it is true that the crusader forces were not matched against a European enemy, the weapons carried by their Muslim foes were not dissimilar to those wielded by the Westerners themselves. One of the largest differences is that Saladin's forces favored bows to a much greater extent than Richard's. This battle occurred during the Third Crusade, when crusader forces were marching along the coast from Acre to Jaffa. Saladin's forces had been harassing them the whole way, attempting to bait Richard's troops into a reckless assault in which they could be destroyed piecemeal, but the king had given strict orders to ensure that no one would break ranks without his order. The fact that this command was followed for so long in spite of the number of arrows being fired at the crusaders speaks volumes to the discipline of the army, and it was likely this discipline which saved them. Would the English troops at Hastings have held themselves so well? It is difficult to say, but the haste with which they broke ranks to pursue the fleeing Norman cavalry suggests otherwise.

A major reason why this strategy was viable for the crusaders is that their armor was easily able to stand up to missile fire. Beha ad-Din reports that "I saw various individuals amongst the Franks with ten arrows fixed in their backs pressing on in this fashion quite unconcerned,"<sup>47</sup> showing how effective their equipment still was against missile weapons of the time. This would change with the introduction of longbows in the 13<sup>th</sup> century, but for the moment, mail armor reinforced with plates remained perfectly adequate.

Ultimately, this harassment only became a battle when two of the Hospitallers in the rearguard charged without orders, their discipline worn down by the constant barrage, and were

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<sup>47</sup> Beha ad-Din, *The Rare and Excellent History of Saladin*, trans. D.S. Richards (Aldershot: Scolar Press, 2001), excerpted in Jonathan Phillips, *The Crusades: 1095-1204* (New York: Routledge, 2014), 195.

followed by many other knights. Seeing the danger of his army breaking apart, Richard ordered his entire cavalry force to charge, which it did with remarkable cohesion, overwhelming the Muslim forces and compelling them to retreat.<sup>48</sup> While hardly decisive, this battle demonstrated how effective contemporary armor was at the end of the twelfth century, as well as the remarkable power which knightly cavalry still possessed, especially when deployed against an unprepared enemy. But while cavalry would not truly become obsolete for many centuries, the armor of the period would not remain adequate for much longer.

In truth, by the mid-thirteenth century the weaknesses of mail armor desperately needed to be addressed. Effective as it had been against bladed weapons, mail was not proving up to the task of dealing with the piercing capacity of new bows and crossbows, and these weapons were proliferating rapidly. The Assize of Arms, issued in England in 1187, required all lower-class levies to carry bows, and these weapons had some exceptional properties.<sup>49</sup> While the effective range of 13<sup>th</sup> century English longbows is contested, their ability to penetrate mail is not. Robert Hardy relates one incident from the Welsh wars in which an English soldier “was wounded by an arrow that penetrated his thigh, the casing armor on both sides, the part of the saddle known as the alva, and mortally wounded the horse.<sup>50</sup>” Longbows could also maintain an impressive rate of fire, in the hands of skilled archers,<sup>51</sup> and with the archers firing while standing sideways in close order, “they could send storms of arrows into advancing cavalry, and, as much as anything

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<sup>48</sup> Sean McGlynn, “Arsuf, Battle of,” *The Oxford Encyclopedia of Medieval Warfare and Military Technology*, ed. Clifford J. Rogers (Oxford University Press, 2010.)

<sup>49</sup> Robert Hardy, *Longbow: A Social and Military History* (London: Bois d’Arc, 1992), 38.

<sup>50</sup> Hardy, *Longbow*, 36.

<sup>51</sup> Hardy, *Longbow*, 43.

by galling the horses, turn a charge into a rout. Against light armed infantry they would be devastating.<sup>52</sup>”

While the longbow proved very popular in England, on the continent it was the spread of the crossbow that truly necessitated improvements in defensive technology. While the crossbow had existed in the Ancient World, it largely faded from use during the early Middle Ages, possibly due to the low technological standard of the barbarian kingdoms. Whatever the reason, by the late 11<sup>th</sup> century it had returned. While there is evidence that it was used in the First Crusade from 1095-1099, it truly began to spread in the late 12<sup>th</sup> century.<sup>53</sup> By the mid-12<sup>th</sup> century, it had flourished. The garrison of Saphet in the Holy Land, about the year 1250, included 300 crossbowmen, and the Lombard League in 1231 had one crossbowman for every two horsemen in its armies.<sup>54</sup> Crossbowmen were also included in the army of Richard I during the third crusade and proved remarkably efficacious on a number of occasions.

The crossbow’s effectiveness as a weapon cannot be denied. The Byzantine princess Anna Commena describes its capabilities in the *Alexiad*, asserting that “the missiles...transfix a shield, cut through a heavy iron breastplate and resume their flight on the far side.<sup>55</sup>” Clearly, contemporary armor was of little use against the penetrative power of a crossbow, as it could easily pierce even basic plate at close range. With this in mind, it is little wonder that a replacement for traditional mail was sought. Numerous modifications were added to the crossbow over the course of the Middle Ages, such as a stirrup attached to the end of the stock so an arbalester could brace the bow with his foot while reloading and the windlass to increase

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<sup>52</sup> Hardy, *Longbow*, 44.

<sup>53</sup> Philippe Contamine, *War in the Middle Ages*, trans. Michael Jones (Oxford: TJ Press Limited, 1984), 72.

<sup>54</sup> Contamine, *War*, 72.

<sup>55</sup> *The Alexiad of Anna Commena*, tr. E.R.A. Sewter, in Phillippe Contamine, *War in the Middle Ages*, trans. Michael Jones (Oxford: TJ Press Limited, 1984), 71.

drawing speed.<sup>56</sup> None of this ever allowed the crossbow to rival the longbow's drawing speed, and the effective range remained shorter, but the crossbow's power could, in the right circumstances, offset these deficiencies.<sup>57</sup> Changes in the composition of the bows, such as the transition to composite crossbows in the early 13<sup>th</sup> century, further increased their power and thus their effectiveness against armor.<sup>58</sup> By the late Middle Ages, crossbows were made largely from steel. While this increased the weight of the bow significantly, it also increased its draw weight and thus its power. Indeed, the power of such crossbows may well account for their wider proliferation than longbows, as "The bolt of a steel crossbow was a heavy and dangerous projectile, even when at the end of its flight; far more so than an arrow. A bolt which did not happen to penetrate armour, must have dealt a blow sufficient to stun a man and knock him to the ground."<sup>59</sup> In light of these developments, it is clear that the power of crossbows was far more than could be handled by contemporary mail armor. Its effectiveness, which so overwhelmed Anna Commena, actually led to the weapon's being outlawed for use against Christians by the second Lateran Council in 1139,<sup>60</sup> and even the best armor of the time was of little use against it.

The effectiveness of such weapons, especially when deployed in a combined-arms approach with other types of troops, is apparent when examining the Welsh Wars of the 13<sup>th</sup> century, particularly the Battle of Orewin Bridge in 1282. During this rather lopsided engagement, a mostly dismounted Welsh army faced an English force consisting of infantry, archers, and heavy cavalry. The English approach to the battle was simple but devastatingly

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<sup>56</sup> DeVries, *Technology*, 41.

<sup>57</sup> Robert C. Woosnam-Savage, "All Kinds of Weapons': The Weapons of Agincourt," in *The Battle of Agincourt*, ed. Anne Curry and Malcolm Mercer (New Haven: Yale University Press, 2015), 147, 150.

<sup>58</sup> DeVries, *Technology*, 41.

<sup>59</sup> Ralph Payne-Gallwey, *The Book of the Crossbow* (Mineola: Dover Publications, 1903), 19.

<sup>60</sup> Payne-Gallwey, *Crossbow*, 3.

effective. The archers fired on the lightly armored Welsh spearmen from the flank, weakening them and forcing them to re-orient their line toward the archers, after which the English cavalry, whom the spearmen had formerly been facing, charged the Welsh forces from their new flank. Unsupported, disorganized, and without specialized weapons, the spearmen were quickly and easily routed by the English horsemen. The tactic of deploying a large number of bowmen, supported by men-at-arms, would continue to be employed with devastating effectiveness by the English for nearly 200 years, although the disaster their own cavalry suffered against the Scottish schiltrons at Bannockburn in 1314 showcased the effectiveness of disciplined infantry formations and caused the English to favor deploying their own knights dismounted.

In response to new forms of weaponry and enabled by advancements in metallurgy, plated body armor began to evolve around this time, initially in the form of iron plates sewn onto leather armor.<sup>61</sup> While it is difficult to determine the proliferation of this type of armor, due to the fact that it was often worn under a surcoat, it is nonetheless useful for charting the development of plate armor, as several notable figures are recorded wearing it, including Richard I of England. Notably, even with this rudimentary form of plate armor, crossbows still proved remarkably effective, as Richard I was himself killed by one.<sup>62</sup>

Probably the easiest place to see plate armor development in the 13<sup>th</sup> century is in head protection, for it was in this period that the great helm appeared. Figure 10 shows an excellent 13<sup>th</sup> century German example, and even a cursory inspection will show the difference between it and the earlier conical helmets. Perhaps the most important of these is the full faceguard integrated into the design. This feature would have protected the entire face from all types of

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<sup>61</sup> Blair, *Armour*, 38-39.

<sup>62</sup> Contamine, *War*, 72.

attacks, including blades, spears, maces and projectiles, with firm plates resistant to both sharp and blunt traumas. The metal ridge running down the front of the visor and bisecting the eye-slit would also have provided some protection against slashing attacks to the face. In fact, the only noticeable defensive weakness of the great helm was the eye-slit, which could be targeted with a precisely aimed dagger, sword, or spear thrust. The fact that the helmet encases the entire head means that it also would have protected the back of the head in addition to making it easy to keep on in battle without necessitating chin straps or other such devices.

There were, however, limitations to plate armor, and these limitations were responsible for its being a phenomenon primarily among cavalry, as opposed to infantry. To start with, plate, especially more advanced forms of plate, required greater skill to forge than did mail. Mail rings would often be either punched out of a sheet of metal, molded, or cut from a length of steel wire. Afterward, the rings would be riveted together or otherwise closed so that each ring linked through four others.<sup>63</sup> While this process was time-consuming, the level of skill required was not excessively high, and the armor was variable, being able to fit soldiers of various sizes. Plate, by contrast, was made from plates of iron or steel molded into particular shapes. Seeing as the shapes required differed based on the particular piece being forged, a wide variety were used in forging a complete set of plate armor. Each plate was made from iron or steel bars hammered into shape, and for more sophisticated designs the plates had to be custom fitted for the men who would wear them in order to reduce chafing and allow for optimal distribution of weight and economy of movement.<sup>64</sup>

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<sup>63</sup> Matthias Pfaffenbichler, *Medieval Craftsmen: Armourers* (Toronto: University of Toronto Press, 1992), 57.

<sup>64</sup> Pfaffenbichler, *Armourers*, 62.



The result of this complex and resource-intensive forging process was armor that was significantly more expensive to make than mail. Consequently, only the wealthy could afford it and more often than not, the wealthy fought on horseback. Infantrymen had to make do with lighter, less expensive designs. Not all of plate armor's restrictions were purely economic, however. While a mail hauberk was certainly not light, the additional metal that went into the forging of plate made it especially heavy. True, as plate designs became more sophisticated the weight of the armor became progressively easier to bear, but even the best suits could not be considered light. For infantrymen who were required to march hundreds of miles on campaign, this weight would have been beyond uncomfortable. Finally, as personal experience will attest, the visibility conferred by a great helm is decidedly unimpressive. The added protection such a helm provides comes at the cost of peripheral vision, and for an infantryman locked in the chaotic press of a melee fight, the benefit would likely not have been worth the cost, especially without a coat of plates to protect vulnerable places on his body.

### The Hundred Years War

Plate armor truly came into its own during the 14<sup>th</sup> century, coinciding in England and France with the Hundred Years War.<sup>65</sup> This was also when the professionalization of armies, visible during the 13<sup>th</sup> century, became truly apparent. While 14<sup>th</sup> century armies were still a far cry from the ancient Roman legions in terms of their discipline and structure, they were nonetheless becoming increasingly well organized, and infantry in particular were developing as

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<sup>65</sup> While it is tempting to claim that the evolution of arms and armor during this period was driven by the Hundred Years War, similar to the way in which weapons development was spurred by the American Civil War, there is insufficient evidence to make this assertion. The claim becomes especially problematic when one considers the fact that armor was also evolving in Italy, Spain, and the Holy Roman Empire, none of which were heavily involved in the struggles in France and so cannot have had their technological innovations driven by Anglo-French wars.

a potent force. True, infantry had always been an important element in medieval armies and had been perfectly capable of defeating mounted knights in the right circumstances, but by the start of the Hundred Years War they were the main strength of many armies. In the case of the English, this was when longbow formations were deployed large-scale and to great effect, often supported by dismounted knights, and indeed, in the greatest battles of the war the English fought on foot. The Scots, too, favored dismounted soldiers, armed with spears and staff weapons and arrayed in schiltrons to hold off incoming charges, and these infantry proved highly effective against the English at Stirling Bridge and Bannockburn. The growth of armies and intensity of war during this period went hand-in-hand with the medieval arms race between arms and armor, and it is thus where some of the most significant changes to both offensive and defensive designs can be observed.

Largely in the second quarter of the 14<sup>th</sup> century, new plate designs began to appear, such as the bascinet, a close-fitting helmet which often included a movable visor and largely replaced the great helm on the battlefield.<sup>66</sup> True plate body armor, referred to as a “pair of plates,” actually appeared in the late 13<sup>th</sup> century, but became extremely widespread during the 14<sup>th</sup>.<sup>67</sup> This armor was made of breast and back plates, buckled or strapped together and usually worn under a tabard or surcoat. Armor covering soldiers’ limbs, such as vambraces, gauntlets, and sabatons, all became more developed, but it would be another century until full suits of plate began to appear. Instead, mail was used to cover the gaps between plates, reducing the

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<sup>66</sup> Thom Richardson and Karen Watts, “Armour at the Time of Agincourt,” in *The Battle of Agincourt*, ed. Anne Curry and Malcolm Mercer (New Haven: Yale University Press, 2015), 110.

<sup>67</sup> *Ibid.*

vulnerabilities inherent in these weak points. But while steel certainly existed by this point, both armor plates and the mail worn under them was usually of iron, likely due to cost constraints.<sup>68</sup>

It is also during this period that some of the most dramatic changes in weapon design can be observed. While both longbows and crossbows continued to be popular, with the former especially a phenomenon in England, melee weapons changed drastically during the 14<sup>th</sup> century. For starters, staff weapons became much more common. Of particular note among staff weapons were pollaxes and halberds.

Figure 11 shows an example of a late 14th century halberd head, and in this several characteristics can be observed. First, it must be remembered that this head would have been mounted on the end of a long wooden haft, gripped with two hands, which would have provided impressive reach. The tip of the halberd head is pointed, allowing it to be used either to keep foes at bay or to thrust at them directly.<sup>69</sup> The small pick on the back of the head, sometimes curved, could be used to drag mounted soldiers from horseback and the heavy axe-blade on the front to finish them.<sup>70</sup> The pollaxe was of a similar design, although the axe blade was more compact and thus more useful for penetrating heavy armor and the pick was replaced by a small hammer head, which could be used for smashing through plate.<sup>71</sup> Such weapons as these, with their long hafts and powerful attachments, made the weapons as effective for swinging as they were for thrusting, and allowed a warrior to channel a great deal of force into a blow without sacrificing the spear-like ability to hold enemies, both mounted and unmounted, at bay. Indeed, staff weapons were often used as effectively against infantry as they were against cavalry, for the

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<sup>68</sup> Richardson and Watts, 113.

<sup>69</sup> *Encyclopedia Britannica Online*, ed. Rev. William L. Hosch, 2007.

<sup>70</sup> *Ibid.*

<sup>71</sup> Oakeshott, *A Knight and His Weapons* 48-49.

power they conferred proved invaluable against the increasingly common armored foes of the late medieval world.

A major reason why power and reach were so important in new weapon designs is because older spears and swords were lacking in one or the other. The spears portrayed in the Bayeux Tapestry, as seen in Figure 6, were narrow and fairly light. Longer than swords or axes, they provided excellent reach in the press of melee, but the rather small spearheads would likely not have been able to deliver sufficient power from a simple thrust to penetrate heavy plate, to say nothing of the danger of a thrust simply glancing off a rounded plate. The picks, blades, and hammers of staff weapons, however, could drag a knight from his horse and cleave or smash through his armor with relative ease, which is no doubt why such weapons proliferated as far as they did.<sup>72</sup>

Spear designs also changed, especially in the 14<sup>th</sup> and 15<sup>th</sup> centuries, developing into pikes. Pikes were in many ways similar to earlier infantry spears, but were much longer. The intent behind this is fairly clear: longer weapons were more easily braced against charges and thus more likely to hold off an advancing foe, especially a mounted one, as the risks of riding into a metal point at full gallop are rather obvious. Simple as this design may have been, it was undoubtedly effective, as the Flemish army proved against the French at the battle of Courtrai in 1302. At this battle, a large force of French cavalry charged a force of Flemish infantry who were braced in close order and equipped with a number of hafted weapons, including pikes, behind a network of water-filled ditches. The French charge, as Kelly DeVries relates, “was halted...the French horses stopped and the knights were pushed into the ditches behind them.”<sup>73</sup>

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<sup>72</sup> Oakeshott, *Weapons*, 51.

<sup>73</sup> Kelly DeVries, *Infantry Warfare in the Early Fourteenth Century* (Woodbridge: Boydell Press, 1996), 17.

Pike designs remained popular and largely unchanged throughout the rest of the Middle Ages and well into the following centuries.

Weapons also had to change for close-quarters fighting in order to deal with the heavier armor that appeared. Maces, for one, became increasingly popular later in the Middle Ages. In particular, a particular design referred to as the “Gothic mace” saw wide usage, due largely to its ability to crush an opponent’s armor.<sup>74</sup> The Gothic mace weighed an average of 1275 grams and its head was compact and wrapped in pointed flanges.<sup>75</sup> The weight of the mace, concentrated in the compact head and supplied with ample force, could easily crush plate armor, which would impair a soldier’s ability to fight even if he was not directly injured.<sup>76</sup>

Swords too underwent some significant changes. Figure 12 shows a late-14<sup>th</sup> or early-15<sup>th</sup> century longsword from western Europe. The changes in design from 11<sup>th</sup> and 12<sup>th</sup> century models are striking. The most notable of these changes is the much more tapered, almost triangular shape of the blade. This shape would allow force to be more effectively channeled along the length of the blade during a thrust, reducing the danger of it flexing or breaking.<sup>77</sup> The point of the sword is also much more prominent, illustrating its thrusting purpose. An interesting design detail can be found near the point of the blade. Along its middle, there is a raised portion called a ridge, which is often found in swords optimized for armor penetration. The ridge concentrates the force of a thrust along the spine of a blade, rather than spreading it throughout the surface, allowing it to be directed down the sword’s length. This particular trait serves to increase the rigidity of the blade’s point, reducing its likelihood of flexing during a critical thrust,

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<sup>74</sup> Oakeshott, *Weapons*, 55.

<sup>75</sup> Oakeshott, *Weapons*, 55.

<sup>76</sup> Oakeshott, *Weapons*, 55.

<sup>77</sup> Oakeshott, *Weapons*, 68.

without increasing its brittleness and probability of breaking. This rigidity was necessary, as thrusts became the primary method of penetrating armor with a sword, for the thick and rounded plates would easily resist slashing blows.<sup>78</sup>

Daggers were also fairly effective against armored soldiers, and this development was not new. The strength of a dagger lay in its precision, for a weapon so small and easily directed could be used against the vulnerable points in an enemy's armor. Indeed, as John Clements relates "Medieval daggers such as the rondel were special weapons quite capable of killing an armored man, especially one who had fallen from or was pinned under a slain horse."<sup>79</sup> However, this was not so much due to daggers being able to easily penetrate heavy plate as to precisely strike vulnerable points, such as the eye-slit. This was especially the case when a soldier had been knocked down or otherwise overpowered, for "When a knight was riding against a hedgehog of tightly wielded pole arms and his horse was shot out from under him, he might well end up lying on the ground stunned while hordes of enemies rushed to jab sharp metal spikes into his eyes."<sup>80</sup> The potency of these new weapons, emerging even as knights were themselves becoming better equipped and used in conjunction with disciplined and numerous forces of infantry, was a major threat to the battlefield preeminence of knightly cavalry. This was a particular problem for the nobility of France, who relied heavily on such cavalry as the backbone of their armies, and provoked a flurry of attempts at effective tactical responses. These responses were tried over the course of the Hundred Years War, and their necessity was rarely made more apparent than at Crécy.

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<sup>78</sup> DeVries, *Technology*, 24.

<sup>79</sup> John Clements, "Medieval Armor: Plated Perfection," in *Military History* 22 (2005), 39.

<sup>80</sup> Clements, "Armor," 39.

## Crécy

When examining the interplay of arms and armor in the 14<sup>th</sup> century, there are few case studies as valuable as the battle of Crécy. Fought in 1346 between English and French armies, led by kings Edward III and Phillip VI, the battle was one of the most resounding English victories of the entire war, and the annihilation of the much larger French army has been held as an example of the effectiveness of longbows against heavily armored knights. This effectiveness is not in doubt at Crécy, and even scholars such as Kelly DeVries, who claim that the power of longbows is often overstated, do not argue against their success in this case. In fact, the tactical details of the battle are also largely undisputed, as the chronicles do not generally contradict one another and so the narrative of the battle and the descriptions of its formations are generally fairly clear.<sup>81</sup>

Before examining the significance of armor at Crécy, a brief description of the battle is in order. The English army formed up facing downward on a sloping hill and was arranged into three divisions, or “battles,” of men-at-arms supported by longbowmen. The English had occupied the position for some time, and so had ample time to prepare before the arrival of the French army. The French, for their part, fielded a large number of mounted knights, as well as foot soldiers. Although the precise numbers are disputed, it is agreed upon that there were significantly more French troops than English. Numbers for the English army are usually given as ranging from 8,000<sup>82</sup>-15,000,<sup>83</sup> according to modern estimates. The French force is harder to determine, as the primary sources generally give completely unbelievable figures, but modern

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<sup>81</sup> Contrast this with the controversy surrounding the infamous “wedges” of English archers at Agincourt.

<sup>82</sup> Andrew Ayton and Phillip Preston, *The Battle of Crecy* (New York: The Boydell Press, 2005), 189.

<sup>83</sup> Clifford J. Rogers, *War Cruel and Sharp: English Strategy under Edward III, 1327–1360* (Woodbridge: Boydell Press, 2000), 423.

estimates place it in excess of 20,000.<sup>84</sup> At the front of the French army was a vanguard of Genoese crossbowmen. The French army launched its attack shortly after arriving at the battlefield, with the Genoese crossbowmen moving forward first to engage the English longbowmen. The Genoese got the worse of this exchange, and many of them were slaughtered, doing little damage to the English forces. After this, the main French army advanced under a hail of missile fire, suffering numerous losses during the assault. The foremost English battle, commanded by Edward, the Black Prince, withstood the brunt of the French attack, and after several failed assaults, the French were driven back, suffering heavy losses.

Now, there are several important things to consider in this case. The fact that the battle of Crécy was a disaster for the French is not in dispute, but there are several complicating factors. First off, at this point there was little meaningful difference in the armor worn by the English and French men-at-arms, as armor designs in 1346 were fairly universal across western Europe.<sup>85</sup> While the archers and crossbowmen would have worn less armor than the knights, the heavy troops of both sides would have been similarly equipped. Seeing as the French suffered heavy casualties and the English hardly any, deficient equipment cannot have been the cause of the French defeat.

Furthermore, the French had been marching for some time before coming to the battlefield, and so were tired, while the English were rested and well-fed. Indeed, some of King Phillip's nobles counseled him "to wait to fight until the next day because of the long journey he had made,"<sup>86</sup> and the king of Bohemia advised him that "we should not seek contact...it is better

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<sup>84</sup> Ayton and Phillips, *Crecey*, 18.

<sup>85</sup> Richardson and Watts, 110.

<sup>86</sup> Anonymous, *Chronicle of Artois*, in *The Battle of Crécy: A Casebook*, ed. Michael Livingston and Kelly DeVries (Liverpool: Liverpool University Press, 2015), 97.



if we stay put, and when the king of England is forced to depart, we will attack him from the rear.<sup>87</sup>” Unfortunately for the French, the counsel of other, less cautious nobles won out, and Phillip decided on an attack. This was extremely disadvantageous to the French, for no matter how well their troops were armored, those troops were tired and would have underperformed in combat as a result.

The terrain also strongly favored the English, as they were formed up on a hillside facing downward, forcing the already tired French troops to hike up it, thereby tiring them further and reducing the speed of their charges. The higher elevation would also have extended the effective range of the English longbows. Furthermore, “the English...dug many holes in the ground in front of their division,”<sup>88</sup> and such obstacles would have disrupted advancing French troops, leaving them vulnerable in close combat. This is actually similar to the deployment patterns of the Anglo-Saxon and Norman forces at Hastings almost 300 years earlier, so it is notable that the outcomes were so different. A major factor, of course, is the fact that the English forces did not break ranks to pursue fleeing horsemen as the Anglo-Saxons had, thereby allowing their line to retain its cohesion and avoid being overwhelmed by cavalry. Furthermore, the quantity of missile fire the advancing cavalry faced was much heavier than anything they confronted at Hastings, and its results far more damaging.

On to the combat itself. There can be no dispute over the fact that the lightly-armored Genoese crossbowmen were massacred by English arrows, for Giovanni Villani relates in the *New Chronicle* how “they could neither hold their ground nor shoot their crossbows, being

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<sup>87</sup> Anonymous of Rome, *Chronicle*, in *The Battle of Crécy: A Casebook*, ed. Michael Livingston and Kelly DeVries (Liverpool: Liverpool University Press, 2015), 171.

<sup>88</sup> Geoffrey Le Baker, *Chronicle*, in *The Battle of Crécy: A Casebook*, ed. Michael Livingston and Kelly DeVries (Liverpool: Liverpool University Press, 2015), 163.

constantly hit by the arrows of those on top of the carts...so that many were killed or wounded.”<sup>89</sup> Without armor or shields, these troops stood no chance against the English archers, and their rapid annihilation reflects this. How well the French knights fared, however, is more difficult to determine. They too faced withering fire from the English longbows, and doubtless a good number of them died. In fact, the evidence seems to suggest that the arrows fired by the English longbows were frequently able to overcome their armor, as the *Chronicle of Artois* describes how the longbowmen “shot so quickly that none could endure it,”<sup>90</sup> though what this means exactly isn’t clear. The *Chronicle of the Counts of Flanders* describes how “arrows pierced men and horses,”<sup>91</sup> and other sources give similar narratives. Some even make explicit mention of arrows killing soldiers in spite of their armor.<sup>92</sup> However, one must remember that many, perhaps most, of the French infantry would not have worn heavy armor and thus would have been more vulnerable to missile fire. Even the knights would not all have been equipped with plate, as the *Chronicle of the Counts of Flanders* mentions “20,000 knights clad in mail.”<sup>93</sup> The number is certainly an exaggeration, but it is notable that the *Chronicle* mentions men in mail, for it suggests that that armor was still in use at Crécy, likely among the knights who could not afford plate. That said, King Phillip himself was wounded in the face by an arrow, despite the fact that he was likely wearing some of the best armor then available, indicating that arrows certainly could penetrate contemporary plate under the right circumstances.<sup>94</sup> Many sources also

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<sup>89</sup> Giovanni Villani, *New Chronicle*, in *The Battle of Crécy: A Casebook*, ed. Michael Livingston and Kelly DeVries (Liverpool: Liverpool University Press, 2015), 119.

<sup>90</sup> *Chronicle of Artois*, 97.

<sup>91</sup> Anonymous, *Chronicle of the Counts of Flanders*, in *The Battle of Crécy: A Casebook*, ed. Michael Livingston and Kelly DeVries (Liverpool: Liverpool University Press, 2015), 93.

<sup>92</sup> Clifford J. Rogers, “The Efficacy of the English Longbow, A Reply to Kelly DeVries,” *War in History* 5.2 (April 1998), 240.

<sup>93</sup> *Chronicle of the Counts of Flanders*, 93.

<sup>94</sup> Pseudo-Adam Murimuth, *Chronicle [Nero Version]*, in *The Battle of Crécy: A Casebook*, ed. Michael Livingston and Kelly DeVries (Liverpool: Liverpool University Press, 2015), 143.

mention how large numbers of French horses were slaughtered by arrow fire, so even if the knights' armor was able to protect them to a certain extent, their horses remained highly vulnerable. Together with similarly disastrous French defeats, such as the battle of Poitiers in 1356, these events illustrate how even in light of new armor improvements, longbows remained a terrible danger for troops in the 14<sup>th</sup> century. Indeed, arguing for the effectiveness of the English longbow, Clifford J. Rogers points to the successes of English archers against heavy troops at the battles of Halidon Hill and Poitiers, quite convincingly making the point that armor at the time was insufficient to protect its wearers against the penetrative power of this bow.<sup>95</sup> The French were not ignorant of this, of course, as in the battle of Auray 18 years later, they deployed many of their troops dismounted, behind heavy shields, which protected them quite well from the arrow fire. Unfortunately, these shields were so heavy that by the time the French troops closed to melee they were exhausted and easily outfought by their English counterparts. The tactical difficulty of countering the longbow remained a major concern of the French for the rest of the war, and while they eventually proved able to overcome it, at least under the right circumstances, it remained a dangerous threat for some time.

### Agincourt

Another valuable case study is the battle of Agincourt, in 1415. Coming as it did several decades after Crécy, armor had developed significantly, and this is reflected in the details of the battle. While it ended just as poorly for the French, the battle nonetheless provides an excellent opportunity to observe later plate armor in action against longbows, and it held up significantly better than that worn at Crécy. That said, the English arrows were far from ineffectual, and while

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<sup>95</sup> Rogers, "Efficacy," 241.

the French plate held up better than it had 76 years earlier, the knights remained vulnerable to well-placed missile fire. However, circumstances at Agincourt also strongly favored the English, and within 15 years it had become apparent that English longbowmen were not invincible, nor were armored knights helpless before them.

Agincourt is, of course, one of the most iconic battles of the Middle Ages, and there has been a correspondingly large amount of scholarship on it. Much of this scholarship has revolved around numbers at Agincourt and how the English were deployed. In terms of numbers, while all agree that the English were outnumbered, the scope of this numerical discrepancy has proven a matter of contention. Contemporary sources are notoriously unreliable, and modern estimates have provided quite a range of numbers. Robert Hardy gives the numbers of the English army as roughly 6,000, with 5,000 of those being longbowmen.<sup>96</sup> As for the French, he declines to give an exact estimate of his own, but readily cites a contemporary English chronicler who estimated 60,000 French in the field.<sup>97</sup> On the other end of the spectrum, Anne Curry estimates roughly 9,200 troops for the English, with 7,500 being longbowmen, and 12,000 French.<sup>98</sup> Perhaps even more vexing is the issue of how the English archers were deployed. One source, the *Gesta Henrici Quinti*, states that they were positioned in wedges between each battle.<sup>99</sup> This is the only source to claim such a deployment, but it has set off over a century of debate among scholars. While still accepted by such scholars as Robert Hardy, this interpretation has been challenged by Matthew Bennet, who cites numerous other sources which make no mention of wedges and argues that the fixation upon their supposed effectiveness stems from observation on effective

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<sup>96</sup> Hardy, *Longbow*, 102.

<sup>97</sup> Hardy, *Longbow*, 113.

<sup>98</sup> Matthew Bennet, "The Battle of Agincourt", in *The Battle of Agincourt*, ed. Anne Curry and Malcolm Mercer (New Haven: Yale University Press, 2015), 102.

<sup>99</sup> Anonymous, *Gesta Henrici Quinti*, ed. and trans. Frank Taylor and John S. Roskell, excerpted in *The Battle of Agincourt, Sources and Interpretations*, ed. Anne Curry (Suffolk: The Boydell Press 2000), 33.

artillery and machine gun deployments, and claims that such a use is unsuited for longbows.<sup>100</sup> The crux of his argument, that such a deployment pattern would leave the archers vulnerable to infantry attack, is equally well made.

More relevant to this study, however, is the debate surrounding how effective longbows were against the armor worn by the French at Agincourt. The fact that the battle was a resounding French defeat, and that most of the English army was composed of archers, would suggest that they were quite effective indeed, and this argument, supported by the claims of some contemporary authors and the evidence from certain modern tests, has led scholars such as Rogers and Hardy to conclude that longbows remained highly potent against the best armor of the day. However, complicating factors in the battle, as well as in recent tests, in fact lead to a much less certain conclusion.

The French defeat at Agincourt owed to several factors, and the ineffectiveness of their armor was not one of them. Rather, the French deployment pattern, one that effectively mirrored the English formation by placing crossbowmen and cavalry on the wings while infantry held the center, was fouled even before the battle began by impetuous nobles pushing themselves to the front, overconfident of their impending victory.<sup>101</sup> This of course blocked the view of the French crossbowmen and left them unable to counter the English archers. Additionally, the English King Henry had his archers equipped with portable stakes, which they used to protect themselves from charges by the French cavalry. Interestingly, Henry only devised this particular scheme when he learned of the French battle plan in advance from a prisoner.<sup>102</sup> Thus it is possible, had Henry not come upon this information, that the outcome of the battle could have been quite different.

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<sup>100</sup> Bennet, *Agincourt*, 106.

<sup>101</sup> Bennet, "Battle," 102.

<sup>102</sup> Anonymous, *Gesta*, 30.

However, this can never be more than speculation. Furthermore, the terrain was fairly muddy, and on the French side of the field it was particularly chewed-up, which severely limited the mobility of the French troops in addition to tiring them badly,<sup>103</sup> for as the *Chronique anonyme du règne de Charles VI* relates, the previous day the French had been “marching through the middle of the mud where they sank up to their knees. So they were already overcome with fatigue even before they advanced against the enemy.<sup>104</sup>” This fatigue doubtless counted toward their poor performance in the ensuing melee.

Tactically speaking, just about everything that could have gone wrong for the French, did. Their cavalry failed to penetrate the stakes and routed back through the advancing infantry, disrupting their advance.<sup>105</sup> It could be argued that this was a weakness of plate armor, for the knights, weighed down and stuck in the mud, would have been unable to extricate themselves. This is a fair assessment, and it must be conceded that in such terrain as there was at Agincourt, heavy armor could be a liability.

The French were also under heavy fire as they advanced, but evidence concerning the effectiveness of this fire is varied and sometimes contradictory. Rogers, arguing for the strength of the longbow at the time of Agincourt, cites a number of contemporary sources, such as Monstrelet, Waurin, and Lydgate, who all relate longbows being highly effective against advancing troops.<sup>106</sup> This conclusion is supported by the *Gesta Henrici Quinti*, generally considered to be the most reliable source for the battle, which reports that “missiles...pierced the

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<sup>103</sup> Ibid, 106.

<sup>104</sup> Anonymous, *Chronique anonyme du règne de Charles VI*, trans. Anne Curry, excerpted in *The Battle of Agincourt, Sources and Interpretations*, ed. Anne Curry (Suffolk: The Boydell Press, 2000), 116.

<sup>105</sup> Ibid. 107.

<sup>106</sup> Rogers, *Reply*, 242.

sides and visors of [French] helmets.”<sup>107</sup> However, the *Histoire de Charles VI* claims that “The French were scarcely harmed by the arrow fire of the English because they were so well armed.”<sup>108</sup> Admittedly des Ursins was not present at Agincourt and has been accused of inventing information, so his account of the effectiveness of French armor may well be an exaggeration. Even so, many sources, such as the *Chronique Anonyme*,<sup>109</sup> in addition to Monstrelet and Waurin,<sup>110</sup> who are both cited by Rogers, tell of wounds suffered by arrow fire, but make little mention of fatalities, at least among the soldiers. Once the battered and tired French troops actually made it into melee, they had to come to grips with prepared and well-equipped English knights and men-at-arms, after which the English archers rushed their flanks with melee weapons. By this point, the French were tired, disorganized, and under attack from nearly all sides, so it comes as little surprise they were slaughtered.

Admittedly, it is difficult to know exactly how effective longbows were against Agincourt-era plate armor from the sources alone, but modern tests seem to have shed some light on this. According to these tests, longbows firing bodkin points have been able to penetrate sheets of steel at close range, but results have been far less conclusive against curved armor, which would have been worn by the time of Agincourt.<sup>111</sup> One such test, conducted against a 1.5 mm mild steel sheet, concluded that a bodkin point could penetrate the sheet cleanly from an angle of 45°, but at 60° the arrow only achieved partial penetration before the tip snapped, and at

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<sup>107</sup> Anonymous, *Gesta*, 36.

<sup>108</sup> Jean Juvenal des Ursins, *Histoire de Charles VI, Roy de France*, trans. Anne Curry, excerpted in *The Battle of Agincourt, Sources and Interpretations*, ed. Anne Curry (Suffolk: The Boydell Press, 2000), 131.

<sup>109</sup> Anonymous, *Chronique Anonyme*, 106.

<sup>110</sup> Enguerran Monsrelet, Jean Waurin, and Jean Le Fèvre, trans. Anne Curry, excerpted in *The Battle of Agincourt, Sources and Interpretations*, ed. Anne Curry (Suffolk: The Boydell Press, 2000), 159.

<sup>111</sup> Bennet, 98.

70° the shot ricocheted completely.<sup>112</sup> It is significant that, while this test proves arrows could penetrate the sides and visors of 14<sup>th</sup> century bascinets as well as cuisses at the right angle, the brow of these same helmets could be as much as 4.5 mm thick, and breastplates almost as thick.<sup>113</sup> Thus, the most heavily armored parts of a knight would have been effectively impervious to arrow fire. Other tests have also shown even bodkin arrows to have minimal penetrative capacity at steep angles, which would especially have been the case at long range.<sup>114</sup> After all, striking plates at an angle increases their effective thickness, in addition to reducing the penetrative capacity of the shots. Because longbows usually fired in arcs, especially at long range, steep angles of incidence would have been a common occurrence. The targets of the English bowmen would also have been moving, further reducing the likelihood of a single direct hit. And while it certainly appears that the archers were able to wound French troops, a wound is far different from a fatality.<sup>115</sup> Wounds in the arms and legs could be explained by the thinner armor in those locations than on the torso or the crown of the head, which would likely have deflected arrow impacts.<sup>116</sup> Even fatalities could be accounted for by variations in the quality of the armor worn, as poorer knights and men-at-arms would have worn lower-quality wrought iron armor or mail, rather than steel. These wounds would certainly have contributed to the underperformance of the French in close combat, but the fact that knights were wounded, rather than killed, speaks to the value of their armor. True, their ultimate fate was the same, but there were other factors in play, and it is once again worth noting that the English and French men-at-

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<sup>112</sup> Peter Jones, "The Target," in Robert Hardy, *Longbow: A Social and Military History*, (London: Bois d'Arc, 1992) 236.

<sup>113</sup> Jones, "Target," 234.

<sup>114</sup> Kelly DeVries, "Catapults are not Atomic Bombs: Towards a Redefinition of 'Effectiveness' in Premodern Military Technology," *War in History* 4.4 (December 1997), 462.

<sup>115</sup> Rogers, "Efficacy," 242.

<sup>116</sup> Richardson and Watts, 147.



arms would have been similarly equipped.<sup>117</sup> With this in mind, and the apparent fact that the French lost the battle in close combat, it seems that the armor of the French knights had improved considerably in effectiveness since 1346, although it was still far from perfect.

Notably, at the battle of Patay in 1429, 14 years after Agincourt, armor technology had advanced little, but the result was extremely different. This time, an English force of roughly five thousand, composed of longbowmen supported by knights and men-at-arms in traditional English fashion, came up against a much smaller force of French knights. The English were unable to complete their defensive preparations in time and the French had the initiative, launching a cavalry charge against the English lines. The longbowmen were unable to stop or even significantly impede the charging knights and roughly half of the English force, including most of its bowmen, was massacred.<sup>118</sup> French casualties were minimal. Clearly, on this occasion, knightly armor proved more than adequate against the weapons pitted against it. This success could certainly be attributed to the unprepared nature of the English lines and the fact that their bowmen were both unprotected by stakes and unprepared to meet the French advance, but the fact that the French forces were able to so rout their foes in a frontal assault, despite being at almost a 4-1 numerical disadvantage, speaks to the effectiveness of their equipment as well as their skill, discipline, and courage.

### Late Medieval Armor

Of course, as weapons improved, so too did armor. Plate became progressively more sophisticated as the Middle Ages went on, reaching its golden age in the 15<sup>th</sup> and 16<sup>th</sup> centuries.

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<sup>117</sup> Richardson and Watts, 110.

<sup>118</sup> "Patay, Battle of," *The Oxford Encyclopedia of Medieval Warfare and Military Technology*, ed. Clifford J. Rogers, Oxford University Press, 2010.

Figure 13 shows a restored suit of plate armor from the early 15<sup>th</sup> century, roughly contemporary with the battle of Agincourt. The legs are well-protected in their entirety, with the shins, knees, and thighs all protected by plates, called greaves, poleyns, and cuisses respectively.<sup>119</sup> The hands, shoulders, elbows, and outer arms are also all covered by plates, the torso is guarded by a brigandine constructed of plates riveted together inside the leather doublet, and the head is encased in a type of helmet called a “visored bascinet.” The weak points between the plates are all covered by mail. This armor would protect the extremities well against blows of all kinds, as the rounded plates would easily redirect force rather than absorbing it, and the brigandine would protect against slashing or even light piercing blows. However, there are some notable weaknesses in this armor. For one, the inner arms are not plated, leaving them vulnerable to a penetrating attack when the arm is raised to strike. Another, even more dangerous weakness, lies in the relative lack of protection for the neck, which could be easily severed in such armor as this. In fact, such a fate befell a French knight at the battle of Mons-en-Pevele much earlier in 1304, who was decapitated while helping king Phillip the Fair onto his horse.<sup>120</sup> This would also leave the soldier vulnerable to arrows with a downward trajectory, which were fairly common when fired at long range.

The contrast with Figure 14, dated 1548, is striking. Nearly all the weaknesses of the early design have been corrected in this later model. The arms are now completely encased in plating, with even the crooks of the elbows covered by a *coudiere*, which would protect this vulnerable section of the arm. The shoulders are guarded by rounded pauldrons, the gauntlets are entirely metal, and the legs and feet are completely protected. The torso, in contrast with the

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<sup>119</sup> DeVries, *Technology*, 76.

<sup>120</sup> DeVries, *Infantry Warfare*, 40.

earlier 14<sup>th</sup>-century armor, is completely covered by solid, shaped plates which have no apparent vulnerabilities and would deflect slashing blows with ease, even as they resist penetrating attacks. The upper thighs and pelvis are protected by a skirt-like design called a *tuille*, made of segmented plates, which would protect this portion of the body while still allowing the legs an impressive range of movement. This armor, while not worn until well after the Hundred Years War, represents the epitome of armor design and some of the finest equipment crafted for the medieval soldier.

With so much plating covering a soldier, it comes as no surprise that many believe knights to have been clunky and awkward on the battlefield. This belief does not do credit to the sophistication of late medieval armor designs. A plate harness was not designed solely to provide optimal protection, but also to allow for freedom of movement. Although this seems obvious after some thought—after all, if armor was such an impairment in battle, it wouldn't have been widely worn for hundreds of years—it is nonetheless worth examining in closer detail. To this end, John Clements describes some of the traits of late medieval plate armor in order to verify the agility it provided. While he admits that “specialized armor designed exclusively for mounted fighting or tilting was much heavier and less maneuverable [than that worn by infantry],”<sup>121</sup> he nevertheless correctly asserts that “a harness was designed to evenly distribute the armor's weight on the wearer”<sup>122</sup> and as such, the weight of the armor was far from excessively burdensome. He also references accounts of training for armored warriors in the 14<sup>th</sup> and 15<sup>th</sup> centuries, pointing out how “warriors in training were advised to keep a wooden horse to practice jumping on and off the saddle as well as becoming accustomed to sitting mounted in armor.”<sup>123</sup>

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<sup>121</sup> Clements, “Armor,” 40.

<sup>122</sup> Clements, “Armor,” 41.

<sup>123</sup> Clements, “Armor,” 43.

While it goes without saying that jumping into a saddle or climbing over obstacles are feats that would require great agility and thus armor must have provided that agility, it makes perfect sense that maneuverability would be emphasized in armor construction. After all, if a knight's horse were to be shot out from under him, or if he were to be knocked to the ground during a battle, he would need to be able to recover quickly in order to avoid being cut down while he lay incapacitated. Battle is chaotic by nature, and a warrior must always be ready to cope with sudden reversals.

### Conclusion

The rate of armor development during the second half of the Middle Ages was unrivalled throughout history. In the space of 500 years, armor went from mail hauberks and iron caps to full-body suits of custom-fitted steel plate. And while the causes for this development were multi-faceted—technological, infrastructural, and political developments no doubt played a significant role—the greatest impetus for improvement was the need for better armor to protect against increasingly lethal weapons. During the 12<sup>th</sup> and 13<sup>th</sup> centuries in particular, crossbows proliferated on the continent and the longbows came to dominate English warfare. With their remarkable power and range, these weapons were able to easily penetrate the mail armor that had served so well up to that point. But as plate improved, so too did the weapons employed against it, and staff weapons, daggers, and thrusting swords became increasingly common on battlefields. Of course, armor grew progressively better as a result. This medieval arms race finally ended, however, with the advent of firearms. Although it took time for gunpowder weapons to truly come into their own, once they did their power and range eventually rendered even the most advanced armor obsolete.

It is easy to forget, though, when examining the ways in which technology developed, that the soldiers who wore the armor were more important than any amount of plate. As is the case with all technologies, as armor advanced, the methods of fighting in it also changed. Some of these changes are fairly obvious, such as the increasing reliance on infantry formations over cavalry as the Middle Ages wore on, but there were also shifts at the personal level. As mail gave way to plate, shields disappeared, and staff weapons became more common, the fighting styles of individual soldiers had to change in order to accommodate this. Thus, the technological developments went hand-in-hand with strategic, tactical, and individual changes. Did these changes also alter the outlook of the soldiers themselves? It has already been noted that armies became progressively more disciplined and professional as the Middle Ages wore on. Battlefield experience and organizational changes doubtless accounted for some of this, but what else led to this increasing effectiveness of, and investment in, common troops as opposed to elite warriors? The late medieval professional armies were a first in the West since the Roman legions, and their spread undeniably changed the scope and methods of war. Understanding the ways in which these changes correlated is just as important as knowing how and why medieval technology changed in developing a better understanding of war in the Middle Ages.



Figure 1: *Bronze Helmet of South Italian-Corinthian Type*, Metropolitan Museum of Art,  
<http://www.metmuseum.org/art/collection/search/257637>.



Figure 2, *Roman Soldier in Lorica Segmentata*, Wikimedia Commons,

<https://commons.wikimedia.org/>



Figure 3, *Helmet (spangenhelm)*, Metropolitan Museum of Art,

<http://www.metmuseum.org/art/collection/search/24685>





Figure 4, *Bayeux Tapestry*, kingsacademy.com



Figure 5, *Helmet of St Wenceslas*, Wikimedia Commons,

[https://commons.wikimedia.org/wiki/File:St\\_Wenceslas\\_helmet.jpg](https://commons.wikimedia.org/wiki/File:St_Wenceslas_helmet.jpg)





Figure 6, *Bayeux Tapestry*, <http://4.bp.blogspot.com/>



Figure 7, *Bayeux Tapestry*, <https://www.bing.com/images/>



Figure 8, *Sword*, The Metropolitan Museum of Art,  
<http://www.metmuseum.org/art/collection/search/24832>



Figure 9, *Sword*, The Metropolitan Museum of Art,  
<http://www.metmuseum.org/art/collection/search/25601>





Figure 10, *Topfhelm*, Wikimedia Commons,  
[https://commons.wikimedia.org/wiki/File:Topfhelm\\_DHM\\_transparent.png](https://commons.wikimedia.org/wiki/File:Topfhelm_DHM_transparent.png)



Figure 11, *Halberd*, The Metropolitan Museum of Art,  
<http://www.metmuseum.org/art/collection/search/34293>





Figure 12, *Sword*, The Metropolitan Museum of Art,  
<http://www.metmuseum.org/art/collection/search/23367>



Figure 13, *Armor*, The Metropolitan Museum of Art, <http://www.metmuseum.org/art/collection/>



Figure 14, *Armor*, The Metropolitan Museum of Art,  
<http://www.metmuseum.org/art/collection/search/>

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