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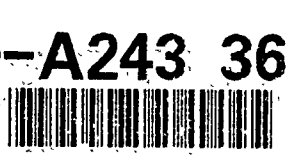

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THESIS ABSTRACT

The chroniclers of the Crusading era (viz. 1097-1254) show a seemingly static situation where neither Christian nor Muslim held uncontested superiority on the battlefield. For the Muslim warrior, the Crusades introduced the permanent presence of an adversary who was more heavily armed and armoured than any other contemporary foe faced by Muslim armies in the Middle East. Archeological evidence shows that an evolution took place from the twelfth to early thirteenth century throughout the Middle East in the primary weapon of Muslim warriors; the design of composite bows changed from an older "angled" design to a newer "smooth" form. This produced a weapon design which had more power with a greater ease of operation than the older form. Previously unexplored in either primary or secondary sources, this technological change was examined by using archeological evidence, the engineering sciences, and historical research based on primary documentation. This

process of change was found to have been driven by the extended exposure of the Muslim warrior to the heavily armoured Western soldier who employed the powerful crossbow as their primary missile weapon. The "smooth" form emerged as the result of a struggle to compensate for the disparity in effective range. Since the use of the composite bow was so crucial to the success of Muslim armies on the battlefield, understanding how and why it evolved is of great interest to the military historian.

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Battle of Doryleum (1097); An eighteenth-century drawing of a lost early-mid twelfth-century stained glass window illustrating the First Crusade, from St. Denis, Paris. Nicolle, Item #753N-753P.

THE FRUITS OF ADVERSITY:
TECHNICAL REFINEMENTS OF THE TURKISH COMPOSITE BOW DURING THE CRUSADING ERA

A Thesis

Presented in Partial Fulfillment of the Requirements for the degree Master of Arts in the Graduate School of The Ohio State University

by

Lt. Bernard A. Boit, USAF

* * * * *

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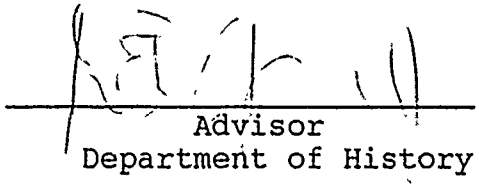

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INTRODUCTION

According to R.C. Smail, most scholars of "medieval warfare in general and of crusading warfare in particular" consider the warfare that took place in Outremer[1] during most of the twelfth century to have been inconsequential in terms of changes in battlefield tactics.[2] Sir Charles Oman also expresses this sentiment in *A History of the Art of War in the Middle Ages*:

> There are many Christian successes worth recording in the years between Marj-es-Safar and the fall of Jerusalem in 1187. But they are not of any special tactical importance...[3]

The chronicles of the era show a seemingly static situation where neither Christian nor Muslim held uncontested superiority on the battlefield. Reconstructed history from the chronicles, however, is based on accounts which rarely give enough detail to draw an accurate picture of all the

[1]The word Outremer is a french phrase composed of two words--*outre* meaning "furthest" or "beyond", and *mer* meaning "sea". This French word was (and still is) commonly used to denote the territory contingent to the easternmost shores of the Mediterranean Sea.

[2]Smail, R.C., *Crusading Warfare 1097-1193*, (Cambridge: at the University Press, 1972), p. 12.

[3]Oman, *A History of the Art of War in the Middle Ages*, I, (New York: Cornell University Press, 1885), p. 304.

factors which constitute the microcosm of the tactical reality. Archeology, however, tells a story that the chronicles of the period do not. Artifacts show an evolution taking place from the twelfth to early thirteenth century in the design of composite bows used by Muslim warriors from an older "angled" design to a newer "smooth" form. Furthermore, this change was not a local phenomenon, but widespread throughout the Middle East.

Due to the esoteric nature of the topic, few historians specialize in the development of Islamic archery in the Middle Ages. This is evidenced by the sparse amount of scholarship on the subject. References to the Turkish composite bow are often only found in appendices to books on Western archery practices or as an example for comparison purposes in technical evaluations of the longbow and the crossbow.[4] However, this is not the case with Western missile weapons such as the longbow and crossbow. The historical context in which these weapons were used and the significance of their involvement in the wars of Europe during the Middle Ages is well known and has been written about exhaustively.[5]

---

[4]Payne-Gallwey, *The Crossbow*; Hickman, Klopsteg, and Nalger, *Archery: the Technical Side*; See also the following sources in footnote 5.

[5]Jim Bradbury, *The Medieval Archer*; Charles Oman, *The Art of War in the Middle Ages*; Robert Hardy, *Longbow: A Social and Military History*; Alfred Burne, *The Crecy War* and *The Agincourt War*; Cliff Rogers, *The Military Revolutions of*

According to David Nicolle, one of the very few authorities on medieval Islamic military history, the older "angled" design of the composite bow used by Muslim warriors was gradually replaced by the "all-curve" or "smooth" design during the twelfth century.[6] Since no surviving Turkish composite bows have been preserved[7], the evidence upon which this assertion is based comes from the close scrutiny of thousands of artifacts from this particular period. Depictions of these two bows are found in the detailed reproductions of sculptures, architectural reliefs, metalworkings, bone carvings, ivory carvings, wall-paintings, tapestries, and manuscripts which fill the pages of Nicolle's work, *Arms and Armour of the Crusading Era 1050-1350*.[8] Close examination of these many illustrations bears out his claim that a change in the composite bow did occur sometime in the twelfth century and continued into the early thirteenth century. A number of illustrations show

---

the Hundred Years War; Donald Featherstone, *The Bowmen of England*; A.V.B. Norman and Don Pottinger, *English Weapons and Warfare 449-1660*.

[6]David Nicolle, *Saladin and the Saracens*, No. 71, (London: Osprey Publishing Co., 1988), p. 7.

[7]This was confirmed by Dr. David Nicolle in a personal correspondence dated 26 July 1991. He does mention that there may be some Central Asian and Siberian bow fragments from this same period, but this would not be of value to the discussion because of their distance from the Middle East.

[8](New York: Kraus International Publications, 1988).

the "angled" and "smooth" forms side by side.[9] There are quite a few instances where the older form is still clearly represented in the depictions of bows from the thirteenth century.

Using such evidence to substantiate a claim can have many drawbacks. Cultural biases can distort or conventionalize art and even the subjective impressions, conscious or unconscious, of those who would copy these art forms can bias how it will be perceived. Nicolle's book, however, provides a large pool of evidence collected over a life-time of travel and study of cultures that stretch from France and Sicily to Iran and the Eurasian steppe. Furthermore, Nicolle's knowledge of the topic is not limited to the material presented in this book but extends to manuscripts which still remain largely untranslated and unpublished. Published manuscripts, however, from the fourteenth to sixteenth century illustrate the process by which the "smooth" composite bow was constructed and serve to highlight the differences between it and the "angled" composite form. The existence of specimens of the Ottoman composite bow are also valuable tools for understanding this problem. Many of them date back to the seventeenth and

---

[9]Dating from the late twelfth to early thirteenth century, an example of this is found in Item #334, figures N, AB, AC, and AQ. Ibid., pp. 134 of vol. 1, and 696-7 of vol. 2. See also Item # 381.

eighteenth century, and they are virtually identical to the newer form which came into vogue in the twelfth century.

That the Turkish composite bow changed in the twelfth to early thirteenth century is certain. The forces which drove the adoption of the "smooth" form, however, have not been examined . . . especially in the context for which it was built: as a weapon of war.[10] Since the use of this weapon was so crucial to the success of Muslim armies on the battlefield during the Crusades, understanding how and why it evolved during the twelfth century is of great interest to the military historian.

With the invasion of the Seljuk Turks from Central Asia into the Levant[11] during the mid-eleventh century, the structure of Islamic armies underwent a radical change in composition, a change which was accompanied by major changes in the conduct of war. The horse-archer became the predominant type of warrior in the Middle East during the Crusading period [1097 to 1272] when the Turkic tradition of mounted combat became adopted throughout all Muslim countries. For over a thousand years, the Turkic tribesmen of Central Asia had used the "angled" form of the composite

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[10]No primary or secondary sources extant explicitly address this transition of the "angled" to the "smooth" form of the Turkish composite bow in its historical perspective.

[11]Archaic term for those countries bordering the eastern coast of the Mediterranean Sea.

bow as their primary weapon of war. The newer form had co-existed with this "angled" form for many centuries, but did not become the predominant design until the close of the twelfth century. It is my contention that this change was a direct response to the new threat presented by the Crusaders in the Levant.

For the Muslim warrior, the Crusades introduced the permanent presence of an adversary who was more heavily armed and armoured than any other contemporary foe faced by the Muslim armies in the Levant. The Fatimid armies of Egypt[12], very western in their tactical formations and military costume, were no match for the Turkish armies of Syria or the Crusader armies. The Frank[13] was different in two very important respects: his armour was extremely resistent to damage from most weapons--and his missile weapon, the crossbow, was devastating against the light armour of the the Turkish horse-warrior. In order for their bows to be effective, the Turks now needed to come closer to

---

[12]When the Crusaders arrived, the forces of the Fatimid caliph had not become "Turkified" and were hostile to the Abbasid Caliphate which by this time had armies comprosed almost completely of Turkish horse-warriors.

[13]The term "Frank" (" فرنك " in Arabic) was used by Muslims to label Westerners in general. Some forms of "Frank" in other languages are generic for "foreigner". This is true in Farsee and Tha'i. John F. Guilmartin, conversation 5 August 1991. Dr. Nicolle stated that the term "Frank" in Arabic means "Catholic" or "European" and, in light of Dr. Guilmartin's statement, it seems that the word becomes more disassociated with the true meaning as one goes East. Telephone interview, 6 August 1991.

the enemy to penetrate his heavy Western armour. Doing this, however, brought them into range of the crossbow. It is my thesis that the "smooth" form of the Turkish composite bow emerged as the result of a struggle to compensate for the disparity in effective range. A number of supporting technologies were also developed and employed by Muslim forces which allowed them to wage war effectively against the Christian field army. The resultant "smooth" form of the composite bow gave the warrior a bow design which was more reliable and had greater capacity for range and penetration compared to the "angled" form. By the middle of the thirteenth century this new bow, in the hands of highly trained and disciplined troops, allowed Muslim forces to change the tactical face of warfare in the Middle East through superior fire power.[14] The smooth, recurved, Turkish composite bow remained the predominant weapon of the Muslim archer until it was made practically obsolete by gunpowder in the late sixteenth century.

To demonstrate the validity of this thesis, this study will examine the following facets of this problem between the beginning of the First Crusade and the end of the Seventh Crusade, that is, roughly 1097-1254. First, the nature of the threat posed by the Western knight to the

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[14]The military forces of the Mamluk Empire were able to oust the Crusaders by the end of the thirteenth century and defeat the Mongols at Ayn Jalut (1260) by virtue of their skill in archery.

Muslim military forces of Outremer must be established. Was it so vastly different from other enemies faced by Muslim armies in the Levant at that time? How well did the Crusader's armour protect against Turkish arrows? Second, the force structure of the Islamic armies at this time will be scrutinized. The third chapter will focus on a detailed technical analysis of the design changes which occurred to the Turkish composite bow. In this chapter, I will also address supporting technologies which were used in conjunction with the bow. And finally, using a number of primary sources, the battlefield conditions will be analyzed to determine the causes of this evolution. Certain salient questions emerge and must be addressed: How powerful was the Crusader crossbow of the twelfth century? How did it influence Turkish tactics and technology? How did the Turkish bowyers[15] respond? What was the vehicle by which this new technology spread? Asking and answering these questions will demonstrate that a significant technological change occurred in Muslim archery in direct response to the threat posed by the Western forces in Outremer.

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[15]The art of constructing bows is called bowyery. One who is skilled in this craft is called a bowyer.

CHAPTER I

WESTERN ARMIES IN OUTREMER

Fig. 1. Detail of an illustration from the Maciejowski Bible (ca. 1240) showing the typical arms and armour of the period.

With the cry of "Deus le volt!" [God wills it!], the Western soldier took up the cross and joined the throngs which made up the First Crusade. A totally alien concept in the East, the Holy War was to become just another invasion

of foreigners in the eyes' of the Byzantines and the Muslim countries of the Levant.[1] The presence of the Crusaders in Palestine--the heart of the Levant--and their subsequent capture of one of the holiest cites of Islam forced Muslim princes to unite and create their own version of Holy War (called the *jihad*). To understand the nature of the military threat posed by the Western soldiers, an examination of the background of Europe during the Crusader period will provide insight into the mind of the Western soldier in the Levant.

The dawn of twelfth century saw the beginning of a period of great expansion for the landed aristocracy in Medieval Europe. Population, productivity, and the wealth of Western and Central Europe was increasing rapidly. The revival of a money economy created an expanding gap in wealth between the masses and the nobles. Compared to the chaotic tenth and eleventh centuries, the twelfth century allowed the nobleman to live in greater luxury and in a more politically stable society. The Church had decreed the *Pax*

---

[1]Before the *jihad*, the Muslim had another concept of Holy War, but this was wholly different from the Western Crusade. This was called *ghazi* warfare. The *ghazi* warrior was a fighter for his faith and spent his time raiding on the frontier of Islam and other non-Muslim countries. While the Crusades were of a definite period and were numbered, the *ghazi* fought an unending war. John F. Guilmartin Jr., "Ideology and Conflict: The Wars of the Ottoman Empire, 1453-1600", *The Origin and Prevention of Major Wars*, (Cambridge: at the University Press, 1989), p. 154; see also Ibn al-Qalanisi, *The Damascus Chronicle of the Crusades*, (London: Luzac & Co., Ltd.), p. 41, 60, and 74.

Ecclesiae ["Peace of the Church"] and the *Treuga Dei* ["Truce of God"] in the latter half of the eleventh century. These decrees, in effect, reemphasized the immorality of killing noncombatants and endeavored to limit the amount of time a lord could wage war.[2] As this process of civilization changed his manner of living, it also changed his idea of ethical behavior in war.

By the middle of the twelfth century the ideals of chivalry had taken a firm root in feudal Europe. The knight lived by rules based on the principle of knightly honor, making war less savage and more amenable to the booming economic conditions. In combat it was not to a knight's advantage to kill his opponent, for if he captured him he could receive ransom and thereby further his own ends. Glory in battle was deemed the highest good. As early as the beginning of the twelfth century, this concept was already influential among the knightly class.[3]

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[2]The Truce was basically prohibition against fighting on certain days during the week according to religiously significant events. The result was a reduction of the time allowable for war to little more than four months of a year. Although both the Truce and Peace of God were (at least in principle) enforced with the threat of excommunication, it did not prove to be an effective deterrent. Brian Tierney and Sidney Painter., *Western Europe in the Middle Ages: 300-1475*, 4th ed., (New York: Alfred A. Knopf, 1983), p. 291.

[3]Orderic Vitalis, recording the valiant actions of a knight in 1119, stated that his bravery was an example "thus gaining glory through all the ages, among the bravest soldiers, by his prowess in arms." *Ecclesiastical History of*

In European battles at this time, heavy cavalry was unchallenged as the offensive arm in battle.[4] Since the time of Charlemagne, the weapon of European cavalry *par excellence* was the lance. In the early twelfth century this lance was little more than a spear: normally used at arms-length and in an over-hand position as if to thrust or hurl. During the course of the twelfth century the lance became heavier and came to be used primarily in a "couched" position. The lance held in this manner is secured tightly beneath the armpit[5] and has the effect of concentrating the momentum of both the horse and rider to the point of the lance.[6] The charge of the cavalry determined victory or defeat on virtually every Medieval battlefield.

England and Normandy, trans. by Thomas Forester, (London: J. Haddon and son, Printers, Castle Street, Finsbury), p. 489.

[4]It is important to note that not all mounted warriors in the West were knights. However, regardless of their social rank, those men who were mounted in battle were normally equipped and trained the same way as the knights. Therefore, for the purposes of this paper, the term "knight" can apply to all European mounted combatants. Philippe Contamine, *War in the Middle Ages*, trans. by Michael Jones, Great Britain: TJ Press Ltd., Padstow, 1984), pp. 67-73.

[5]This is shown to be true in all sources of the period. Smail states that he knows of no evidence in which a Western knight used the lance during the Crusades in an overhand attack such as that depicted on the *Bayeux Tapestry*. Smail, p. 113, footnote 1. Ousama gives many detailed accounts of cavalry combats and "notable lance thrusts" in his *Autobiography*, trans. by George R. Potter, (London: George Routledge & Sons, Ltd., 1929). Throughout the text it appears that the lance was always used in the couched position.

[6]Lynn White, *Medieval Technology and Social Change*, (Oxford: at the University Press, 1962).

The instances of battle in Europe during the twelfth and early thirteenth are relatively few, but they clearly show the change that chivalry brought to the battlefield. The actual casualties in the wars which occurred, at least among armoured knights, the decisive arm, were generally very few. For instance, at the battle of Bremule in 1119, the chronicler Ordericus Vitalis stated that in a battle "between the two kings, in which nearly nine hundred knights were engaged, I have ascertained that three only were slain."[7] A war which started in 1127 in the county of Flanders and was waged for over a year claimed only seven lives (five were knights) even though over one thousand knights were involved during the course of the war.[8] The battle of Bouvines in 1214 resulted in only three French deaths and less than one hundred German deaths[9]--this out of forces having over ten thousand soldiers each![10] Unless the

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[7]He claims that this was due to their "steel armour, and mutually sparing each other for the fear of God and out of regard for the fraternity of arms." Vitalis, p. 484.

[8]Of these five knights, only one was killed in combat, the rest were killed in accidents from: a fall from a horse, a slip while climbing a wall, the collapse of a ceiling, and too much enthusiasm in blowing a horn. Contamine, p. 256.

[9]J.F. Verbruggen, *The Art of Warfare in Western Europe during the Middle Ages*, (New York: American Elsevier, 1976), pp. 236.

[10]This is based on Ferdinand Lot's estimate. Cited in Joseph Dahmus, *Seven Decisive Battles of the Middle Ages*, (Chicago: Nelson-Hall, 1983), p. 161.

European knight went to Outremer, however, he rarely saw battle and would often engage in tournaments to improve his combat skills. Of greater significance was the conduct of seiges, for the capture of fortified points was generally the real objective of military campaigns in Europe.

The composition of the Western war machine had its foundation on two classes of troops corresponding to social classes from which they were drawn: infantry and cavalry. Membership in one or the other of these classes depended not only on the wealth of the individual but also on his birth. The peasantry and poorer vassals of the lords comprised the rank and file of the foot soldiers. It was not uncommon for knights falling upon hard times to be reduced to the ranks of the foot soldier, but the reverse was rarely true.[11] Knights were of gentle birth and had the financial means to purchase expensive armour, arms, and mounts. The skill and training needed to be competent in the saddle was considerable and required frequent practice to maintain. These factors constituted another barrier to those with the financial means to "rise" to the knightly class. This socio-economic split within the Western military was

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[11]The author of *Gesta Francorum* was a knight who, through the hardships of the journey through Anatolia during the First Crusade, lost his mount and joined the ranks of the infantry in battle.

accompanied by attitudes which were to influence the way war was to be conducted.

The defining of classes in feudal Europe became more pronounced and it translated across the Mediterranian into the Crusader States of Outremer. These distinct lines of social order are described by the Syrian amir Ousama Ibn Mounkidh, who, having friends among the Franks of his same (knightly) class, was able to witness this first-hand:

> The Franks (may Allah turn from them!) have none of the virtues of men except bravery. It is only the knights who are given prominence and superiority among them. The knights are really the only men who count among them.[12]

infantry being used merely as support for the knight.

In this support capacity, the foot soldier would be responsible for carrying armour and weapons to the field of battle and furnishing additional mounts to those knights who had lost theirs in battle. When under attack, the foot soldiers were also used to provide a barrier for the knights against the enemy cavalry and would hold off the enemy until their own knights were ready to charge. In this situation, the foot soldier might engage in stabbing the horses of the enemy or killing any unhorsed knights. The use of missile weapons by the infantryman in Western Europe was common, but relatively inconsequential. Unlike the their adversaries in the Middle East, Western archers were not mounted.[13]

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[12]Ousama, p. 86.

Archery was rarely employed by members of the knightly class since the nature of mounted combat precluded use of the bow. There seems to have been a general disdain for the use of this weapon by the knightly class. King Richard Lionheart's love of the crossbow earned him much disdain from his countrymen.[14] To die by the arrow was an ignominious death--far better to fall in hand-to-hand combat with glory. Archery was never meant to be decisive; victory was the privilege of the knights. The only other use of the foot soldier, albeit an important one, was for the conduct of siege warfare where a great number of men were needed to dig tunnels, fill in ditches, build siege equipment, and storm walls.

From the First Crusade (1097-99) to the Seventh (1248-1254), the armour of Western Crusaders and the knights of Outremer changed very little. Generally speaking, Western armour increased in effectiveness and weight, but it changed very little in design. Rather than give up defensive advantages, the armour of fighting men changed very little to accommodate the hot climate of the Middle East. This

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[13]Other than the crossbow, the short bow was the predominant missile weapon of the typical foot soldier. It was only in the last quarter of the thirteenth century that the longbow became popular weapon--and then only among the English.

[14]Being killed by a crossbow bolt during a siege in 1199 was thought to be a "judgement from Heaven inflicted upon him for his disobedience and impiety in permitting crossbowmen to enter his service." Payne-Gallwey, Ralph, *The Crossbow*, (London: Columbia University Press, 1948), p. 3.

trend would cause the Frankish soldier much suffering when campaigning under the blazing Syrian sun. Frankish, Arab, and Byzantine chroniclers of the period display a genuine admiration for the resistance of Western armour to not only the Turkish arrow but the lance and sword also. The best way to obtain a clear picture of the armour of the Western knight during this period and an idea of its effectiveness is to examine the developments which took place over the course of seven crusades.

The Western soldiers (knights and infantrymen alike) of the First Crusade wore armour essentially identical to that depicted on the famous Bayeaux Tapestry.[15] As their primary defense, mounted warriors wore a knee-length coat of mail called a *hauberk*. This garment of inter-locking metal rings had slits on both sides to allow for ease of movement and to facilitate sitting in the saddle. In almost all cases, the sleeves of the hauberk ended at the elbow, although there are some instances of separate mail defenses for both the forearm and lower leg. Most of the hauberks on the Tapestry are shown with a mail hood, known as a coif. By the end of the twelfth century it was becoming common to extend the sleeves of the hauberk to form a mail mitten which would

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[15]The Bayeux Tapestry is an illustrated account of the Norman invasion of England in 1066. The Tapestry is thought to have been made in the time frame 1066-1082. Dr. Nicolle's work *Arms and Armour of the Crusading Era 1050-1350* provides a number of illustrations from this Tapestry.

protect the hand in battle. The hauberk, by itself, is estimated to have weighed as much as 25 to 28 pounds.[16] Wearing this armour at all times would have created fatigue so it was normally carried to the point where battle was imminent and then donned.[17]

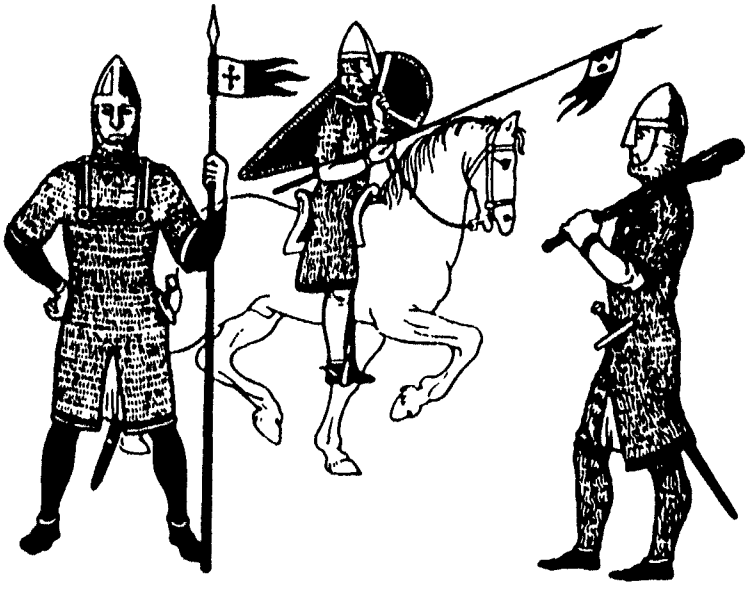

Fig. 2. Norman armour; from the Bayeux Tapestry

Writing a few decades after the First Crusade, the princess Anna Comnena describes the mail armour of the knights under Bohemund in 1107:

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[16]Claude Blair, *European Armour: circa 1066 to circa 1700*, (London, B.T. Batsford, 1958), p. 192.

[17]There are a number of illustrations on the Tapestry that illustrate just this; in a few areas there are pictures of hauberks being carried by two men by means of poles that were passed through the sleeves.

> their chief means of defence is a coat of mail, ring joined to ring, and the iron of that fabric is so good that it repels arrows and keeps the wearer's body unharmed.[18]

From this it can be assumed that this armour equalled or surpassed the protection offered by the mail employed in the Byzantine and Seljuk militaries. If Byzantine and Seljuk armour was as effective, Comnena surely would not have taken pains to mention the great protection afforded by the Frankish armour. Anna was the wife of a military commander and so her comments concerning armour, arms, and tactics were not just an uneducated exposition. Her admiration of the Frankish mail is even more surprising considering the mutual disdain Franks and Byzantines held for one another at that time.

Ousama, a Muslim knight from Syria, also witnessed the durability and strength of the Frankish armour firsthand. After an encounter with Frankish knights where, by his own account, Ousama himself displayed much courage and skill, he was introduced to a Frankish knight whom he had lanced and unhorsed earlier. Impressed with Ousama's ability, the Frank wanted to meet him and pay his respects. The blow he had dealt this knight was so severe that Ousama was frankly amazed that he was still among the living: "I could never have imagined that the knight could survive such a blow."

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[18] *The Alexiad of the Princess Anna Comnena*, trans. by Elizabeth Dawes, (New York: Barnes and Noble, Inc., 1967), p. 341.

The lance had "pierced his coat of mail in two places at the edge" but was rendered harmless because "[t]he stroke was blunted against the skin of his hips [by the mail]."[19] In still another encounter, Ousama lanced a Frankish knight and nearly unhorsed him, but "[h]e had a mailed coat under his tunic and my thrust had not wounded him."[20] During a seige, Ousama relates in another story where a Frankish infantryman armoured in a "double coat of mail" was attacked by a Turkish swordsman. Without shield and having been disarmed, the Frank turned his back and doubled over to absorb the the Turk's blows: "The Turk dealt him several blows which did him no harm, and the Frank returned unhurt to his tower."[21] As further proof of its quality and value as a defensive garment, Ousama at one point in his life personally owned and wore a coat of Frankish mail.[22]

Another type of body armour which was used was scale armour. In the Bayeux Tapestry the figure of William's half-brother, Bishop Odo of Bayeux, appears in what could be interpreted as a hauberk of overlapping small metal plates or scales. Scale armour, compared to mail, was a rarely used form of defensive body armour. This was

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[19]Ousama, p. 54.

[20]Ibid., p. 82.

[21]Ibid., p. 100.

[22]Ibid., p. 135.

Fig. 3. Bishop Odo; Bayeux Tapestry.

probably because it offered less resistance to penetration. On a base of leather or cloth, the overlapping scales of this armour allowed arrow and blade points to pierce easier than would mail. Arrow or blade points striking a mail hauberk, however, would be prevented from penetration because its point would become lodged in an individual link. Although it was never as popular as chain mail, scale armour seems to have become more common towards the end of the twelfth century. A Moravian manuscript dated in the early thirteenth century shows hauberks comprised of large scales.[23] An early twelfth century carving of Goliath on the face of the Abbey of St. Gilles also depicts this type of body defense.[24]

Almost without exception, the warriors on the Bayeaux Tapestry wore a conical helm with a nasal bar providing

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[23] Pierpont Morgan Library (Ms. 7739). A.V.B. Norman, *The Medieval Soldier*, (New York: Thomas Y. Crowell, Co., 1971), p. 216.

[24] Ibid., *The Medieval Soldier*, p. 216.

additional defense for the face. This type of helm remained popular well into the latter half of the thirteenth

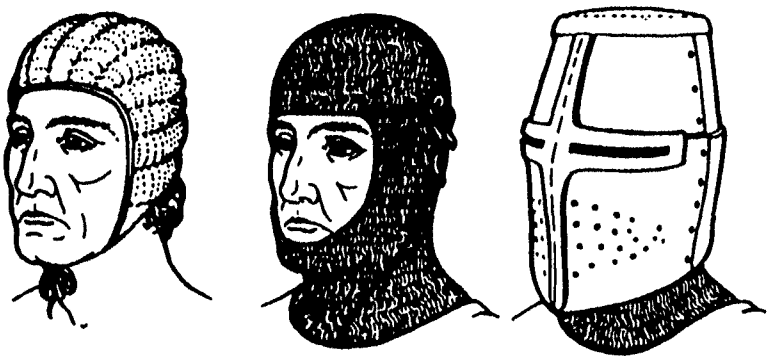

Fig. 4. Arming cap, coif with ventail, and great helm (ca. 1250).

century. A round-topped version, minus the nasal, came into vogue in the mid-twelfth century. Around this same time (ca. 1180) another version also came into use and became popular: the cylindrical helm with a flat or slightly rounded top. Both of these types remained in use for over a century. About 1220, another new head defense came into use. This was the cervelliere or bascinet--a small metal skull-cap sometimes worn under the mail coif.

In the later twelfth century, all the types of helmets mentioned above were being modified with a face guard. This was usually a removable metal plate with slits for the eyes and perforations for ventilation. It would not be until the

early thirteenth century that this would become a common feature. The kettle-hat[25] became popular in the mid-

Fig. 5. Foot soldier with kettle-hat (ca. 1250).

thirteenth century and was the most common type of head defense for the foot soldier--probably because it was relatively inexpensive and easy to make in great numbers. This provided not so much protection as it did an unobstructed view and fresh air. Because of these qualities, it was not uncommon for knights and infantrymen alike to don these hats when not engaged in battle. During the Seventh Crusade (1249-50), Joinville records in his *Memoirs* that "...[it] caused his [the King St. Louis'] helm to

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[25]This was called "*chapel de fer*" or "hat of iron" by the French and made its "come back" just before World War I as the helmet design adopted by the Allies.

be removed and gave him my 'chapel de fer' to give him air..."[26]

The use of the elongated, kite-shaped shield came into dominance in the beginning of the eleventh century. By the

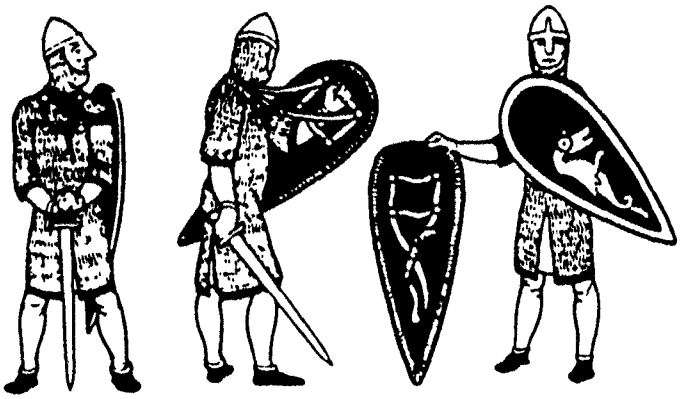

Fig. 6. Norman "kite" shields.

time of the First Crusade, this type was used almost exclusively. The princess Anna comments on this defense in the *Alexiad* as being a "a shield which is not round but long, very broad at the top and tapering to a point."[27] Unlike the round shield which left the legs exposed to attack, the kite-shaped shield offerred a measure of protection for the legs. This shield was further modified around the mid-twelfth century by flatening the top point so that the shield now resembled more of an elongated

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[26]Jean Joinville, *Chronicle*, trans. by Sir Frank Marzials, *Memoirs of the Crusades*, (London: Everyman's Library, 1964), p. 196.

[27]*The Alexiad*, p. 341.

triangle.[28] The knight also used this kite-shaped shield or modified version. Since the legs of the knight were vulnerable to attack by foot soldiers, this type of shield allowed for greater protection of at least one leg--leaving the other to be protected by the sword arm. In addition to

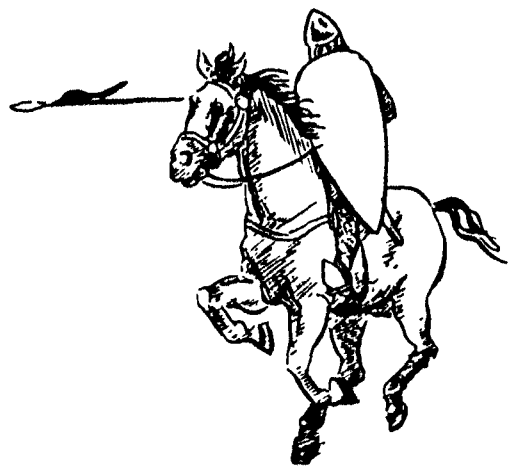

Fig. 7. The charging knight of the early Crusading period. Note how the shield adapted to fit the space between the rider and his horse's neck and thereby protecting the rider's leg.

the kite-shaped shield, the small round shield, known as a buckler, was used throughout the entire period of the Crusades. Gripped by a strap behind the boss, this shield afforded little protection from arrows but gave the soldier greater freedom of movement when in melee. The buckler was normally used by foot-soldiers and rarely by knights.

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[28]This offered virtually the same protection, but it now created a platform on which the crossbowmen could steady their crossbows.

The peasant, not able to afford a costly coat of mail, often went unarmoured or merely used a shield and a helm--if he was lucky. By the mid-twelfth century a type of padded armour came to be used among those of lesser means. This armour, called a *gambeson*, was a coat made of an outer and inner thickness of linen and having a stuffing of either cotton, wool, or old rags. This stuffing was held in place by a quilting in parallel vertical lines. An Assize of Arms in 1181 of Henry II of England made it a minimum requirement for all burghers, and for freemen with goods and rents worth under ten marks a year.[29] Another variation of this was the *atekon*[30], which was lighter than the gambeson and usually worn under the mail armour to prevent chaffing. Surprisingly, this type of armour resisted sword blows as well as arrows fairly well. It was adopted by knights who would sometimes wear it under their hauberks for extra cushioning; wearing this under the mail would also help prevent broken links from being pushed into the wound.

Appearing around the middle of the twelfth century, the surcoat became a common accoutrement of Crusaders.[31]

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[29]Norman, p. 221; C. Warren Hollister, *The Making of England*, 5th ed., (Mass: D.C. Heath and Co., 1988), pp. 147-148.

[30]From the Arabic word for cotton: *al-qutun*.

[31]The surcoat is sometimes referenced as "coat armour". Norman, p. 226.

Consisting of nothing more than a long sleeveless shift extending from the shoulders to the mid-calf, it was worn

Fig. 8. The Surcoat.

over the hauberk and was often emblazoned with distinctive marks to identify the wearer. This garment was normally made of silk, fine cloth, serge, light silk, or even a coloured worsted.[32] The earliest depiction of this surcoat was on a seal of Waleran de Bellomonte, Earl of Worchester, in 1150.[33] This did not become common until the early 13th century when, as depicted in manuscripts such as the *Eneide*, almost all knights wore it.[34] It was usually cinched at the waist with the sword belt and, like the hauberks depicted on

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[32]Paul Martin, *Armour and Weapons*, (Fribourg, Switzerland: the Office du Luvre S.A., 1967), p. 93.

[33]Norman, p. 226.

[34]Ibid., p. 226.

the Bayeaux Tapestry, was commonly split in the front and back to allow for sitting on the saddle.

Modern scholarly debate as to the origins and purpose of the surcoat has contributed little more than an educated guess. The poems *The Avowing of King Arthur*[35] and *The Buke* contend that this garment was used to protect the soldier from rain.[36] This seems unlikely in that the garment did not cover the head, arms, or legs. Furthermore, once wet, the surcoat would soak through, making the wearer wet also. Most scholars agree that it was probably an imitation of the Saracen custom of wearing long flowing robes to protect them from the sun's rays.[37] The Byzantines also wore a similar garment. Although not at first, the surcoat eventually became the background for a knight's coat-of-arms. Used in this way, the surcoat allowed other knights and men at arms to distinguish their lord at a glance. This was especially important in the chaotic conditions of battle. Paul Martin offers the conjecture that, when made of a strong fabric, the surcoat provided some measure of resistance to sword-

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[35]In the "Avowynge of King Arthur", the poem reads: with scharpe weppyn and schene/ gay gownus of grene/ to hold ther armur clene/ and were hitte fro the wette. Cited in R. Oakeshott, *Archaeology of Weapons*, (London: Lutterworth Press, 1960), p. 271.

[36]Norman, p. 226.

[37]This seems to be a credible use for the surcoat. It would have been intolerable to be wearing metal armour with the sun shining directly on it.

cuts and lance-thrusts.[38] This is doubtful considering the usual materials used to make the surcoat were fine cloths or silks.

What no author has of yet suggested is that the surcoat was a means, not so much for protection, but for limiting the damage from arrows wounds. The Mongol warriors of the steppes were a lightly armed and armoured horse archer. Under their relatively little armour they wore little more than loose silk robes or shirts. Since their tactics dictated a fluid attack consisting of volleys of arrows, the Mongol horse warrior had little to fear other than the enemy's arrows. The silk garments of the Mongols did not prevent them from receiving arrow wounds, but did provide another type of protection. It seems that silk has a characteristic unlike other cloths in that it resists the shearing force of the arrow-head.[39]

An arrow hitting an exposed silk-covered area would enter that part of the body and would draw the surrounding silk into the wound with it--thus encasing the arrow-head in a silken shroud. To extract the arrow, the wounded man would grasp the silk around the shaft and pull gently. This would lessen not only the chance of the arrow breaking off in the wound, but would also lessen the possibility for

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[38]Paul Martin, *Armour and Weapons*, p. 90.

[39]Victor Hurley, *Arrows Against Steel*, (New York: Mason/Charter, 1975), p. 26.

infection. Normally the arrowhead is affixed to the shaft by a tight wrapping of some sort of animal sinew. Without the silk encasement, the heat and blood surrounding an arrowhead could relax the sinew and the arrowhead would remain in the wound. Having the silk as a barrier would prevent this from occurring. Still, for this to be effective, the silk would need to be next to the flesh.

The billowy silk tunics of the Crusaders may have indeed offered a modicum of defense against this type of attack when subjected to the arrows of the Muslims. Quite frequently, the arrows used were of a very light weight and lacked the power of penetration characteristic of heavier types of arrows. These arrows of lighter weight are referred to as "darts" in Crusader chronicles. These darts measured approximately eight to twelve inches in length and were shot by means of several innovative devices.[40] As a weapon, these darts were relatively ineffective other than as a means of harassing. Joinville, writing ca. 1250, relates in his *Memoirs* the actions of one of his friends while street fighting against the Turks:

> When he saw that the Turks came into the street he ran upon them, sword in hand, and sent them flying out of the village; and the Turks as they fled before him--for they could shoot behind as well as before--covered him all with darts. When he had driven them out of the village, he pulled out the darts that he had upon him, and then replaced his coat of armour...[41]

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[40]Discussed in chapter three.

After this encounter his friend mounted his horse and continued the attack. Having a rigid type of armour underneath the surcoat would, of course, negate all the benefits that the silk could offer. Mail, or even a gambeson, would provide enough resistance to the arrowhead to render this property of silk ineffective. Since this is what happened, the use of heavy armour--itself an effective means of defense--conformed better to the needs of the Crusaders who often disdained arrows and archers as "beneath th. ." and as a means of combat not worthy of their attention.

Horse armour, or *barding*, was at first a cloth covering made of a heavy, coarse worsted and lined with silk or velvet. In use by the Arabs as early as the tenth century, horse armour did not begin to be used by the West until roughly the same time as the surcoat.[42] The barding used by the Crusaders was normally of two parts: one section covering the head and fore-quarters, with holes for the eyes, and the other draping over the crupper, with a hole for the tail. Due to difficulties in design, the legs were left uncovered. Bardings composed of mail did not come into

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[41]It is unclear whether "coat armour" refers to a surcoat or gambeson or hauberk. Joinville, *Chronicle*, pp. 232-233. See also page 25.

[42]According to David Nicolle, the use of felt barding was adopted by the Arabs in the seventh century as the growing Islamic Empire stretched over Greece and Persia and came into contact with the horse-archers of the Central Asian steppes. *Armies of Islam*, p. 12.

widespread use until the mid-thirteenth century and the earliest reference to the use of large metal plates for the construction of these "trappers" is in the de Nevers armour inventory of 1266.[43]

There is no evidence to suggest that large, rigid plates of metal were used as a form of armour for the Medieval European warrior until the last quarter of the twelfth century, although the technology to do so did exist in Europe at that time.[44] The advent of plate armour did not actually come about until the middle of the thirteenth century and it was not in widespread use until about 1330. The type of armour known as *cuir-bouilli* or *curie*, however, did come into use in the later twelfth century. *Curie* was armour made from leather which was treated by a process which involved boiling it in hot wax.[45] This produced a fairly rigid material which was used at first as a *cuirasse*[46] (armour for the torso) and later as barding for the mounts. First mentioned in literature in the 1220s, the *curie* was recorded as sometimes being used to make a coat-of-plates.[47] This gown was a poncho-like garment lined with

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[43]Blair, pp. 184-5.

[44]Ibid., p 37.

[45]Norman, p. 216.

[46]Note the etymology of this word from the French word *cuir*, meaning "leather".

[47]Ibid., p. 218.

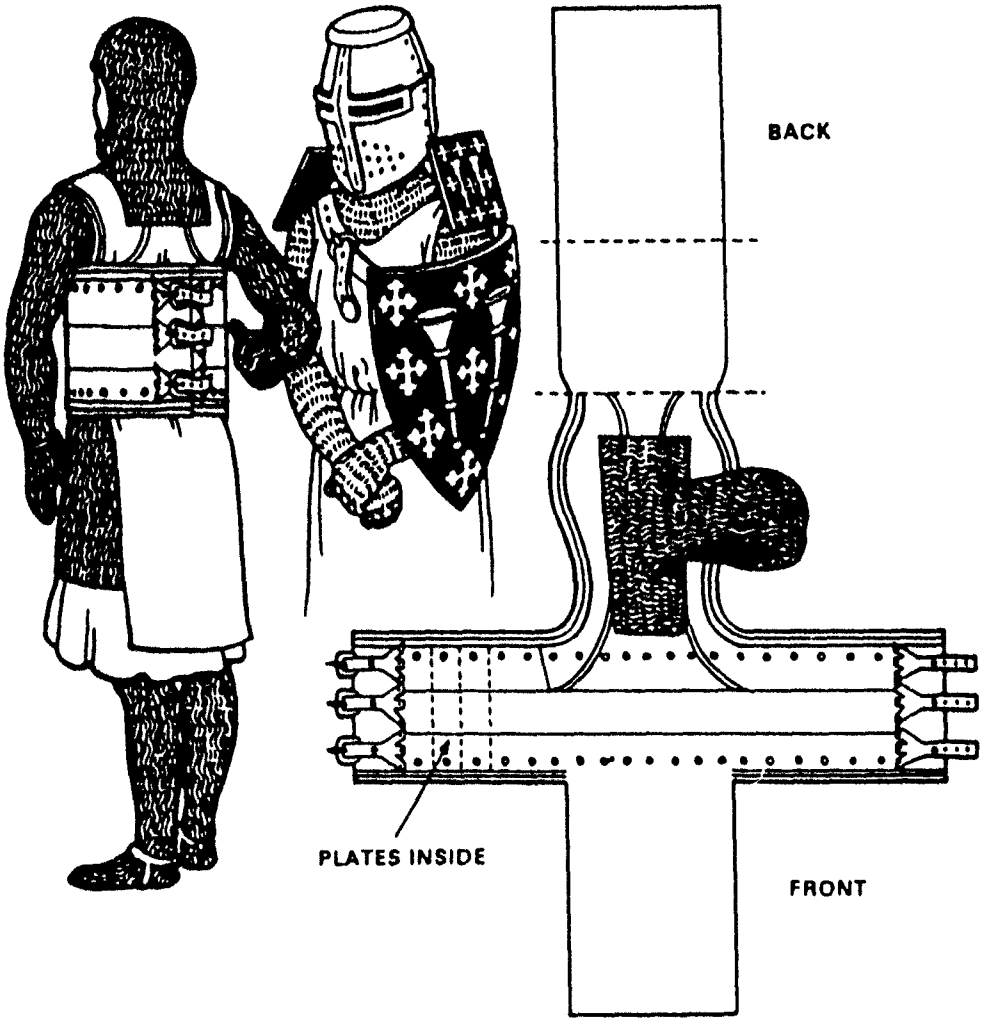

Fig. 9. The coat-of-plates.

Plate I, The sleeping guard from a reliquary at Wienhausen, Germany.

plates of *curie*, having larger plates over the breast and back, and sometimes reinforced with iron. It was worn over the hauberk but under the surcoat thus forming a coat-of-plates. Even though there are no known illustrations of this in the twelfth century, there are a number of mid-thirteenth century manuscripts which show a waist length, sleeveless vest made of some stiff material. Dating from the second half of the thirteenth century, the figure of the sleeping guard on a reliquary at Wienhausen, Germany, shows the rivets of such a coat-of-plates under his surcoat.[48]

Other than the surcoat, there is only one other technical innovation in Western armour which occurred during the Crusades. It was not to come about until the Third Crusade, and then only under the direction of Richard Lionheart, King of England. Recognizing that the threat from his enemy was almost exclusively derived from their use of arrows and darts, Richard had his foot-soldiers put on heavy mantles of felt. This was so successful that even the Arab historian Beha ed-Din ibn Shedad commented on the effectiveness of this strategem, this instance being the battle of Arsouf in 1191:

> Each foot-soldier had a thick cassock of felt, and under it a mail-shirt, so strong that our arrows made no impression on them ... I noted among them men who had from one to ten shafts sticking in their backs, yet

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[48]Ibid., p. 219.

> trudged on at their ordinary pace and did not fall out of the ranks.[49]

This seems to have been an exceptional case among the Crusaders since this type of counter-measure was not recorded as being used against the Muslim archers before or after this instance. This was probably so because of the excessive strain placed on the soldier from the added weight of the felt and the heat. Numerous chronicles attest to the problems that the soldiers had from heat prostration while bearing their heavy load of arms and armour. At this same battle for instance, the forces under Richard Lionheart lost many men from sunstroke and many more fainted and were thus killed as they laid unconscious.[50]

As the twelfth century came to a close, the social distinction between the knightly class and the foot soldier became more pronounced. Even so, the basic armour for both infantry and knight were still essentially the same.[51] The

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[49]cited in Norman, *The Medieval Soldier*, p. 222.

[50]When Richard employed this type of armour, he was making short marches along the coast of the Mediterranian and was regularly victualed from transport ships. Steven Runciman, *A History of the Crusades*, III, (Cambridge: at the University Press, 1955), p. 55.

[51]The Assize of Arms of 1181 under King Henry II of England was an attempt to reorganize the military along the lines of wealth. The holder of a knight's fee (the first two of four catagories) was required to maintain a shirt of mail, a helmet, a shield, and a lance. Those of lower incomes (viz. the third catagory) had to have a coat of mail, an iron headpiece, and a lance/spear--the equipment of an infantry man. The lowest stratum, catagory four, was to have a *gambeson*, an iron headpiece, and a lance. Hollister, pp. 147-48.

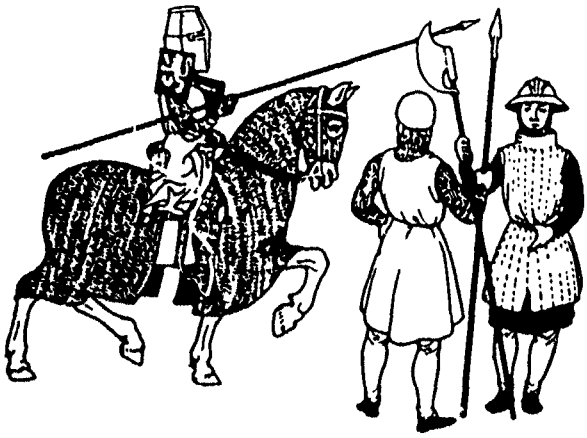

Fig. 10. Heavy cavalry and infantry of the thirteenth century.

Frankish mounted soldier of the early to mid-thirteenth century was most likely clad in a gambeson over which he wore a mail hauberk with sleeves and mail gauntlets. He had some sort of mailed leg armour, an elongated triangular shield, a metal helm with face-guard, a surcoat, and had a scant possibility of having the further defense of some type of plate armour--if so, it was a metal plate or coat-of-plates placed over his chest and under his hauberk. His mount may have had a mail bard, but was most likely of cloth and/or silk. A foot soldier would normally be expected to have a gambeson, over which he would wear a shirt of mail, a steel helmet, and shield. Those who followed the Crusaders and were of lesser means would probably have had at least a gambeson and shield.

The equipment of a mounted Western soldier fully armoured probably weighed approximately fifty pounds--the foot soldier about thirty to forty pounds. So armoured, the

Western soldier was vulnerable only to the Muslim's heavier arrows at close range and rarely to his darts. He would encounter the greatest danger to his person in the actual melee where he could expect to defend against mace, sword, and lance. His mount was vulnerable to most types of missiles and, just as the knight, faced the greatest danger when in melee. So armoured, the soldiers of Europe entered Outremer to face adversaries radically different in their manner of waging war.

The chronic lack of manpower and the difficultly in obtaining horses in the Levant were forces which rendered the Western knight unable to modify traditionally Western tactical formations. Even without these disadvantages, it is doubtful that the European knight would have changed his tactics significantly. Culturally bound by his background and training, the Western knight was unable and unwilling to adopt the foreign practice of mobile horse-archery. Lacking the speed to match the Muslim horse-archer, the Christian forces of Outremer learned fast that safety was to be found in tight cohesive bodies working with close attention to discipline. The battlefield demands placed on the commander of Christian forces in Outremer were radically different from those of Europe. Arriving in the Levant, however, the Western noble was not totally without knowledge of the art of war as practiced beyond the confines of his native region.

One of the military treatises known to have been circulated in Europe at this time was Vegetius' *Epitoma rei militaris*. Whether Vegetius was read by Latin commanders in the Crusader States we do not know; in any case, the question is largely academic since the manpower available to the Crusader States made application of the principles which Vegetius advocated unfeasible. Vegetius called for a disciplined force which could be drilled in formations and maneuvers. There is some evidence that Crusaders learned the tactics and ruses of their Turkic adversaries from the Byzantines. The *Alexiad* mentions that before the Crusaders crossed the Hellespont in 1097, the Emperor Alexius called the great lords among the Franks together to counsel them "in the Turk's usual methods of warfare, and suggested the manner in which they should dispose the army and arrange their ranks."[52] This was probably based on the *Tactica* of Leo.[53] Whether this military knowledge was used by the

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[52]*The Alexiad*, p. 267.

[53]Written during the early tenth century, the *Tactica* of Leo encompases information from his actual war experiences and the so-called *Strategicon* of Maurice. Written in the early seventh century, the *Strategicon* discusses the art of war in Byzantium and gives detailed histories of peoples such as the Persians, Turks, Avars, Slavs, Franks and Lombards and information on their customs and methods of warfare. George Ostrogorsky, *History of the Byzantine State*, trans. by Joan Hussey, (New Jersey: Rutgers University Press, 1969), pp. 16 and 315.

Crusaders is not known. It does appear, however, that ideas about general principles of war were understood.

In the chronicle of William of Tyre, he acknowledges that some actions are in accordance with the military discipline [juxta rei militaris disciplinam] and some against [contra rei militaris disciplinam].[54] Since no specific mention of a tome of military thought is made, whether this knowledge came from a book is not known. Much concerning the art of war is common sense, and experience in the field alone might have allowed the Latins to deduce the "correct" actions required for the situations they encountered. The most likely answer is that some notion of a written tradition of a systematic approach to the theory and practice of war survived from classical times and helped to prepare the minds of the Latin commanders for the unfamiliar conditions which faced them.

Regardless of the source, the military commander of Latin forces in Outremer had to be an extremely wary general to survive in the field against the Turk. The chivalric ideal, however, did not die when the Western knight entered Outremer. Examples abound of knights charging out to meet their opponents to achieve glory in the eyes of their comrades-in-arms. During the truces sometimes arranged between the Latin Kingdom of Jerusalem and various Muslim

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[54]See R.H.C. Oc., pp. 725, 849. Note: these are two of many instances that can be found throughout the text!

princes, the Frank and Muslim were able to mingle with each other and come to know each other's customs. Having many friends among the Frankish nobles, Ousama was able to tell the difference between the Franks "who have come to dwell in our midst" and those "who have more recently joined them in the country which they occupy."[55] These new arrivals understood little or nothing of Islamic culture and customs and were the most zealous in killing and eradicating the "infidel". After a time, however, the Frank came to understand the foreign nature of his Mulsim host--in peace and in battle.

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[55]Ousama, p. 184.

CHAPTER II

MUSLIM ARMIES OF THE CRUSADES

They lay hold on bow and spear,
they are cruel and have no mercy,
the sound of them is like the
roaring sea;
they ride upon horses,
set in array as a man for battle,
against you, O daughter of Zion!

Jeremiah 6: 23

Fig. 11. Turco-Mongol horse-archer shooting to the rear. From a fifteenth century miniature, Topkapi Sarayi Muzesi, 2163, Istanbul.

The Muslim armies faced by the Crusaders during the Seventh Crusade (1248-54) were not that different from the Muslims forces fought by the Crusaders of 1097 as they made their way to Jerusalem. Based on the Turkic tradition of warfare, the tactics of Muslim horse-archers had been used by Muslim armies for centuries in a support role similar to the Western way of war. It only was during the twelfth century that the influence of Turkic traditions in warfare came to predominate throughout all Muslim armies in the Middle East. The Muslim institution using mamluk slave recruits for the professional core of their armies facilitated this process of "Turkification" significantly and ultimately became the source of new military strength. Using the composite bow as their primary weapon, Muslim forces under the Mamluk sultans were eventually able to oust the Latins and the Mongols from the Levant.[1] This progression is best understood using a chronological survey of how Muslim forces changed from the First to the Seventh Crusade.

The First Crusade entered the Levant just as the area was beginning to settle following widespread external and

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[1]Training with the composite bow had become so advanced that Mamluk forces were able to alter their tactics and fight a set-piece battle effectively. At the battle of Gaza in 1244, a Crusader cavalry charge was stopped in mid-course by the use of arrows alone from Mamluk horse-archers drawn up in disciplined ranks before them. According to Nicolle, this incident has no precedent in Crusader history. *Saladin and the Saracens*, p. 17.

internal wars. When the Crusaders arrived at Constantinople in 1097 the Seljuk Turks had just expelled the Byzantines from the Anatolian penninsula following their pivotal victory in 1071 at Manzikert. As the Crusaders crossed into Anatolia a power struggle was in progress among the rival princes of the Seljuk and Danishmandid Turks and so the Turks could not field a united force. Once in Palestine the Crusaders found that the resistance from Fatimid forces was almost non-existent. Having just resolved a civil war, the political turmoil still within the Fatimid government hindered a quick response needed to stop the Crusaders from taking key cities in Palestine.[2] This slow response to the Frankish invasion afforded the Crusaders time to establish the Crusader States.

Consequently, the Western soldiers of the First Crusade found themselves confronted by two rival Muslim forces in Outremer: those of Damascus and those of Egypt. Egypt at this time was ruled by the Fatimid caliph of Cairo, al-Musta'li, but was actually governed by the vizir al-Malik al-Afdal. Opposed to the Sunnite school of Islam, which was championed by the Abbasid dynasty in Baghdad, the Fatimid caliphate was the sponsor of the newer sect called Shi'ite. When the Seljuks became the force behind the Abbasid

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[2]A Fatimid army from Egypt was eventually sent after the fall of Jerusalem, but was caught unawares and completely routed at Ascalon (1098).

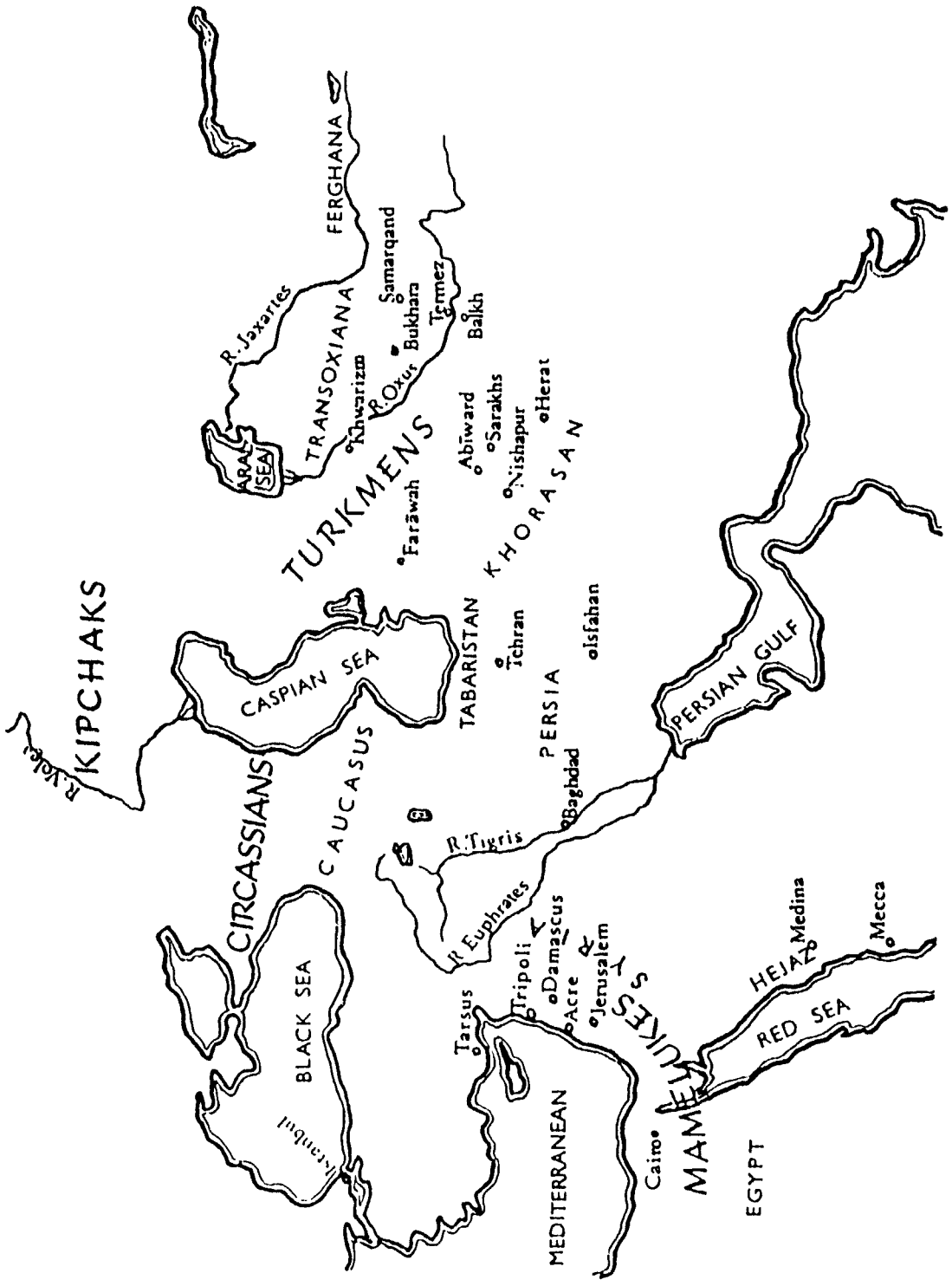

Fig. 12. Map of people and places.

caliphate in 1059, the military superiority of the Turks forced the Fatimids from their possessions in Syria and most of Palestine. This situation created intense religious and political rivalries between the two caliphates which the Crusaders used to their advantage. When fighting one or the other (or amongst themselves), the Franks would often ally themselves with Muslim princes in order to further their own ends.

The Fatimid Empire in Egypt did not pose a serious threat to the Crusader States even though the Fatimid army was based on an tradionally Arab style of warfare which was similar in some respects to the Western way of war. At least in outward appearances, Western and Fatimid soldiers were so alike in armour and weaponry that they were virtually indistinguishable.[3] Even the tactical formations of the Fatimid army were similar to the Western: foot-soldiers formed the front ranks behind which the cavalry was placed. The core of the Fatimid army was based on slave recruits from the Turkic Transoxiania. The invasion of the Seljuk Turks in the early eleventh century into Iran and Iraq resulted in a major loss of manpower to the Fatimid forces in Egypt during the early Crusading period. Humphreys notes that it was the relative scarcity of these Turkic slaves which made the Fatimids (969-1171) rely

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[3]David Nicolle, *The Crusades*, No. 19 (London: Osprey Publishing Co., 1988), p. 48.

primarily on Sudanese, Slavic, and Armenian slave-recruits, as well as Berber and Arab tribal levies.[4] In a chronic state of military decline, the Fatimids were forced to call on the aid of the Abbasid caliphate numerous times against the Crusaders. Thus the military threat to the Franks from Egypt was minimal. By the middle of the twelfth century almost all adversaries of the Franks in Outremer were Turkish armies or had undergone recent "Turkification".

Even though the military forces in Egypt progressively dwindled in size during the twelfth century, the Fatimids had grown extremely rich since they monopolized trade with the Orient. Both the Crusaders and the Syrian princes under the Abbasid caliph realized that controlling and utilizing the wealth of Egypt would mean the demise of one or the other.[5] The Crusaders initiated a number of offensive military campaigns (1163-1169) with this objective, but the cooperation of Abbasid troops with Egyptian forces successfully prevented the Crusaders from taking Egypt. In 1169 an Abbasid army under Nur al-Din occupied Cairo. Becoming vizier over Cairo in 1171, Saladin declared the Fatimid caliphate abolished and siezed the great wealth of

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[4]H.S. Humphreys, "*The Emergence of the Mamluk Army*", *Studia Islamica*, Vol. XLV, (Paris: Maisonneuve-Larose, 1977), p. 96.

[5]Runciman, II, pp. 393-4; Sir John Glubb, *Soldiers of Fortune: The Story of the Mamlukes*, (New York: Dorset Press, 1988), p. 32.

Egypt. With Nur al-Din's death 1174, Saladin returned to Syria at the head of an army equipped and paid for with his newly found resources. After ten years of war, Saladin was able to establish a great, unified empire and establish a dynasty--the Ayyubid.[6]

Under the leadership of Saladin the structure of Muslim armies remained virtually the same. After purging the Fatimid forces of Sudanese slave-troops, Saladin incorporated the remaining Fatimid mamluks with his own forces.[7] This new conglomerate army retained many of the traditions of the Fatimids, but overall the focus was still primarily on the Turkish horse-archer.8 After his death, the training and composition of Ayyubite armies were left to the discretion of the princes who controlled the several principalities which composed the domain of the Ayyubite Empire. Each of these territorial *junds*, or armies, were formed and organized according to the traditions, needs, and capacity of its principality, and each had its own officer corps. The differences between these separate *junds* were

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[6]Glubb, p. 23-34; Runciman, II, 403-10.

[7]Saladin used a large number of Kurdish troops in his forces. Kurds are of Turkic origin and fought in the accustomed horse-archer tradition. *The Cambridge History of Islam*, p. 205.

[8]Ibid., p. 205.

not profound, but did suffice to create a feeling of individual identity.[9] Generally speaking, Ayyubid armies

> display no clear structure of units and subdivisions; rather, their internal organization seems rather loose and improvisatory, stemming less from formal administrative cadres than from custom and rules of thumb, manipulated according to the needs of the moment.[10]

It is only with the last sultan of the Ayyubid Dynasty, as-Salih Ayyub, that a profound change was made in the composition and organization of Muslim military forces. These innovations were so far-reaching that he is commonly considered to be, if not the actual founder of the coming Mamluk Empire, then certainly its precursor.

As-Salih Ayyub's rise to power in 1240 initiated a short reign (1240-49) focused on the consolidation and centralization of power. In order to accomplish this, he pursued two main courses of action. Distrusting the princes who were maintaining armies of their own in the principalities, as-Salih attempted to change the very constitution of the Ayyubite Empire from a loose confederation of autonomous principalities to a unified and

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[9]Humphreys, p. 70.

[10]This statement was made with the the following assertion: "Whether our reconstruction is an accurate reflection of the reality or is due only to the inadequacies of our knowledge is of course open to question." Humphreys laments the fact that his articles "The Emergence of the Mamluk Army" were not able to use sources contemporary to his period of study which, as of yet, were not published. Humphreys, p. 83 of XLV and p. 179 of XLVI.

centralized state. The administration of this state was to be under the direction of his own personal entourage instead of the various Ayyubite family members. He was only partially successful in accomplishing this goal; although he was able to subjugate the south and central principalities of Syria under his personal control, the principalities of Mesopotamia and Northern Syria remained out of reach.[11]

The second part of his plan was to initiate a number of radical changes in the composition, training, and organization of Ayyubite armies. Frustrated with the treachery and the lack of discipline of the established Ayyubid regiments, as-Salih purchased great numbers of Turkish mamluks to mold into an elite corps of troops loyal solely to himself.[12] This was only made possible with the displacement of the inhabitants of the Qipchak steppe[13] by the Mongol armies under Subotai and Batu in 1238. Al-Salih was then able to draw great numbers of these Turkic people into his own personal guard. This regiment, known as the Bahriyya, was approximately one thousand strong and fully

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[11]Glubb, pp. 34-41; Humphreys, p. 94; *The Cambrige History of Islam*, p. 209.

[12]Elite Mamluks in the service of the sultan himself were normally entitled the *halq sultaniyya*. Humphreys, p. 96.

[13]The homeland of the Qipchak (also spelled Kipchak) people lay between the Volga and Don Rivers. These people are also sometimes called, especially by Western chroniclers, the Cumans.

trained in the arts of warfare.[14] Although his purchases of these mamluks were greater than those of any previous sultan, they still comprised no more than a tenth of his total available forces.[15] Even so, it was these newly formed and trained mamluks who formed the vanguard of the new Egyptian army, bringing spectacular victories against the Franks and Mongols in the latter half of the century. Because the institution of using mamluks was so vital a component of any Muslim army during the Crusading era, it is important to understand their significance.

The practice of using mamluks, at first called *ghulams*[16], as military troops in Muslim armies dates back to the beginning of the Abbasid Caliphate during the reign of al-Mu'tasim (833-42). They were drawn primarily from pre-Islamic Transoxania as captives and were formed into an elite guard for the sultan. At first these people were captured adult warriors of Turkic origin. Later these forces would be also made up of slaves who had been purchased at birth and raised and trained by a single master. Converted to Islam, these mamluks received a fanatical orthodox education and were trained extensively in

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[14]Humphreys 94-5; Glubb 36-39; *The Cambridge History of Islam*, pp. 209-211.

[15]H.S. Humphreys, p. 97.

[16]*The Encyclopedia of Islam*, vol. 2, (London: Luzac & Co., 1971), pp. 1079-91.

the arts of war. Once converted, the mamluk was freed.[17] Upon his release, however, the mamluk stayed with his master and served him loyally.

According to Nicolle, these early *ghulams* were heavy horse-archers who united the military traditions of the Central Asian steppes to the existing military of traditions. Written records show these Turkic horse-warriors as "having exceptionally obedient horses and carrying two or even three bows, plus a lasso." They were more heavily armoured and hence slower than their Arab counterparts, but were equally adept in the use of a lance.[18] A characteristic of these Turkic peoples which was prized over anything else was their valor in battle and their skill in archery on horse-back. The famous Arab writer al-Jahiz (776-869) wrote a somewhat exaggerated account of the remarkable abilities of these Turkish horse-archers in the service of al-Mu'tasim:

> the Turk can shoot at beasts, birds, hoops, men, sitting quarry, dummies, and birds on the wing, and do so at full gallop to fore or to rear, to left or to right, upwards or downwards, loosing ten arrows before the Kharijite [Arabian religious extremists hostile to the Abbasids] can nock one.

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[17]According to Islamic law, a Muslim could not enslave another Muslim. This did not apply to Muslim slaves who were enslaved before converting.

[18]Nicolle, *The Armies of Islam: 7th-11th Centuries*, vol. 125, (London: Osprey Publishing Co., 1982), p. 15.

He also adds that the Turkish archer spelt certain death since he was as accurate in attack as in retreat.[19] The author of the *Gesta Francorum*, having fought the Turkish horse-warrior and witnessed his military prowess, exclaimed that if only they were Christians, they would be the finest of races![20]

A special admiration for the race was fostered in the Middle East as these slave troops became to be employed with greater frequency. It was generally thought that

> their native habitat of the steppes, with its extreme climate and harsh living conditions, gave them an unrivalled hardiness; it likewise nurtured men who were supreme exponents of the equestrian skills and masters of the longbow [viz. composite bow].[21]

Besides these military qualities, there seems to have been a a genuine preference for the "fair-skinned races of the North over the darker ones of the South."[22] The Turkic people of the Eurasian steppe represented an extensive

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[19]*Saracen Archery: An English Version and Exposition of a Mamluke Work on Archery*, trans. and ed. by J.D. Latham and W.F. Paterson, (London: the Holland Press, 1970), introduction, p. 23.

[20]*Gesta Francorum*, ed. B.A. Lees, (Oxford: Clarendon Press, 1924), p. 20.

[21]C.E. Bosworth, "Recruitment, Muster, and Review in Medieval Islamic Armies", *War, Technology, and Society in the Middle East*, ed. V.J. Parry and M.E. Yapp, (London: Oxford University Press, 1975), p. 64.

[22]David Ayalon, "The Muslim City and the Mamluk Military Aristocracy", *War, Technology, and Society in the Middle East*, ed. V.J. Parry and M.E. Yapp, (London: Oxford University Press, 1975), p. 314.

reservoir from which to draw these nomads. At first, the term *ghulam*[23] denoted all slave-warriors. Later the term *mamluk*[24] was used to signify those slave-warriors of Turkic background, for these were the best type of troops and were highly sought after. The slave markets of Syria and Egypt were hard-pressed to obtain large quantities of these Turkic Mamluks to meet the demand.[25]

Once they completed their religious education and military training they were freed, but remained loyal to--and in the service of--their original master. Descendents of these *ghulam*s were not allowed to join the status of their fathers as military elite and thus was born "a one-generation nobility only, all its members having been born in the steppe and being Muslims of the first generation."[26]

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[23]The word "غلام" "ghulam" is the root word in Arabic meaning primarily "youth/boy" and also, from its historical usage, "slave". This word was used to denote those Turkic steppe peoples who were raised from infancy to adults to become the mounted warriors which would later in history be known as *mamluk*s.

[24]The word "مملوك" "*mamluk*" shares the same root word as the Arabic word "ملك" "*malik*", which means "king" or one who owns. *Mamluk* is the past participle of this root word and is thus translated as "that which is owned or possessed".

[25]Humphreys, pp. 96-7.

[26]David Ayalon, "The Muslim City and the Mamluk Military Aristocracy", *Studies on the Mamluks of Egypt*, (London: Variorum Reprints, 1977), p. 313. The proceedings of the Israel Academy of Sciences and Humanities 2. Jerusalem 1968.

The perpetuation of the Mamluk institution relied on the continued introduction of nomadic Turks into the Muslim society from non-Muslim territories. This situation safeguarded the "nomadic vitality" and the zealousness of a new convert to Islam.[27] To ensure the exclusiveness of this class of military troop, a number of social restrictions and privileges were established.

One method of separating the Mamluks, even Mamluks of races other than Turkic, was the requirment that they should have Turkish first names. Since the Arab and Turkish population at large were forbidden to adopt Turkish names, having a Turkish name became a mark of military aristocracy. Mamluks spoke a Turkish dialect exclusively. This privilege was highly prized by the mamluks; they did not want the population to understand what they were saying. This further intensified the distinction of mamluk status. Mamluks were required to only marry slave-girls (usually from the same province of their own origin) or the daughters of other mamluks and were forbidden to purchase slaves other than those of mamluk origin. The normal population was restricted to purchasing negro slaves. Perhaps the clearest example of how the Mamluks were treated as a separate class is that, even though they were educated to be orthodox Muslims, if both parties in a legal dispute were of Mamluk

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[27]Ibid., p. 313.

status they were allowed to be judged under the Mongol *Yasa* instead of the Muslim *Shari'a*. This code of law came from the Turkic steppe and was the traditional means for settling disputes among the Turkish tribesmen.[28] These measures were undertaken to ensure the purity of the Mamluk tradition.

By the mid-tenth century the mamluks of Iran and Iraq were using the traditional Arab tactic of repeated attacks and retreats, but were now using the Turkish method of horse-archery instead of closing with spears after the Arab fashion. The mamluks of the greatest prowess were given more armour than those of lesser skill. In Syria at this time, an army composed of these mamluks was operating independently. These troops were described as having armour for both man and horse and employing the sword and lance.[29] A mamluk training manual of 1368 illuminates the type of exercises which were being conducted to make these horse-warriors competent in battle. Although this was used to train horsemen under the Mamluk Empire, the same type of training was being used for those mamluks who would comprise the *askars* of Turkish princes.

The mamluk horse-archer was a product of many years of hard physical training. The training of the mamluk horseman, called a *faris*[30], was conducted by a *furusiyya*[31]

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[28]Ibid., pp. 322-324.

[29]Nicolle, *The Armies of Islam* p. 15.

master on the training-grounds, called the *maydan*. This master would instruct the groups of mamluk trainees in four fields of military skills: horsemanship, the use of the lance, archery, and swordsmanship. Only when the mamluk achieved the required skill in these four areas would he became a *faris*.[32]

Much of the training focused on the use of the bow from horseback, but mamluk *faris* was also trained to fight on foot. The mamluk *faris* had to be able to fire his bow--accurately--in almost every direction possible and at every speed conceivable. The practice of *qabaq* and *qiqhaj* shooting was designed to fulfill this requirement and was a routine exercise for the mamluk trainee.[33] The *qabaq* was a target mounted at the top of a pole--normally a gourd. As the rider passed beneath this he turned and shot at the target. The *qiqhaj*, conversely, was a target placed on the ground--usually a basket of sand. The master would show the mamluk how to hold the reins between the middle and the annular fingers, how to hold the bow firmly, how to stand in

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[30]The word "فارس" "*faris*" is the word in Arabic meaning "horseman" or "rider".

[31]The word "فروسيا" "*furusiyya*" comes from the same root word in Arabic as "*faris*". It means "horsemanship" or "equitation".

[32]Hassanein Rabie, "The Training of the Mamluk *Faris*", *War, Technology, and Society in the Middle East*, ed. V.J. Parry and M.E. Yapp, (London: Oxford University Press, 1975), p. 154.

[33]*Saracen Archery*, pp. 77-9, and 172-3.

Plate II. Mounted horse-archers practicing with the *qabaq*.

the stirrups, leaning forward slightly, and how to shoot the arrow accurately without touching the horse's ears.[34]

Furusiyya treatises also provide a vast amount of information of particular interest to the mamluk archer. Such topics as the construction and care for various types of composite bows, methods of bracing the bow, the types of arrows, and choosing appropriate arrowheads for warfare are explained in detail. Common ailments suffered by archers such as blistering and wounds caused from the bowstring snapping against the chin, ear, forearm, and left thumb are discussed as are the remedies for these problems.[35] The mamluk also recieved advice which would help them in battle. For example, when shooting at a mounted man moving towards you,

> you should sight your bow-hand on the horse's forehead and shoot. If your arrow flies above the actual mark, it will strike the rider, while if it falls short, it will pierce the horse's chest. If your shooting is accurate, it will, of course, hit the animal's forehead.[36]

Even though the bulk of the mamluk's training was with the composite bow, he was not merely a bowman but also extremely able with the sword, mace, and lance.

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[34]Rabie, p. 160; Latham and Patterson, p. 79.

[35]Rabie, p. 160; Latham and Patterson, pp. 115-121.

[36]*Saracen Archery*, p. 137.

The training with the other weapons was also a very thorough process of elaborate ritual designed to make the Mamluk an extremely deadly foe from either on horse or foot. Instruction with the use of sword dealt with the varieties of swords, their different weights, the best methods of striking a foe (on foot or mounted), and ruses which could be employed in actual combat.[37] Archery, however, entailed the most lengthy period of training. Mamluk horse-archers were able to achieve unequalled skill with their primary weapon--the Turkish composite bow. Nicolle states that a fully trained mamluk was expected to loose up to five arrows in five and a half seconds! An "unpracticed" mamluk could shoot one or two in a similar amount of time![38] Called "shower" or "successive" shooting in an Arab manuscript on archery (1500), the training required to achieve this high rate of fire is described in detail. According to the text, the Arab historian al-Tabari (838-932) stated that "this is the best type of shooting and there is nothing beyond it in power or accuracy."[39] This tradition of excellence with the

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[37]Parry and Yapp, *War, Technology, and Society in the Middle East*, (London: Oxford University Press, 1975), p. 6.

[38]Nicolle, *Saladin and the Saracens*, p. 9. Compare this to the rate of fire of an English longbow of one arrow in six seconds. Extrapolated from Payne-Gallwey, p. 7.

[39]*Arab Archery: A Book on the Excellence of the Bow and Arrow*, trans. and ed. by N.A. Faris and R.P. Elmer, (Princeton University Press, 1945), pp. 150-3.

composite bow was maintained (though probably not to this degree!) in the Muslim armies during and after the Crusading period. Not until the reign of as-Salih, however, does this skill in archery reach the level of earlier periods.

Forming the professional core of Muslim armies during the Crusades, mamluks were the palace-guard of Turkish princes. The entire composition of a prince's army, however, was based on an institution which has its origins in the early days of Islam. The *iqta*[40] was the basis for the muster of military forces under the Seljuk Turks. Originally given as a reward for service by the ruler to an individual, the *iqta* could take a variety of forms: a land grant, the right to farm taxes from a certain territory, the governorship of a city, or even revenue from a concession. The sultan would receive a specific renumeration for the grant such as a portion of the taxes collected or part of the crops harvested. By the time the First Crusade had arrived, this renumeration had been changed to military service. Under the direct power of the sultan, these "administrative *iqtas*" were land grants which required the holder to govern the territory given to him and to provide troops comensurate to the size or importance of the holding. The greatest holdings were held by amirs, Turkic princes, whose military responsibilities would be to raise a *jund*, or

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[40] *Encyclopaedia of Islam*, vol. 3, pp. 1088-91.

regional army, upon demand. Given virtually autocratic powers within their principalities, these amirs were often difficult for the sultan to control. The ability of a sultan to enforce his will on these amirs dictated the amount of political cohesion within the state and the size of the armies which could be raised.[41]

The composition of the *jund* itself differed from amir to amir. During the twelfth to early thirteenth century, Muslim armies were composed of three basic elements: a small *askar* of *ghulams*, a mercenary force, and a large force of tribal Turkic auxiliaries. The *askar* was a standing army of slave recruits, called *ghulams*, who were purchased, trained, and loyal only to the prince. Highly prized for their loyalty and skill in the arts of war, these slave troops were sought by both Arab and Turkish princes alike to add to the ranks of their personal body guard. By the end of the ninth century the Turkish *ghulams* had largely replaced the Arab *jund* and eventually formed the professional core of the armies under the Abbasid caliphate.[42]

Under Turkish domination, the Syrian prince's *jund* would always be supplemented with a great number of tribal contingents who would be summoned only for specific campaigns.[43] Even though these Turkish tribal forces were

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[41]Becker, *Der Islam*, v, 84-88, cited in Smail, p. 65.

[42]Nicolle, *The Armies of Islam*, p. 14.

Plate III. An Egyptian hauberk (*zardiyyat*) from the late 1600s. Apart from the collar, this was the general style of hauberks in Egypt and Syria from 1100 to 1300.

[43]Ibid., p. 24.

skilled archers and brave in battle, they lacked the discipline of the *askar*. These tribal contingents were organized for battle under their respective tribal *beys* (leaders) and were rewarded individually with a share of the booty captured. The *beys*, in turn, expected to receive payment from the sultan himself.[44] Organized in such a loose fashion, these bodies of warriors were equipped usually by their own means.

Compared to the Latin knight, the typical military costume of the Turkish horse-archer was vastly different in appearance and was probably of lighter weight. Since the Turks normally wore long flowing robes, the absence or presence of armour underneath is almost impossible to tell from contemporary depictions without closer inspection.[45] The *Autobiography of Ousama* (1095-1188) gives us an apparently comprehensive view of the variety of armour used by Muslim horsemen: mail, cuirasses, padded tunics, gambesons, and helmets.[46] This cuirass which Ousama "buckled on"[47] was a common body defence used by the Turk

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[44]Ibid., *Saladin and the Saracens*, p. 8.

[45]Such armour as the *jazerant* hauberk was a thickly padded and *fabric covered* mail body armour commonly used by the Turks. From personal correspondence with Dr. Nicolle, 26 July 1991.

[46]Ousama, p. 77, 99, 132, 134-5, 137, and 155.

[47]Ousama, p. 99.

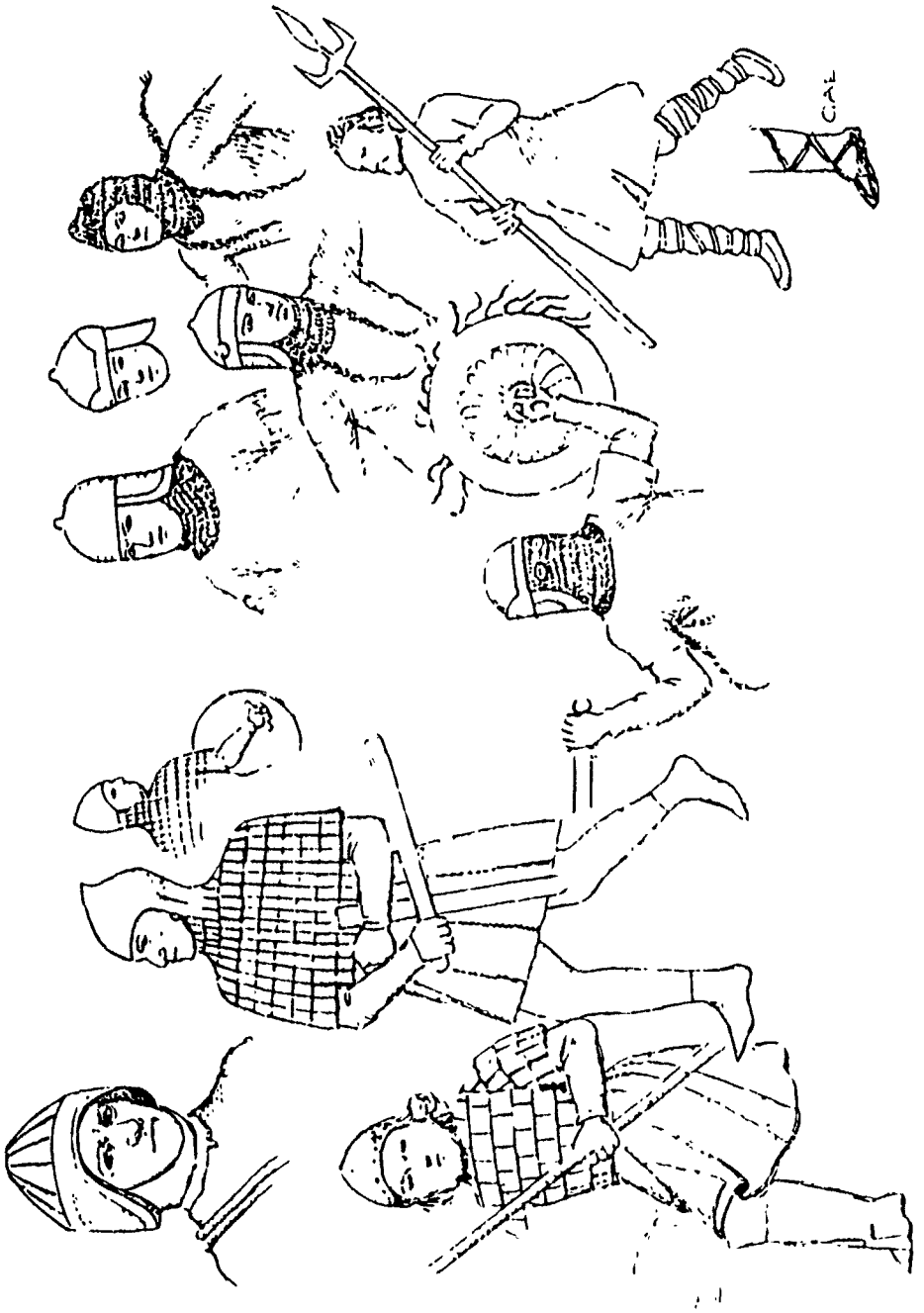

Fig. 13. Illustrations of 12th century Turkish armour taken from drawings based on Saracen and Turkish contemporary manuscripts and sculptures. Note: the body armour on the left is lamellar.

called lamellar armour. Similar to the *curie*[48] of the Frank, this armour was made from small plates of hardened leather and offered a "graduated shock-absorbing protection against arrows and would, under most circumstances, be more effective than plate armour of comparable weight."[49] It was not uncommon for lamellar to be worn with mail. Nicolle states that until the 12th century, mail armour was the widespread form of body armour of Muslim forces in the Middle East.[50] Once the Turkish horse-archer became the prominent warrior in Muslim forces, trends in armour favored light weight defences.[51] The threat the Frank presented to the Turk on the field of battle forced the Turk to remain mobile and increase the range of his missile weapon to be able to engage him safely. To achieve this extended range, the Turkish composite bow underwent refinement during the twelfth and early thirteenth century. This change will be examined in detail in the following chapter.

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[48]See page 32.

[49]Nicolle, *Saladin and the Saracens*, p. 41.

[50]Ibid., p. 41.

[51]Agreeing with this assertion, Nicolle stresses that this was not due to a technological inferiority. Muslim armourers could clearly work with large plates of metal as evidenced in the design of their helmets. Ibid., p. 41.

CHAPTER III

TURKISH ARCHERY DURING THE CRUSADES

London 1795[1]

'Dear Brother, --I have just been to see the secretary of the Turkish Ambassador shooting with Waring and other famous English bowmen. There was a great crowd, as you may suppose, to see them. ... The Turk's bow is made of antelopes' horns and is short, and purposely made short for the convenience of being used in all directions on horseback.

'The Toxophilites wished to see the powers of the Turkish bow, and the Turk was asked to shoot one of his flight arrows. He shot four or five, and the best flight was very carefully measured at the time. It was 482 yards. The Toxophilites were astonished, I can tell you.

'Waring said the furthest distance attained with an English flight arrow, of which he had ever heard, was 335 yards, and that Lord Aylesford had once shot one, with a slight wind in his favor, 330 yards. Waring told me that he himself, in all his life, had never been able to send a flight arrow above 283 yards.

'The Turk was not satisfied with his performance, but declared that he and his bow were stiff and out of condition, and that with some practice he could shoot much further than he had just done.

'He said, however, that he never was a first-class bowman even when in his best practice, but that the present Grand Seigneur was very fond of the exercise and a very strong man, there being only two men in the whole Turkish army who could shoot an arrow as far as he could.

'The Turk said he had seen the Grand Seigneur send a flight arrow 800 yards. ...

'Neither Waring nor any of the Toxophilites present, (and many tried,) could bend the bow as the Turk did when he used it.

'So much for the triumph of the Infidels and the humiliation of Christendom. 'Yours aff.

'W. Frankland

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[1]Payne-Gallwey, pp. 27-28.

This passage poignantly illustrates the state of technological refinement that the Turks were able to attain in the construction of their composite bows. The type of bow discussed in the above letter is a direct descendant of and probably identical to the type of bow which was eventually adopted almost universally among all Turkish tribesmen in the Middle East during the Crusading era. Having undergone over a thousand years of development, the Turkish composite bow which was to be used against the Crusaders was a remarkably complex, efficient, and powerful machine.

When the Crusades first began there were two predominant types of the Turkish composite bow commonly employed: the "eared" and the "smooth" construction.[2] Reacting to the military threat posed by the superior quality of Crusader armour and to the deadly action of the Western crossbow, the Turks eventually abandoned the "eared", recurved, composite design for the "smooth", recurved, composite form in the early twelfth to late thirteenth century. A technical evaluation of the differences in design of these two bows will show that the "eared" bow was inferior to the "smooth" not only in design, but in performance and ease of operation also. Considered

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[2]The "smooth" composite bow is illustrated on page 82 and the "eared" is illustrated on page 83.

Fig. 14. Horse-archer using the "eared" form of the composite bow. Taken from a decorated bronze mirror of the 12th century.

in the context of Frankish and Turkish tactics from 1097 to 1254, the "smooth" form of the composite bow had qualities which proved to be more conducive to the type of warfare conducted by the Muslem horse-archers.

WHAT IS COMPOSITE CONSTRUCTION ?

The bow is one of the earliest forms of complex technology to be used by man. By artifical means, man was able to transform muscular energy into the potential to do work--in this case the shooting of an arrow. With varying degrees of efficiency, the bow stores the energy spent in drawing it as potential energy and converts it into kinetic energy when the string is released and the arrow takes flight. The use of bow and arrow as a means of combat touches on a primal instinct of man to remove himself from

danger. With the bow man is able to kill at a distance--if not kill, then at least weaken.[3] Since man first made use of the bow, he has endeavored to improve upon it.

The earliest and simplest form of bow was made from a single stave of wood. Dependent on the elasticity of the wood of which it was comprised, this type of bow was further improved upon as man eventually learned, through trial and error, the properties of different materials which could be fashioned to create a bow with a greater capacity to do work. These reinforced bows cannot be considered composite *per se* because the majority of tension in the bow is still derived from the properties of the wood. The role of wood in the composite bow, conversely, is of little consequence other than to provide a foundation for other materials which will best utilize the compressing and stretching which occurs when the bow is bent.

The materials used to construct a composite bow include a combination of various types of wood, horn or bone, sinew, and glue. Building on a core of wood, composite construction uses horn and sinew to create a complimentary system which utilizes the unique qualities of each material:

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[3]The desire to remove one's self from danger is a basic survival instinct which has been a constant force throughout history driving the development of new technologies--offensive and defensive. Note the chronological progression: personal combat--bow and arrow--gunpowder weapons--airplanes--chemical warfare--inter-continental ballistic missiles.

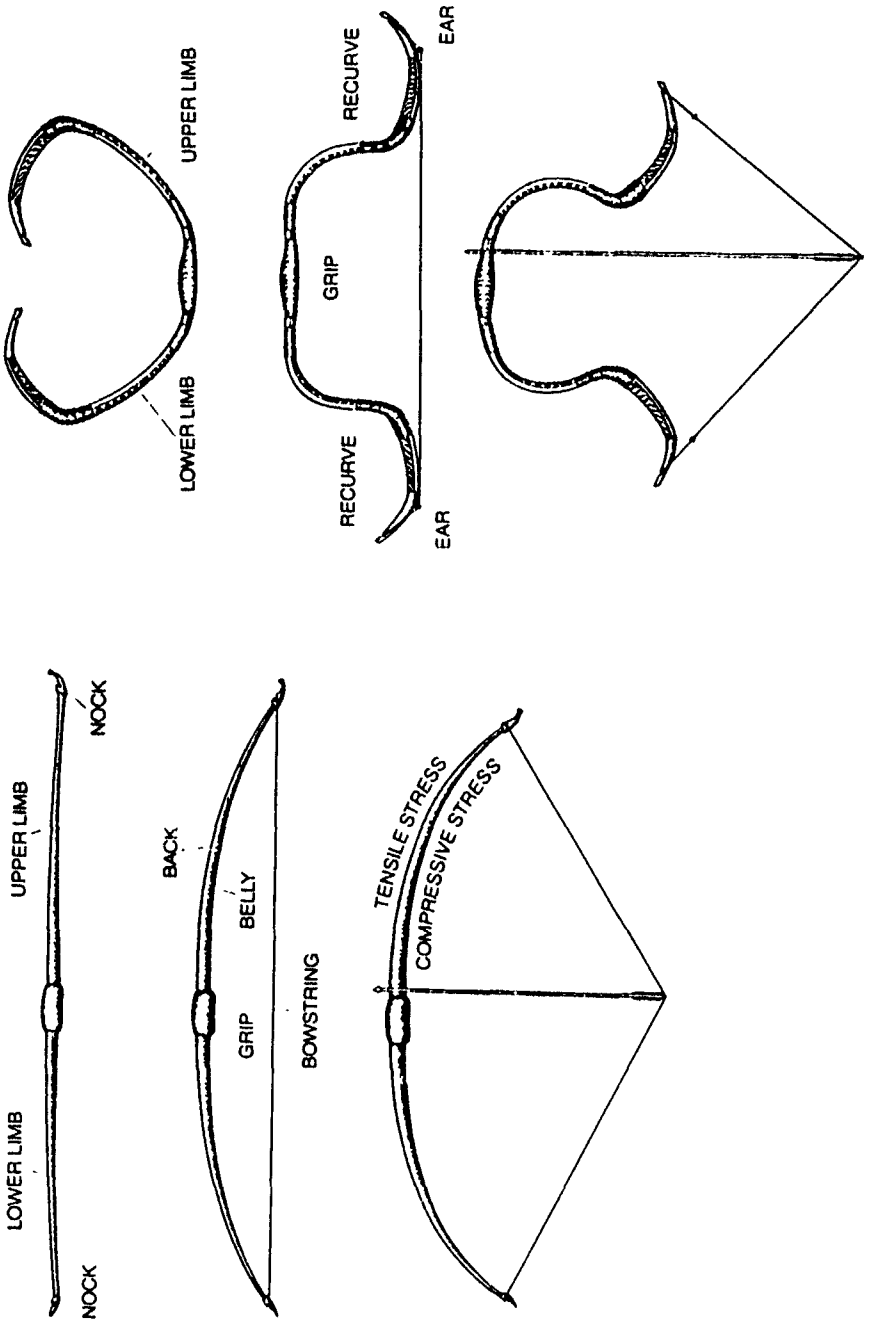

Fig. 15 The self bow (on left) compared to the composite bow. Note: the composite bow is of Indo-Persian ancestry.

sinew for its properties of tensile strength and horn for its great compressive strength. Since the belly of the bow is in compression and the back of the bow is under tension when a bow is drawn, horn was applied to the belly in thin layers and sinew was added to the back using a glue as an adhesive. This final product was protected from the elements by a thin covering of lacquer or leather.

ORIGINS: QUM-DARYA

The origins of the composite bow can be traced back to early neolithic times. Archeological finds in the Levant, Siberia, and Japan suggest that the composite bow was already an old invention by the third millenium B.C.[4] Of the several ancient prototypes, one of the earliest forms of the composite bow was that of the Qum-Darya bow: a long, doubly convex bow with sunk grip and ears turned slightly forward. This design type is given its name from the bow fragments found in the Qum-Darya tomb excavated from the burials on Lake Bajkal.[5] The eastern frontiers of Europe were subjected to repeated invasions of nomads from the Asiatic steppes armed with variations of this Qum-Darya bow. Arriving in the fifth century A.D., the Huns were the first

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[4]Gad Rausing. *The Bow: Some Notes on its Origins and Development*, (Acta archaeologica lundensia, papers of the lunds universitets historiska museum, series in 8°. N° 6., 1967), p. 148.

[5]Ibid., p. 143.

invaders to use this type of bow. Subsequent invaders, such as the Avars and Magyars, also employed this bow. When the Seljuk Turks began to arrive from the east in the late tenth century, they too were armed with a particular variant of the Qum-Darya bow--one with extended "ears".[6]

The Turkish variation of the Qum-Darya was overall a much shorter weapon as compared to the bows used by previous invaders: the average Turkish bow measuring 44-46 inches as compared to 55-59 inches of the specimen recovered from the Qum-Darya tomb.[7] Both the limbs and ears of the bow were significantly smaller. Rausing notes that this Turkish variant was first recognizable as originating in Northern Siberia around the first century A.D..[8] As the newer type of bow spread with the Turkish migrations, it gradually replaced all former types of the Qum-Darya bow.

The Turkish people were famous for their method of warfare which consisted of harassing operations from the backs of horses. Composite construction allowed the Turkish horse-archer to achieve the power of a larger bow in compact form and to greatly exceed the larger bow in many other

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[6]The ears are the those portions of a bow at the end of either limb. Formed from a rigid material and bent forward at an angle, the ear acts as a lever and allows one to draw the bow with relative ease. The "eared" composite bow under consideration in this paper has ears bent forward at approximately 90^0.

[7]Rausing, p. 144.

[8]Ibid., p. 144.

technical aspects which will be dicussed at length later in the chapter. From the early twelfth century through the thirteenth century, the Turkish bow in the Orient adopted the more refined, smooth, recurved shape. Many of the "eared" bows which continued to be used were adopted by cultures which had been overrun in ages past by invaders carrying such bows. From pictoral evidence and actual artifacts, it is known that this "eared" form survived until the late thirteenth century throughout various areas of the Mediterranean.[9] That the "smooth" form came to be used almost exclusively among the military forces in Muslim countries is attested to not only from the artifacts[10], but also from existing manuscripts which document the bowyery process of these newer forms of Turkish bows.[11]

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[9]This statement is based on a close examination of David C. Nicolle's two volume work on the *Arms and Armour of the Crusading Era* which contains thousands of illustrations of artifacts.

[10]Existing specimens of composite bows of Ottoman design illustrate the continuity in the bowyery process which stretches back to the "smooth" forms that were used in the Crusades. Compared to the pictoral evidence of that era, these Ottoman bows are virtually identical to the newer form of bow that underwent its final evolution during the Crusades.

[11]My primary sources for the bowyery process are an Arabic manuscript of about 1500 A.D., translated by Faris and Elmer, and another Arabic manuscript of Mamluk origin written in 1368, translated by Latham and Paterson.

TURKISH COMPOSITE CONSTRUCTION

The period of construction for a composite bow was dictated by the customs of the individual Turkish tribes and the qualities of the materials available to a bowyer. The Turkish composite bow is recorded as requiring at least a year to complete, sometimes even two.[12] Since the properties of the materials used to construct the bow varied within different climates, there was no standardized construction process. The end result was basically an individualized bow with characteristics which varied from bow to bow even within the stock of a single bowyer.

The bowyers considered their art as being almost mystical in nature. This is clearly seen in a Mamluk work on archery:

> Its composite character displays profound wisdom and august and sublime workmanship, for it is produced after the formation of a human being and is of comparable structure. For even as man is built on four foundations, namely bone, flesh, arteries, and blood, so is the bow formed in like manner inasmuch and the wood corresponds to bone in man, the horn to flesh, the sinews . . . to the arteries, . . . and the glue to the blood by which the whole is held together. Like man, bows are provided with a back and a belly and can bend bellywise like man. When they are bent backwards, they will snap, as would be the case with man.[13]

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[12] *Saracen Archery*, pp. 15-16.

[13] *Saracen Archery*, p. 6; Paul E. Klopsteg, *Turkish Archery and the Composite Bow: Some Scientific Considerations*, (published by the author, 2424 Lincolnwood Drive, Evanston, Ill., 1947), p. 52.

The art of Turkish composite bowyery is still preserved today in a number of manuscripts, but has not been actually used for many centuries.

The Turkish composite bow of the pre- and early Crusading era was built from three basic components: the *qabdah*, the *dustars*, and the *siyahs*. The *qabdah*[14], or grip of the bow, was typically made from a single piece of thick and rigid wood. The requirement for a stiff wood was essential, for if the grip were to flex the bow would have the unfortunate quality of "kicking" when the arrow was released and thereby impinge on accuracy. Because of the need to perfectly fit the grip to the hand of the archer, the grip's thickness was determined by the archer's actual physical dimensions.

The *dustars* are the working limbs of the bow. They were spliced on either side of the grip and would be subjected to most of the actual bending when the bow was drawn. In the composite bow, the role of the wood core is little more than a base for the glue to be applied and hence was chosen on its power to adhere glue; such woods as white poplar (*nab'*) and orange had this quality.[15] The wood used for the *dustars* was shaped to be slightly flat or even oval

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[14]Technically, the *qabdah* is the Arabic word which designates the grasp or mode of gripping a bow. The term *maqbad* is sometimes used to denote the grip of the bow also.

[15]*Arab Archery*, p. 117.

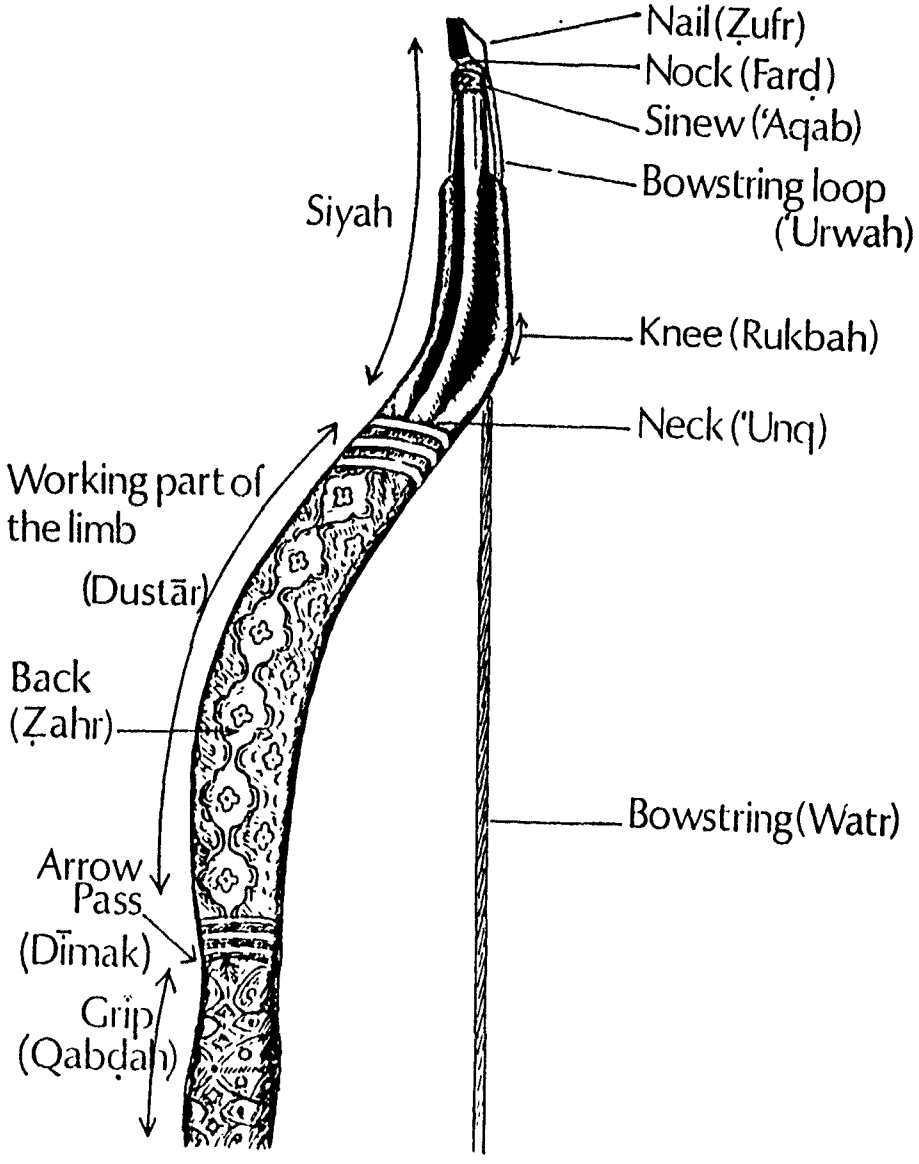

Fig. 16. Composite bow terminology. The upper limb of a composite bow (of Indian ancestry).

in cross-section and had a uniform thickness over its entire length.[16]

From the ends of the *dustars*, the *siyahs* formed the part of the bow which would have the nocks cut into them.[17] The last few inches of the *siyah* were turned sharply by the bowyer to form the "ear" of the bow. Triangular in cross-

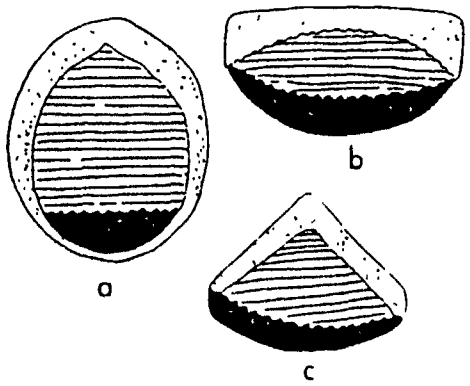

Fig. 17. Cross-sections of the Turkish composite bow: a. handle; b. limb; c. limb just below the ear. Note: the black areas are horn and the stipple areas are sinew.

section to give it structural strength, the *siyah* was typically made from an inflexible material and served as a lever during the draw.

The joints which fused these pieces together were of a "V" form. According to Latham and Paterson, when actual Turkish composite bows of Ottoman design were stripped down,

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[16]*Saracen Archery*, p. 11.

[17]The nock is the groove where the bowstring is tied. The act of fitting the arrow to the string is called the "nocking" of an arrow.

these splices are seen to have run approximately three and a half to even five inches in length.[18] The wood for the three pieces could be all the same type or even of different types. As the evolution of the Turkish composite bow came to its ultimate shape, the design described above was often modified by forming the *dustars* and *siyahs* from one piece and the grip from another.19 Upon this foundation of grip, *dustars*, and *siyahs*, the horn and sinew was applied with glue.

Chosen for its tensile strength, sinew was glued to the wood base. Authors Nabih Faris and Robert Elmer conducted dissections of Turkish composite bows of Ottoman heritage and noted that these sinews, when teased apart in hot water, were anywhere from "two inches to a foot or more" in length.[20] Taken from the necks and legs of animals, these fibers were molded with glue and were made to run the length of the back of the bow from *siyah* to *siyah*.[21] At the grip, being much narrower than the arms of the bow, the sinew was squeezed into a ridge which made for a better hold. At the *siyahs* the sinew and glue was molded into a shape which gave

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[18] *Saracen Archery*, pp. 11-12.

[19] Ibid., p. 11.

[20] *Arab Archery*, p. 161.

[21] Ibid., p. 161.

a triangular cross-section and thereby further strengthened that limb.

As a method of providing compressive strength, horn was used to cover the belly of the bow. This horn came from a number of possible animals native to the area of the bowyer. The horns of the carabao, the ibex, and some species of domestic goats are known to have been used in composite bows of Turkish origin.[22] Since these horns were often quite short in length, a number of sections could be used to cover the belly by layering them. Before the glue was applied to the surfaces where the horn and wood would meet, each was scored to facilitate optimum adhesion.

Once fully assembled, the bow then underwent a period of drying and was subjected to a process which put a reverse curve into the bow. This was accomplished by stringing the bow in the opposite manner and leaving it for an extended period of time. Doing this, the horn which covered the belly tended to separate where it met at the grip. After the process of recurving is complete, this gap was fitted with a piece of wood, called the *ibranjaq*, which closed the distance between the two pieces of horn and served to further preserve the recurvature. The resultant effect of this process was to increase the tension of the bow when it was strung in the correct manner.

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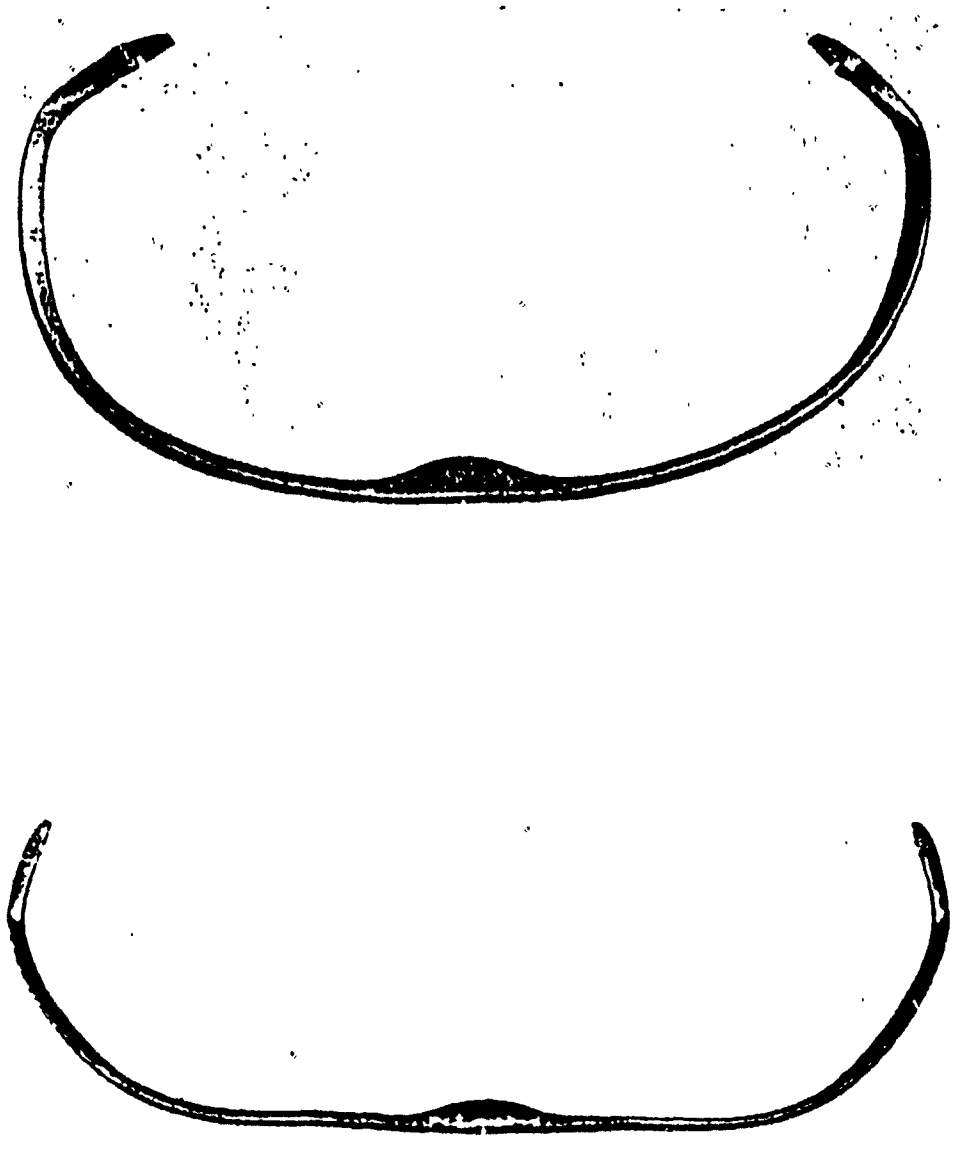
[22]Ibid., p. 161.

Plate IV. Turkish bows (of Ottoman ancestry) in the unstrung position from the personal collection of Paul Klopsteg.



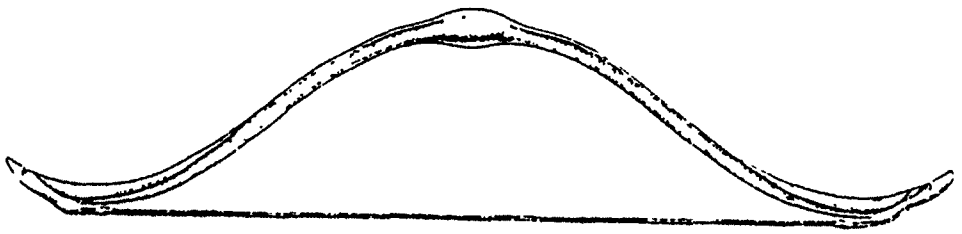


Fig. 18. The "smooth" Turkish composite bow (17th century).

The length of the bow, measured from nock to nock, varied within a certain range due to a number of factors: the physique of the archer, the types of materials that were locally available, the intended use of the bow, and the bowyer's own idiosyncracies with the method of construction. A Turkish bow of the "smooth" form, in the collection of Sir Ralph Payne-Gallwey, measured forty-four inches when unstrung and approximately thirty-six inches when braced.

SCIENTIFIC ANALYSIS OF COMPOSITE CONSTRUCTION

The only significant physical difference between the older form of the Turkish composite bow and the design which became generally adopted was that in the "eared" form, the latter portion of the *siyah*s--anywhere from four to eight inches in length[23]--were formed from a rigid material and bent forward at a sharp angle. The nocks were cut into the ends of the ears. In the "smooth" form, the extremities of

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[23]Since there are no existing specimens of this "eared" form, this statement was based upon an examination of the pictorial material which illustrated this type of bow.

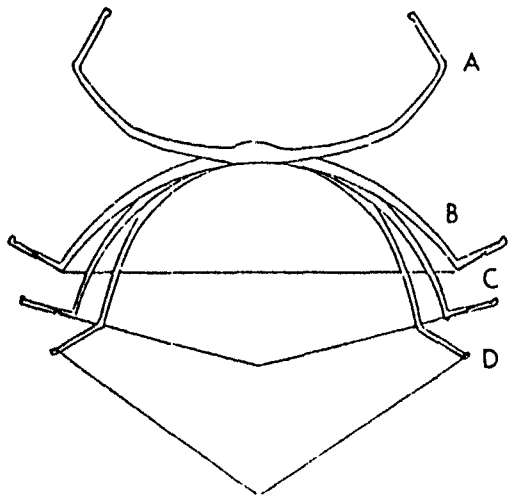

Fig. 19. The eared composite bow: a. at rest; b. braced; c. partly drawn; d. drawn.

the *siyahs* were of a pliable material and gradually curved forward to form ears. The nocks in this smooth form were cut into the ends of the *siyahs*. Both old and new forms were built using the same construction process. In order to understand why the smooth, recurved, Turkish composite bow replaced the older bow with pronounced ears, a basic understanding of the physics of archery is needed.

Normally a bow is described in terms of its *weight*. This translates into the number of pounds of force required to draw the string back the full length of the arrow normally used with the bow. Depending on its designed purpose, the weight of bows have been known to exceed two hundred pounds in some cases. Only a man of exceptional strength could draw a bow having 150 or more pounds of pull to its full draw. The smooth, recurved, Turkish bow used

against the Crusaders often had a pull weight of well over 100 pounds.[24]

Fig. 20. Detail of the "smooth" ear of a Turkish bow.

The following graph[25] depicts the force-draw characteristics of several types of bows. The physical design of each bow determines how the curve will be represented. This data was obtained by taking several types of bows and pulling the string back by means of a spring balance to get the values of force. By correlating this force data with the length drawn, a curve can be derived by plotting the points.

Curve "A" is that of a straight, four foot bow made from a single stave of wood. Curve "B" represents the force-draw characteristics of a straight, six foot bow having the same bracing height as "A". The bow used to generate curve "C" is a straight bow of four feet having "ears" of three

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[24]Possessing a personal collection of a number of Turkish composite bows, Payne Gallwey states in *The Crossbow*, that some of the most powerful bows required a pull of 150 to 160 lbs. From page 21 of the appendix.

[25]Klopsteg, pp. 145-147.

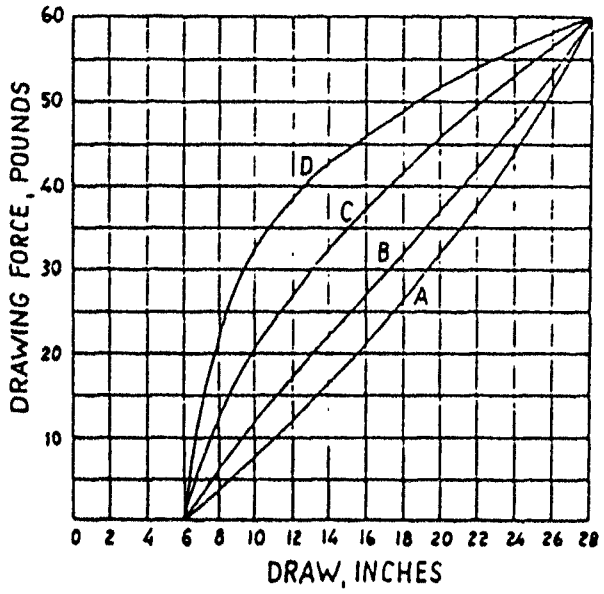

Fig. 21. Force draw curves of typical bows.

inches in length on each end. This bow is construed so that the string is "tangent to the outer ends of the ears at full draw, and tangent to the inner ends of the ears when let down." In other words, the ears are of the "smooth" design. Curve "D" is a bow with the same dimensions as "C" except that it has been strongly recurved. This last bow represents a close facimile of the final form of the Turkish bow.

The resultant curves allow one to interpret the effects of various design-types on the ease of draw and of the total potential energy in that particular bow. Curves "A" and "B" show an almost linear progression in force to draw. An archer drawing these bows would experience little resistance at first and increasingly greater difficulty towards the

end. Small changes in the amount of draw towards the end produces great variations in the amount of force imparted to the arrow and hence are difficult to master. Bow "C" has a stiff pull at first, but in the last half it smooths out. Compared to bows "A" and "B", the force per inch of draw in the later half of the graph is considerably smaller. This bow is "pleasant to draw and easy to hold at full draw."[26] The graph of bow "D" shows the draw to be extremely hard at first, but smooths out significantly after the half-way point. The force per inch of draw in the last half of the draw for bow "D" is smaller than the other three bows. The following is a clear comparison of all four bows in the half and full drawn states:[27]

Table 1. Comparison of draw weights for various bow types.

Bow	A	B	C	D
Force in pounds to half of full draw	23	29	39	47
Additional force to complete draw	37	31	21	13

The area under each of these curves represents the total energy of that particular bow. From the graph, it is clear that bow "A" has the least amount of potential energy. Using "A" as the standard for comparison, bow "B" has twenty percent more energy; "C" has forty-six percent more energy; and "D" has fifty-seven percent more energy.[28] Since each

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[26]Ibid., p. 147.

[27]Ibid., p. 147.

type of bow had the same weight at full draw, it is clear that the Turkish type (bow "D") not only has the greatest amount of potential energy, but was also the easiest to hold at full draw. Small variations in the length of draw translate into very little difference in the total power available to be transferred to the arrow. This quality in the bow would improve the accuracy of the archer.

What was desired, therefore, was a bow which produced the highest velocity for the least amount of energy required to accomplish the draw. At some point, dependent upon the physique of the archer, the weight of the bow began to negate the advantages of the bow's efficiency. This was the case when the energy required to draw the arrow was so great that the strength of the archer was strained to accomplish it and thus sacrificed accuracy.

Bows of the same design and weight, however, may vary widely in their performance. This is the result of differing degrees of efficiency among the bows. To qualitatively analyze the efficiency of a bow, the *cast* of that particular bow must be examined. Cast is that property of a bow which allows it to impart velocity to an arrow. A bow of good cast transfers a high proportion of its potential energy into the arrow whereas one of poor cast retains a significant fraction of the potential energy in its limbs after the arrow is loosed. The efficiency of a

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[28]Ibid., p. 147.

particular bow is simply the ratio of the amount of kinetic energy imparted to the arrow to the amount of energy it took to draw the bow. Once built, the cast of any bow is set for the rest of its life.[29]

Since arrows of varying mass will on varying velocities when shot from the same bow, the surest method of determining the cast of a specific bow is to graph the velocities produced with arrows of varying masses. To understand exactly what is responsible for the loss in energy transfer, however, the concept of *virtual mass* is a valuable tool. Paul Klopsteg was the first to introduce this concept to the field of archery in his article on the "Physics of Bows and Arrows" published in 1943.[30] The virtual mass of a particular bow corresponds to the amount of energy left in the bow when the arrow leaves the string and is expressed in terms of a defined mass having the same speed as that of the arrow as it left the bow. In other words, virtual mass is an expression of the total amount of energy in a bow which is not transferred to the arrow upon release.

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[29]Over the years, as the bow is used over and over again, it will experience a slight drop in efficiency from the cumulative effects of stress on its component materials.

[30]Paul E. Klopsteg, "Physics of Bows and Arrows", *American Journal of Physics*, vol. 11, no. 4, (Chicago: Central Scientific Co. August 1943), pp. 180-181.

This residual energy is the product of a number of factors which largely cannot be controlled once the bow is built. For example, it can be assumed that at least a minute part of the energy expended in drawing the bow will be used in overcoming the resistance of the air on the bow's limbs and the bowstring upon release. Surprisingly, the mass of the bowstring has an appreciable influence on the efficiency of the bow. Bowstrings of greater mass tend to reduce the transfer of energy to the arrow through residual vibrations after release. A heavy string will tend to oscillate more after release than one of less weight under the same amount of tension. This vibration takes away from the velocity of the arrow and impinges on accuracy. Thus something so apparently minor as the weight of the bowstring can translate into a substantial loss in a bow's overall performance.[31]

Another variable which can affect the efficiency of a bow is the length of the bowstring. Individual bows have their own bracing length with which optimum cast is achieved. Too tight a string as well as one too loose will adversely affect cast. If the bowstring is too short, it will not give the maximum cast possible for that bow and

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[31]In an experiment conducted by Klopsteg, a bow of a certain virtual mass had the mass of its bowstring cut by 50% to determine the effect. Using an arrow of an established mass, the increase in efficiency was 3.7% which translated into a distance of 40 yards. From *Turkish Archery and the Composite Bow*, p. 156.

will tend to make for "uncertainty of flight."[32] If too loose, cast will be diminished as well. The correct length is determined by the design of the bow. Various manuscripts have attempted to prescribe methods for determining the length of the bowstring through mathematical computations of dubious validity.[33]

In addition, there are those losses that occur inside the bow itself. This is sometimes referred to as *hysterisis* and describes the amount of energy lost due to the nature of the materials of which the bow was built; in a crude sense this effect may be visualized as internal friction among shifting planes within any material as it flexes. Furthermore, the mass of the bow's limbs and the velocity of these limbs at the instant the arrow leaves the string will create a momentum which will draw energy away from the transfer also. All of these factors create the virtual mass of a bow. This phenomenon physically manifests itself in the amount of time it takes for the bow to return to equilibrium--a stable condition of non-vibration. If the virtual mass is very large, it will result in a "kick" after the arrow is loosed.

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[32]Klopsteg, *Turkish Archery*, p. 55.

[33]The Mamluk work on archery describes one method in which the following is recommended: "If the length of the string is assessed form the length of the bow, the string must be shorter than the bow by one-half of one-sixth." Latham and Paterson, pp. 21-22.

THE ARROW

After ten years of study, Klopsteg derived an equation which describes the relationship of virtual mass to the mass and velocity of an arrow. Using this equation and verifying his results with empirical observations, he was able to use the concept of virtual mass to predict the efficiency of a bow by forming a ratio of the virtual mass (viz. the residual energy) of the bow to the mass of the arrow. When a bow's virtual mass roughly equalled the mass of the arrow, the effect was that the efficiency of the bow was approximately fifty percent. When the virtual mass equalled one-third the mass of the arrow, the efficiency was seventy-five percent. A virtual mass which was larger than that of the arrow's mass had the effect of lowering the bow's efficiency. As a rule, Klopsteg found that as the mass of the arrow increased--regardless of the virtual mass of the bow--the overall efficiency of that bow increased.[34]

Leaving the bow, the initial velocity (v) of an arrow of a specific mass (m) is determined by the equation: $E = (.5)\, m \cdot v^2$, where E is the total energy transferred to the arrow. Through simple algebraic manipulation the relationship between the mass of the arrow and its initial velocity becomes clear (assuming E to be constant). As the mass of the arrow increases, its initial velocity decreases.

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[34]Klopsteg, "Physics of Bows and Arrows", p. 181.

Conversely, the lighter the arrow will result in a greater initial velocity. Since range is dependent on this initial velocity, the lighter arrow would have the furthest range, but would have the least amount of energy when it hit its target.[35] The range of an arrow, however, also depends on a number of other variables: the bow's weight and cast, elevation angle upon the loosing, atmospheric conditions, and the type of arrow employed (viz. drag characteristics).

Upon release, the arrow is accelerated in the space of a few hundreths of a second to its intial velocity *v*. As it takes off, it is subjected to the effects of drag and gravity. The drag generated by wind resistance will reduce the velocity of the arrow by several feet per second until impact thereby constantly reducing its total energy. This drag is determined by the physical characteristics of the arrow such as length and shape of the shaft, smoothness of its surface, and the type and arrangement of the stabilizing fletchings. Furthermore, drag varies as the square of the speed relative to air.[36] This means that the retarding force of an arrow at a certain speed would be four times that of an arrow at half its original speed. Finally, all other variables being constant, the effects of drag is less

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[35]Maximum horizontal range is determined by using the equation v^2/g: where g is the acceleration of gravity. This equation assumes no drag.

[36]Klopsteg, *Turkish Archery*, p. 148.

for arrows of greater mass. Given the same initial velocity, the heavier arrow flies farther than the lighter arrow.

Although no specimens of Turkish arrows used during the Crusades have survived to modern day, a number of literary sources describe their construction and effectiveness.[37] Designed for a specific purpose, the length of the Turkish arrow varied from the short dart of eight to twelve inches to the normal length of the bow's draw of twenty five to thirty inches. The longer arrows were used for armour piercing because of their weight[38] and the lighter arrow were used for harrassment tactics because of their great range. Regardless of length, the arrow itself was fashioned with consumate skill and had extremely little loss due to drag.

THE ANGLED VS THE SMOOTH DESIGN

The fact that the "eared" form of the Turkish composite bow was eventually abandoned for the "smooth" design

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[37] *Saracen Archery*, pp. 24-33; *Arab Archery*, pp. 15-117

[38] The long arrows used by the English with their longbows had a tremendous amount of killing potential derived from it weight. The achievements of this weapon in battle became legendary. According to an account by Giraldus Cambrensis in 1184, Welsh bowmen were able to pierce an oak door "one palm thick" with their arrows. In another instance, a Welsh bowman hit an English man-at-arms with an arrow that had such power of penetration that it went through his armour, and his thigh, through the saddle and into the horse thus killing it.

illustrates that the latter was considered superior to the former. There are a number of sources that can provide a basis from which a comparison of the two forms of the composite bow can be made. Unfortunately, no actual Turkish composite bows from this era were preserved. There are, however, a number of Turkish composite bows of Ottoman design which are essentially the same as the smooth, recurved, composite shape which we are considering. In addition to this, there are a number of manuscripts (fourteenth and sixteenth century) which detail the construction of the Turkish composite bow and explain the art of archery as practiced in that day.

Before a comparison of the eared, recurved, composite bow to the smooth, recurved, composite bow is attempted, certain variables must be assumed for lack of historical verification. First, it must be assumed that both the "eared" and the "smooth" bows were constructed from basically the same materials and underwent the same process of construction. This is a safe premise since both designs were used by the Turks for basically the same tactical operations. In the artistic depictions of the era, it is quite common to see both forms of the bow used side by side with one another.[39] Only after several centuries of

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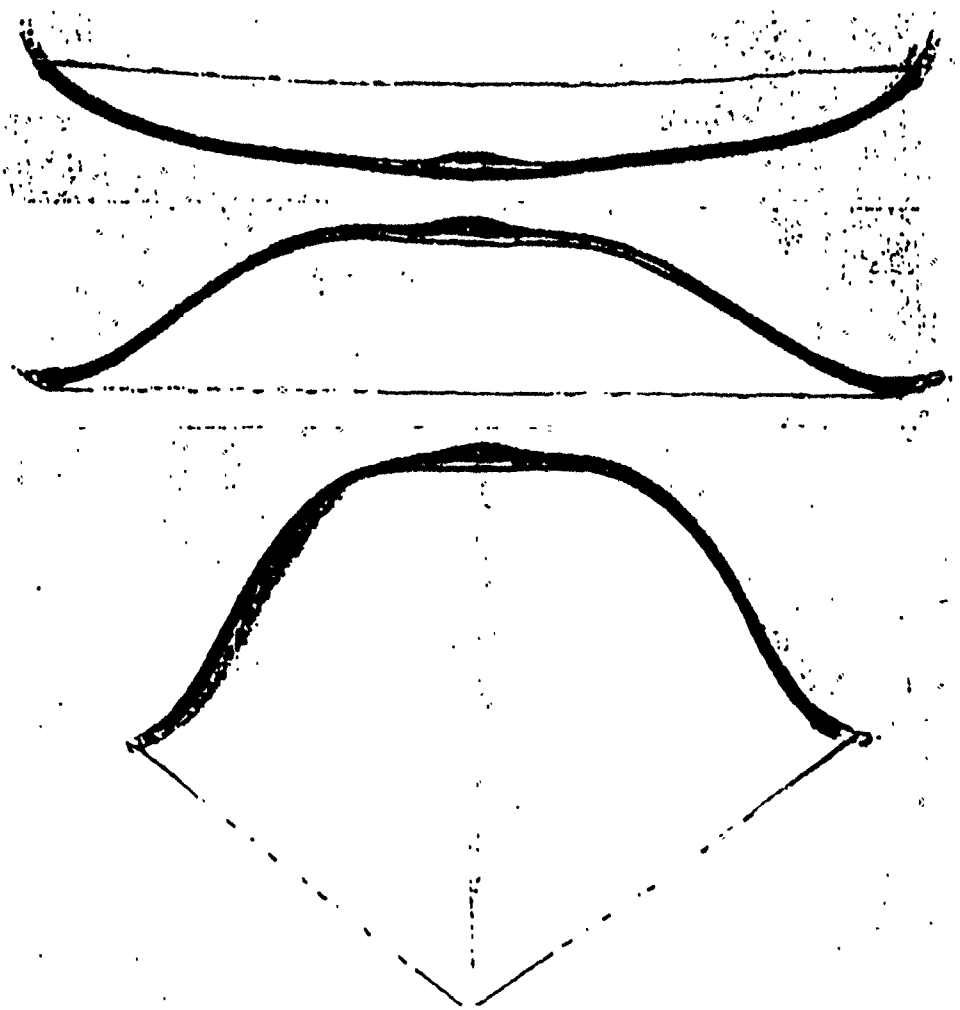
[39]For an example, see the following pages of Nicolle's *Arms and Armour of the Crusading Era*: (item #1423), pp. 520-22 in vol. I, and pp. 927-28 in vol. II.

coexistence did the "smooth" design eclipse the "eared" construction.

Because each bow was individualized and custom fit for the user, there is a certain amount of variation in performance even among bows of the same design. Since these factors defy quantification, those factors which tend to individualize one bow from another even among specimens of the same design will be discounted. Similarly, since the use of arrows of different masses will produce changes in the efficiency of a bow, this factor will also be negated. By approaching the analysis of these different bow-types from purely design considerations, a more objective picture of the essential qualities of each type of bow is possible.

The smooth, recurved, Turkish composite bow presents an aesthetically pleasing appearance which accentuates the subtlety and skill of the design. The *siyahs* flow gracefully into the *dustars* which join imperceptibly with the grip. The shape of the bow's limbs, the cross-section of the limbs at various points, and the non-homogenous composition of the bow's limbs preclude a uniform distribution of stress. As the bow is drawn, the moment of force which produces bending in the limb of a bow decreases from the base to the tip. Also, the degree of bending at any point on the limb depends on the magnitude of the bending moment and the shape and cross-section of that limb. For the greatest efficiency of design, the limb should

Plate V. The smooth, reflexed, Turkish composite bow in the relaxed, braced, and fully drawn positions.



undergo a uniform bending. This requires the limb's stiffness to diminish in a constant ratio to the bending moment. This, however, is not the case with the Turkish composite bow.

Klopsteg, an accepted authority on the Turkish composite bow, stated that "the limbs of all Turkish bows that I have examined or seen illustrated are almost uniform in width as well as thickness from grip to shoulder."[40] This design results in stress being distributed along the limbs with the greatest amount focused on those sections of the *dustars* nearest the grip. As you move toward the ends of the *siyahs* from the grip, the amount of stress on the limb diminishes fairly quickly. There is an increase in stress towards the end of the *siyahs* where it curves into the ear, but the smooth construction significantly reduces the possibility of structural damage to the limb itself.

The eared, recurved, Turkish composite bow was a product of the same skillful construction as that found in the smooth form, except this retained the ancient practice of using a distinctly angled ear. The stress distribution in this design type is similar to the smooth except at the joint where the *siyahs* bend at a sharp angle.[41] In this area the stess is comparable to that found near the grip

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[40]Klopsteg, *Turkish Archery*, p. 136.

[41]This is commonly referred to as the shoulder or knee (*rukbah*) of the bow.

except here the cross-section is significantly smaller. A triangular cross-section is used at this juncture to provide

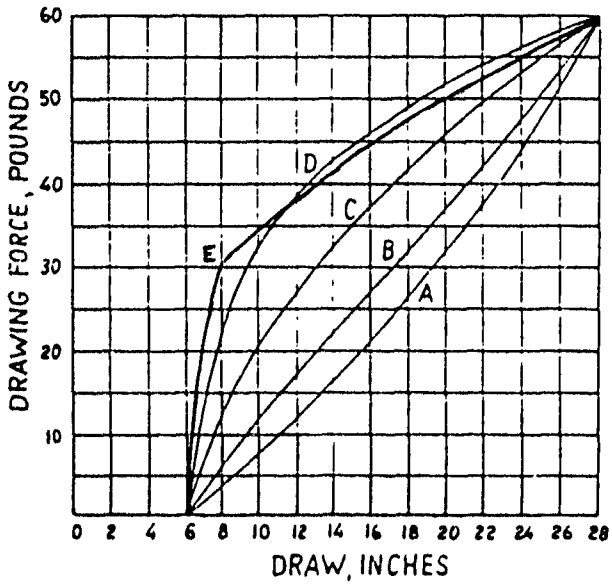

Fig. 22. Force-draw curves of typical bows with the "eared" design superimposed.

the needed reinforcement. Compared to bows of other designs, this type of bow would be exceedingly easy to draw in the first half and then would probably smooth out in the second half with a force-draw slope similar to the design "D".[42] The sharp turn at the half-way point is where the ears would lose their function as levers resulting in the bending force being concentrated on the *dustars*. Inserted into the graph with the other bow-types, it would appear at first glance that this "eared" form (labeled "E") is the

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[42]Not having an "eared" bow with which to conduct an actual test, this curve was extrapolated with the assistence of Lt. Jay Lowell, a graduate student in the physics program at The Ohio State University.

most advantageous design. Both "D" (the equivalent of the "smooth" form) and "E" have the roughly the same amount of area under their curves. This graph, however, merely represents the total *potential* energy for any design shape. It does not indicate *in any way* the efficiency of energy transfer after the arrow is released from full draw.

In terms of virtual mass, the "eared" form of the bow would have probably had a greater amount of residual energy than the "smooth" form. Upon release of the draw, the "eared" bow, having longer limbs than the "smooth" design, would project an arc described by the tips its ears which would be greater than the arc described by the tips of the "smooth" form's ears. Assuming that both bows return to their undrawn state in the same amount of time, the tips of the "eared" bow would travel at a higher velocity than those of the "smooth". Coupled with this greater velocity, the massive ears of the "eared" form would result in a much greater momentum than would be found with the "smooth" design. The overall effect would be a larger amount of virtual mass and hence smaller level of efficiency when compared to the "smooth" form. This could be countered, to some extent, by the length of the bowstring used to brace the bow.

The techniques for bracing the Turkish composite bow are numerous. Surviving manuscripts list methods that include: standing positions, sitting positions, two people

working in concert, the use of mechanical leverage, even methods which could be used while on horseback.[43] At all

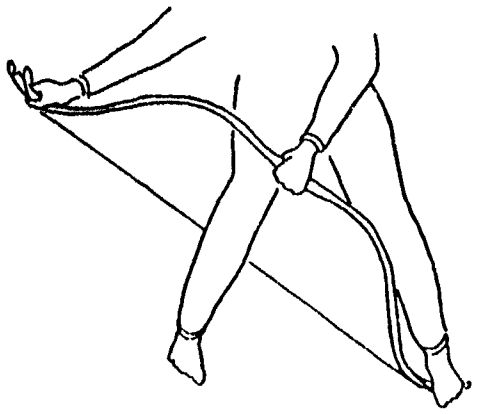

Fig. 23. Bracing the composite bow in the "military method."

times, the archer was warned to be constantly looking for flaws or damage to the bow. Should he detect some flaw or twist in the bow, the archer could correct this by subjecting the bow to heat which will make the bow more pliable. A Mamluk training manual notes that:

> To do this calls for dexterity, deftness, and technical skill, and great care must be taken to ensure that the bow neither springs round nor gets burned. How to correct a bow in this way is something every archer should know really well and be determined to master; for it is a great fundamental and an accomplishment that none can afford to ignore since a bow is prone to distortion and must be constantly watched.[44]

One danger which must be considered when choosing the design of a bow is the possibility that it could upset.

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[43] *Saracen Archery*, pp. 90-100.

[44] Ibid., p. 91.

This would occur if the bowstring were to slip around the sides of the *siyah*s with the result being a catastrophic and violent return to its unstrung position. If this were to happen, the archer could possibly suffer injuries and the bow itself would almost certainly be damaged. The "smooth" composite is virtually impossible to upset unless there was a major structural flaw in the bow. With the "eared" composite, however, the possibility of it upsetting is a very real danger.[45]

When the "eared" composite is in the braced position, it is clear that the string could easily slip off the lower portion of the ear and upset. This problem was sometimes corrected by means of a bridge built on the lower end of the ear or even by creating a groove at the base of the ear to catch the string. This latter option was particularly hazardous since it could weaken this highly stressed joint and cause the *siyah* to snap when drawn. Considering the conditions with which a horse-archer was required to perform, there was a very real danger of accidentally leaning or striking one limb of the bow against the horse during battle and upsetting it. A relatively minor structural flaw could likewise cause the "eared" bow to upset and therefore greater care would be required by the

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[45]Whether this was a frequent occurrance is not known. This possibility, however, would have been a design consideration which every bowyer had to recognize and compesate for in some fashion.

archer to closely guard and protect his bow from damage. The "smooth" composite would not need this extraordinary amount of attention nor fear upset through deformation except under the most severe cases.

One way in which this danger was countered was in the choice of bowstrings. By using a shorter string than normal, the possibility of it slipping past the shoulder of the *siyah* is negated through the high tension which would be present even when the bow was in the undrawn state. This greater stability would be traded for a decrease in the overall performance of the bow. The "eared" bow, unlike the newer design, had to choose between these two options: 1) a longer string giving greater performance with decreased stability, or 2) a shorter string giving lesser performance with increased stability. It seems that the Turkish archer using the "eared" bow opted for the best performance his bow could offer and tried to reduce the dangers of instability by using string rests and bridges on the shoulders of his bow.

SUPPORTING TECHNOLOGIES

This powerful bow was further augmented through artificial means to increase its range and ability to penetrate armour. One such supporting technology was concerned with the manner of drawing the bow. The archer of the Orient had developed by this time a number of finger

locks[46] for use with the composite bow which allowed for a cleaner release.[47] In this manner of drawing the bow, the thumb is used to pull the string and the index finger is used as a lock which braces the tip of the thumb and thereby

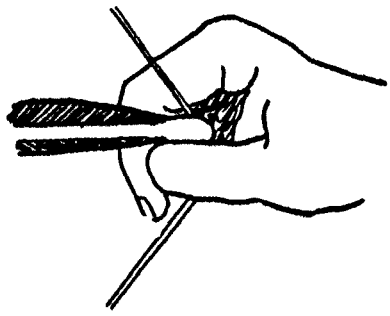

Fig. 24. The finger lock.

provides reinforcement. Bows of strong pull were often drawn with the aid of a thumb ring which covering the portion of the thumb upon which the string would rest. Constructed out of highly polished horn or ivory, these rings distributed the pressure of the string over inner portion of the thumb and also provided a measure of protection from injury to the fingers (a common occurrence) upon release. The result was a virtually frictionless release which improved both the efficiency and accuracy of

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[46]This method of drawing the bow was very different from the Western method which use the middle three fingers of the hand, the arrow being held in position between the index and middle finger.

[47]This technology was *not* the result of the transition from "angled" to "smooth" form of the composite bow.

the bow. These finger locks and thumb rings were originally used with both types of bows.

Another artificial aid for the bow was the *siper*. This device was a piece of horn with a groove fashioned into it which served as a channel for the arrow. Strapped to the

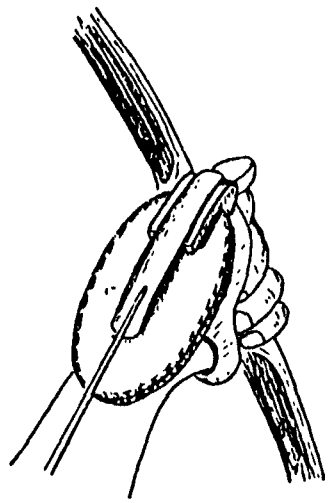

Fig. 25. The Turkish siper.

hand gripping the bow, the *siper* allowed the archer to safely increase the draw of the arrow inside the arch of the bow itself. This also allowed the archer to reduce the length of the arrow and thereby increase the range of the bow. Conducting experiments with the *siper* and the Turkish bow, Payne-Gallwey was able to significantly increase the range of his bow.[48]

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[48]In *The Crossbow*, the author relates that by using arrows of 28.5 inches he shot a distance of 275 yards on the average. Reducing the length of the arrows to 25.5 and employing a *siper*, he was able to draw the arrows 2.5 inches inside the arch of the bow and thereby achieved an average range of 360 yards. p. 11 of Appendix.

Similar to the *siper* was the *majira* or *nawak*.[49] Constructed from a long piece of wood, this device was usually the length of a normal arrow and had a groove in the

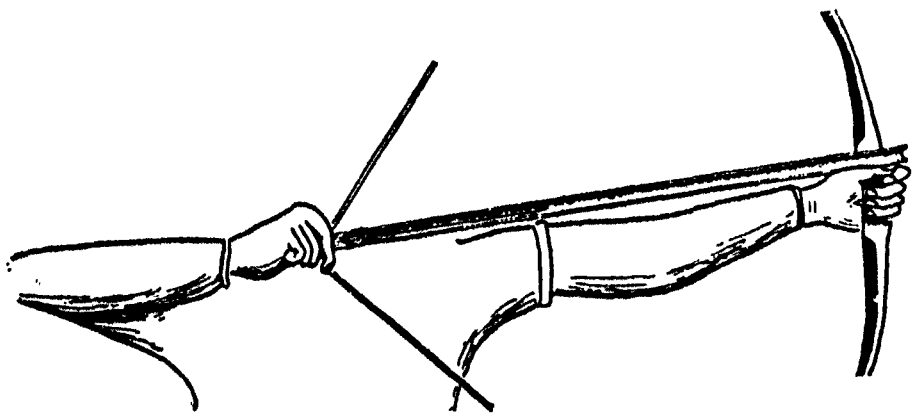

Fig. 26. The use of the arrow-guide at full draw.

center. Like the *siper* it allowed the arrow to be drawn back beyond the grip. The *majira*, in effect, transformed the archer into a human crossbow. This lengthened guide for the arrow allowed the Turk to shorten his arrow significantly. This miniature arrow designed for long-range tactics was called a dart by the Crusaders. Another version of the *majira* had a hollow chamber running the length of the wooden block which again was approximately the length of a normal arrow. This variation allowed the archer to shoot specially designed darts: nockless, extremely short, arrows

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[49]Arabic for 'channel guide'. The authors Latham and Paterson of *Saracen Archery* concede that they know of know surviving specimens of these devices dating from the Middle Ages. There are, however, artistic depictions of this device from this period.

with small fletchings. When used against heavy armour, the dart was useless. When the situation called for armour penetration, a heavier arrow was used with the bow.

Against a heavily armoured man, however, sometimes the weight of the arrow alone is not enough to ensure that it will pierce his defenses. Over the centuries, it was found that arrowheads of various forms and cross-sections are effective against certain types of armour. A Mamluk archery manual from 1368 contains a considerable amount of information on this topic. According to this book, the most effective arrowheads are those of "triangular or square" cross-section; these are recommended for use in battle against all kinds of armour, but especially against mail armour.[50] Another arrowhead designed for use in war is one which:

> should be made of steel. In these cases the tip must be tempered and a fraction snipped off if it is intended to pierce laminae or armour. This technique is a well-guarded secret, and the result a weapon capable of piercing armour plates and shoulder-guards. The heavier it is, the greater its power of penetration. This is well known.[51]

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[50]Having this type of cross-section would make the arrow especially suited against mail armour. Hitting a hauberk, as the tip slides into the ring mesh it has the effect of bursting the metal link thus opening a way for the arrow to penetrate further. *Saracen Archery*, p. 25 and 28.

[51]An arrow having a normal tip would have the possibility of snapping off or even slipping off (only against plate) and thus rendering the arrow ineffective. The "snipped tip" (resembling a chisel) would allow the arrowhead to bite into the armour and transfer all its energy into piercing the material. The authors of *Saracen*

How much of this knowledge concerning arrowhead design was actually known by the Turkish tribal archers is open to speculation, but this manual does mention Turks of certain territories having a preference for certain types of armour-penetrating designs. Considering the great skill of Turkish archers of even tribal status, it is likely that a number of these arrowhead modifications were known to them.

A recent translation by Edward McEwen of the eleventh chapter of the Islamic manual for war entitled *Adab al-harb wa-l-shaja'a* shows that knowledge of specific arrowhead designs was known to the Turks at the beginning of the thirteenth century, if not much earlier.[52] This book was written by Fakhr-i Mudabbir for the Delhi sultan Shams al-Dunya wa-l-Din Abu al-Muzaffar Iltutmish (1211-1236), the greatest of the so-called Slave Kings who laid the foundation of Muslim rule in India.[53] Dealing primarily with the archery of North Indian and Afghanistan, this text also refers to Central Asian equipment by way of comparison--and is therefore connected to the Turkic archery tradition. Referring to earlier masters, the text asserts that "there

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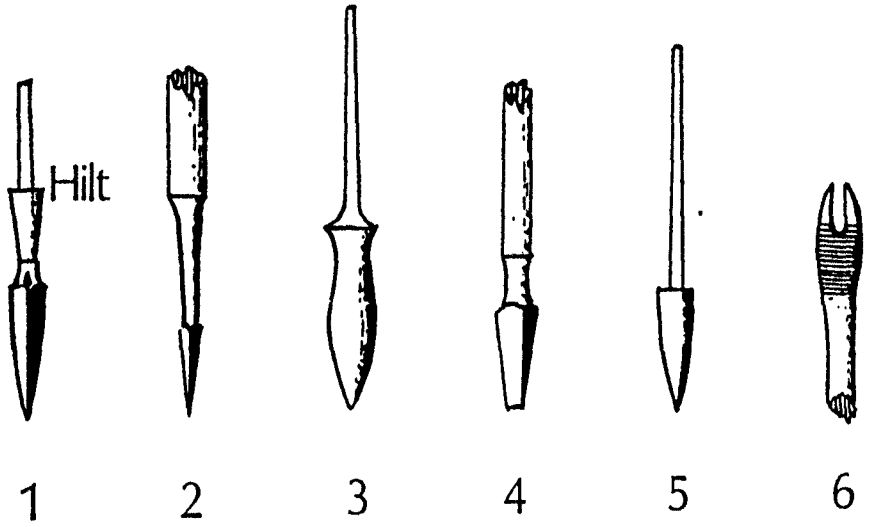
Archery actually tried this type of arrowhead against laminae armour and found it to be very effective. Ibid., p. 26.

[52]Edward McEwen, "Persian Archery Texts: Chapter Eleven of Fakhr-i Mudabbir's *Adab Al-Harb*", *Islamic Quarterly*, XVIII (1974), pp. 77-99.

[53]McEwen concedes that dating from this period, this manual is the earliest known work of its kind., p. 77.



ARROWHEADS AND NOCKS

1. *Yaghliq* from N.W. India.
2. *Yaghliq* from Doge's Armoury, Venice.
3. 'Olive-shaped.' (From Saxton Pope, *Bows and Arrows*, Plate 14.)
4. Chisel-head from N.W. India.
5. *Maydānī* target head (conjectural).
6. Turkish nock.

Fig. 27. Various arrowhead designs and a typical Turkish nock.

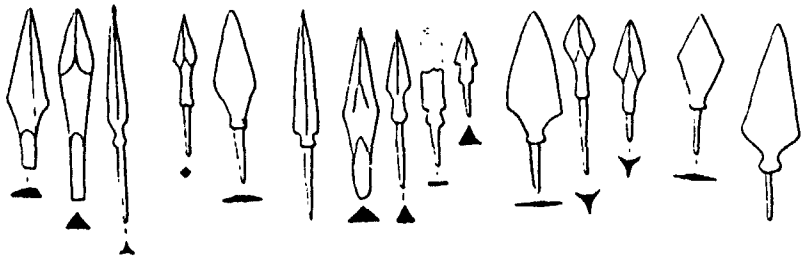


Fig. 28. Various arrowhead designs from Murakaevskiye, southern Urals, 10-11 centuries.

is a certain type of arrow and a different type of arrowhead necessary for each situation of war for it to be efficacious."[54]

Arrowheads are recommended for use against many types of armour: mail, breastplates, wooden shields, cane shields, poplar shields, caftans, cotton-quilted and iron mail horse armour. Anecdotes speak of armour-piercing experts, the habits of Turkic archers, and of great feats achieved in the art of archery. The detail and expertise displayed in the text show mastery of the art of archery to a degree of equal if not greater thoroughness of that displayed in the Mamluk archery manual of 1368. In addition to this, there are known specimens of these specialized arrowheads dating back to the ninth and tenth centuries from the East Eurasian steppe.[55] Based on this evidence, it is safe to assume that the Turkic people which came into contact with the Crusaders from 1097 to 1244 knew something of the use of various shaped arrowheads for penetrating armour.[56]

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[54]Ibid., p. 81.

[55]See items 8 and 31 in volume II of Nicolle's *Arms and Armour of the Crusading Era*. pp. 5 and 13.

[56]Based on his vast knowledge of published and unpublished manuscripts on Muslim archery, Dr. Nicolle states that he thinks that "there was always considerable specialization among Turco-Muslim archers and their arrowheads." Besides surviving Islamic archery manuscripts, this assertion is further supported by "the extraordinary variety of arrowheads found in Central Asian graves from all periods." From personal correspondence with Dr. Nicolle, 26 July 1991.

COMPARISON CONCLUSIONS

The smooth, recurved, Turkish composite bow was superior to its "eared" cousin in many respects. Although there is no empirical data to confirm it, the smooth, recurved, composite bow apparently had a stiffer action in general when compared to the "eared" form of the bow.[57] The "smooth" design greatly reduced the advantages accrued in the ease of drawing that the longer ears provided in the older form of the bow. Even though the resultant loss in lever-action translated into a harder draw, the "smooth" form had a greater efficiency of energy transfer than the "eared" type. In terms of virtual mass, the action of the long ears of the older form would have created more residual energy than those of the "smooth" form. The pronounced ears resulted in a greater mass of the bow traveling at a faster velocity upon release of the draw when compared to the smoothly integrated ears of the newer design.

The design of the newer form gave the bow greater efficiency and stability which translated into a better cast. Although it had a stiffer draw than the "eared" form, this increase in weight was apparently rendered less of a problem with the use of the thumb ring and the finger lock. The greater weight of the "smooth" design, however, placed a greater need for the use of these technical adaptations to

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[57]This assumption is based on the theoretical data taken from the graphs on pages 85 and 98.

achieve accuracy. Since this dominance of the "smooth" design occurred in the early twelfth to the late thirteenth century, the Crusader threat must be evaluated in this same time-frame to understand *why* this happened.

CHAPTER IV

THE CLASH OF CULTURES

A king is not saved by his great
army;
a warrior is not delivered by his
great strength.
The war horse is a vain hope for
victory,
and by its great might it cannot
save.

Psalms 33: 16-17

The meeting of East and West on the battlefield resulted in a clash of two forms of combat greatly defined by their respective cultures. The Turkish warrior was a lightly armoured horse-archer who relied on the swiftness of is mount in battle. The Western soldier, by comparison, was probably the most heavily armoured warrior in the world at the time and moved only as fast as the foot soldiers. Both Frank and Turk had their own forms of long-range weapons: the Franks employed the short bow and the greatly feared crossbow, and the Muslim horse-archer relied on the Turkish composite bow. After the initial shock of meeting a form of combat alien to their own[1], as these two opponents contended

[1]The military of Byzantium was similar to the West, but had several important differences: the cavalry was

with each other during the twelfth century and into the next, the weaponry and tactics of each were modified to exploit their enemy's weaknesses. With specific focus on the Turkish composite bow and supporting technologies, this process of evolution is the subject of this chapter.

Before examining the interplay of the tactical aspects of warfare in the Middle East during the Crusader period, it is important to understand what "victory" meant to the parties involved. Having the advantage of mobility and speed, the Turk was able to give and refuse battle on his own terms. This necessarily influenced the objectives and conduct of warfare for the Western soldier. Facing such an adversary, the destruction of the enemy's forces was rarely the primary objective of Latin commanders. Gauged by battlefield casualties, the military history of the Crusades and Latin Outremer would reflect a long unbroken series of failures for the Frank. Due to the nature of the Turkish military force structure, even in such notable Frankish victories as Danith (1115), Mount Gisard (1177), and Arsouf (1191), actual battlefield casualties for Muslim forces were relatively insignificant.[2] Put to flight by a Frankish

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disciplined, the composition of their forces was a conglomerate of several nations, they had a significant amount of mercenary forces, their armour was not as heavy, and their infantry were not acquainted with the crossbow. The Fatimids were very similar to the Franks in armour and tactics, but were not a cohesive unit since their troops were primarily multi-national slave-recruits (unlike the Turkish mamluk!).

cavalry charge, light-armoured Turkish horsemen could normally outdistance their pursuers and regroup later once the Franks returned to their infantry base.[3] The Latin forces, however, were tied to the slow-moving infantry and were therefore liable to incur significant losses when infantry and cavalry failed to work in close support of one another.

Under these tactical conditions it was not prudent to seek battle, so the Christian forces of Outremer generally restricted themselves to strategically defensive campaigns in which the reduction of towns and castles through siegecraft became the primary objective. Tactics were designed to protect the column as it marched from the point of muster to its objective. For the Western commander, tactical victory was measured not in the battlefield casualities of the enemy, but in the success or failure of the march to reach its objective. Strategic victory hinged on the ability of the Latin commander to successfully conduct or raise a siege. For Muslim forces, conversely, victory lied in a prince's ability to use his forces to stop

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[2]Although routing the forces at Danith, the only significant casualties came from the ensuing massacre: the Crusaders massacred three thousand male camp followers, enslaved the women, and committed the children and old men to the flames. Kenneth M. Setton, p. 404.; R.H.C. Oc., 496-498.

[3]Ibn Al-Qalanisi, *The Damascus Chronicle of the Crusades*, trans. by H.A.R. Gibb, (London: Luzac & Co. Ltd., 1967), p. 70.

the Frank's march or siege. Since this was only brought about with an actual encounter on the battlefield, victory was based solely on the tactical skill of Muslim forces. Frankish forces faced great hardships on the battlefields of Outremer when they contended with the Seljuk armies of Syria[4] using their centuries-old Turkish tradition of highly mobile warfare. The Byzantine Emperor Leo VI (886-912), in his book on military operations called *Tactica*, described these tactics as if he were a member of the First Crusade writing in 1097.

The Turks[5] with which the Emperor Leo was familiar were the Seljuk Turks who had just recently broken forth from the steppes into the Levant. He describes them as bands of light-armoured horse-warriors who used the lance/spear, mace, and sword and relied primarily on their archery for victory. "[G]iven to ambushes and stratagems of every sort," Leo notes the prowess of this enemy in executing their maneauvers and how, through the stationing of pickets,

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[4]The Fatimid armies were not as great a threat to the Crusader armies as were the Turks of Syria. Relying of a slave-recuit army of primarily Sudanese, Berbers, and Arabs, Fatimid armies employed tactics similar to that found in the West and, as a result, were easily defeated by Frankish forces. R.H.C. Oc. 380-2; Smail, 86-87; Nicolle, *Saladin and the Saracens*, pp. 13-15. Declining in authority, the Fatimid Empire was slowly Turkified until Saladin united Egypt under Abbasid rule. Since the use of Turkish forces were rare among the Fatimids, and the tactics so dissimilar to that of the Turks, the value of studying these battles for clues concerning the evolution of the Turkish composite bow are negligable. See pages 46-48.

[5]For the origins of the Turks see appendix A.

they are extremely difficult to surprise.[6] Chronicling the course of the Second Crusade, the royal chaplain of King Louis VII of France, Odo of Deuil, saw first-hand the Turkish method of war and described it very much like Leo had centuries earlier:

> Actually the enemies harassing the flanks of the army hindered him by cunning, not by strength, for they assaulted boldly and retreated skillfully and easily...[7]

Because the Byzantine archers outranged the bows of the Turks, disciplined infantry could hold the Turk could off. Having his horse shot out from beneath him, the Turk was helpless because--being of a nomadic background--he was unaccustomed to fighting on foot. Therefore the Turk would seek to engage in a decisive battle. When in the field against such an adversary, Leo continues, the Turks were no match against the Byzantine heavy cavalry and could easily be ridden down. When following up after a victory, the commander is warned to pursue with caution because the Turks are known to rally quickly and lie in wait for a surprise counter-attack.[8] Unaccustomed to this method of war, the

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[6]Oman, *Art of War*, pp. 35-36.

[7]Odo of Deuil, *De profectione Ludovici VII in orientem*, trans. by Virginia Gingerick Berry, (New York: Columbia University Press), p. 111.

[8]Paraphrased from Leo's *Tacticus* in C.W.C. Oman, *Art of War*, pp. 35-36.

Crusaders quickly learned for themselves the value of Leo's advice.[9]

This recipe for victory against the Turk was based on the one maneuver the Franks knew and loved best--the cavalry charge. Reflecting upon the tactics of the Western knight, Leo's *Tactica* also comments on how the Franks often fell into confusion after delivering the charge. In order to defeat the Frank, therefore, Leo prescribed a simulated flight and then a quick reverse to catch them when they are in disorder.[10] This problem of control stemmed from the social background in which the knights of the West were trained. The value of personal glory was esteemed as the highest good; for even in defeat, if one were to distinguish himself with acts of valour he would be still highly regarded by his fellow countrymen.[11]

The cavalry charge of the twelfth-early thirteenth century was not the disciplined operation of seventeenth century European cavalry where men rode into battle knee to

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[9]According to *the Alexiad*, the leaders of the Franks were counciled by the Byzantine Emperor Alexius before crossing the Hellespont into Anatolia on the nature of the Turkish warrior and how to best defeat him. *The Alexiad*, p. 264.

[10]Paraphrased from Leo's *Tacticus* in C.W.C. Oman, *Art of War*, p. 34.

[11]Richard Barber, *The Knight and Chivalry*, (New York: Harper and Row Publishers Inc., 1982), pp. 193-197; Vitalis, p. 489.

knee and at a regulated speed.[12] Instead, the Frankish cavalry charge appeared to be but a seemingly mad, uncontrolled dash. Describing the Frank's use of cavalry, the princess Anna Comnena states that the soldier of the West "never employs military discipline or science" and, "not to be restrained," they "dash into the middle of the enemies' ranks with irresistible force..."[13] The momentum of a Frankish cavalry charge would make "a hole through the walls of Babylon."[14] As often as the charge achieved the desired results, it also at times "ended in being dashed against a stone wall or tumbled into a canal, in painful floundering in a bog or futile surgings around a palisade."[15] The charge, therefore, resembled an "aggregate of many individual charges."[16] Once set loose, the charge was uncontrollable and could not be influenced by the

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[12]There are a number of instances where the cavalry charge was conducted in an ordered fashion in Crusader chronicles (see Smail, pp. 112-3), but the vast majority of cavalry charges were not. This was especially so against the Turk. Usually as a result of frustration, the cavalry would charge at full speed against a steady hail of arrows in order to reduce the number of arrows he would have to face before he reached the Turk. The battle accounts in this chapter illustrate this clearly.

[13]*The Alexiad*, 283.

[14]Ibid., p. 342.

[15]Oman, *Art of War*, p. 59.

[16]Smail makes the comparison of the Frankish cavalry charge to "a projectile in the hands of commander. When directed against the enemy it could strike him only once, and therefore to succeed must strike and shatter him *uno impeto*, in a single attack. pp. 114-115.

commander. This was especially so when the commander joined the charge himself; his personal participation in the charge was quite commonplace since the lord was expected to set the example of valour in battle.

The effectiveness of the cavalry charge was not so much in the amount of shock it delivered, as in the amount of shock it could deliver as perceived in the mind of the enemy. Few men have the courage to face a wild charge of heavily armoured knights, each over a ton of flesh and steel, bearing down upon one at full-tilt.[17] The fear of being trampled under the hooves of a horse is one that is basic in the reaction it elicits. The French military officer Ardant du Picq, writing about the nature of the use of cavalry in his *Battle Studies*, pointed out that man's survival instinct has never changed. Studying ancient and medieval combats in detail, he noted that the clash between the foot-soldier and cavalry almost never occurred: "Fear has certainly routed a hundred thousand times more men than the real encounter."[18] The cavalry versus cavalry combat "...had no reality." In those rare battles where cavalry

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[17]At the battle of Arsouf in 1191, Saladin's secretary, Beha ed-Din, "gasped at the splendor of the spectacle as the Christian cavalry thundered towards him." This action caused the Muslim horsemen to flee in panic. Runciman, III, p. 56.

[18]Ardant du Picq, *Battle Studies*, trans. by Col John N. Greely and Maj. Robert C. Cotton, in *Roots of Strategy*, Book II, (PA: Stackpole Books, 1987), p. 118.

actually clashed "there was no shock at full speed, but a halt face to face and then an engagement."[19] The battles during the Crusades between the Frankish cavalry and the Turkish mounted and foot contingents verify these assertions.

Not changing their traditional mode of warfare, the Latins of Outremer placed their sole hope of victory in the cavalry charge. The key to success lay in directing the charge towards the greatest mass of the Turks. If the charge evoked the desired response, as the enemy dispersed the Franks could kill at their pleasure with their lances and swords and not have to worry too much about counter-attacks. The Frank would direct their charge against the largest concentration of Turks. If this group broke and fled the field, the remaining groups would follow until they could regroup. The highly mobile tactics of the Muslim horse-archer, however, made determining the greatest body of Turks a difficult judgement. The Turks could evade the brunt of the charge on their swift mounts and melt away if the charge was timed incorrectly; all the while the knights would face the arrows of the Turkish horsemen. At the battle of Dorylaeum (1098), William of Tyre records how the Turks evaded the shock [ut impetus eluderent] of the Frankish knights.[20] An excellent description of the charge

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[19]Ibid., p. 117.

being used against the Turk was recorded by Odo of Deuil. In this instance, a number of knights, led by the king himself, charged . . .

> after them like whirlwinds, scaled the steep bank, and penetrated the rain of arrows and the Turkish throng more swiftly than can be told. Also the king, by similar good fortune, when riding at top speed against the Turks who were shooting arrows from the rear, put them to flight, [and] divided their forces...[21]

In an engagement where knights were the sole combatants, Ousama describes a Frankish knight who "had thrown down his coat-of-mail, unburdening himself in order to be able to overtake us."[22] Armoured not as heavily as the Frank, the Turk's ability to choose when and where to engage the Christian forces allowed them to create a situation amenable to disrupting the lines of the Franks.

The battles between Muslim and Frankish forces show that the Frank could fight on the march or in a set-piece battle. Although much more adept at the latter, there are many instances where the Franks were forced to fight on the march. The Turkish horse-warrior would use his mobility to catch Christian forces in situations where they would be forced to fight while marching. Against the marching column, Turkish horse-archers would concentrate their

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[20]R.H.C. Oc., 131. Even though William was not an eye witness of this battle, his personal experience fighting the Turk makes him valuable as a source.

[21]Odo, p. 111.

[22]Ousama, p. 52.

attacks on the rear of the column, thus forcing the Franks to turn and fight in the opposite direction. Engaging the Frank in this manner would result in the rear guard stopping to fight or continuing in the awkward situation of fighting in retreat. If the column was unorganized and undisciplined, the van of the column would continue and the forces in between would spread out, making it easier for the Turk to create disorder in the Latin's ranks with their archery and cavalry feints. Those Latin commanders who were able to fight successfully on the march[23] did so at a very slow pace.

By far the most dangerous opponent the Turk faced, Muslim commanders approached the task of overcoming a Frankish force with extreme caution. The armour of the Western soldiers being nearly impenetrable to arrows, the Turkic horse-archer had to come close to his opponent to ensure penetration.[24] The mounts of the knights, however, were vulnerable even at long ranges. Generally without

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[23]Richard Lionheart was one such commander. When under attack from the Saladin Turkic horse-archers: "oportuit continue versa retrorsum facie progredi post tergum sine intermissione in persequentes immittentes sagittas." *Itinerarium peregrinorum*, p. 118, cited in Smail, p. 162.

[24]Eventhough the Turkic warrior often adopted certain modification to the design of their arrowheads, it is doubtful that it extended the range of a bow's effective killing range significantly. The heavier arrowhead had more total energy, but also suffered a decrease in maximum range. See pages 91-3.

armour until the mid-twelfth century, the horse became the natural target of the Turkish bowmen.[25] Unlike the Turks, who were able to replace lost mounts, the Crusaders were in the unhappy situation of a constantly diminishing number of mounts suitable for use in combat.[26] Unfortunately, the Frankish cavalry were usually out of the effective range of their bows having placed itself behind--or in the midst of--the infantry. When the Turk closed to insure the efficacy of his arrows, he made himself vulnerable to the devastating quarrels of the Frankish crossbows. This interplay is clearly illustrated by a narration from Joinville of an encounter with Turkish horsemen:

> The Turks charged the Count of Flanders with great vigour and spirit ... When I saw this I commanded our crossbowmen to shoot at those who were mounted. When those who were mounted saw they were being wounded from our side, then they took to flight; and when the Count's people saw this, they left the camp, scrambled over the barriers, ran in among the dismounted Saracens and discomfited them. Many were killed...[27]

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[25]When the Byzantine Emperor Alexius faced Bohemud at Dyrrachium in 1107, he furnished his archers "abundantly with arrows and exhorted them not to use them sparingly, but to shoot at the horses rather than at the Franks. For he knew that the Franks were difficult to wound, or rather, practically invulnerable, thanks to their breastplates and coats of mail." *The Alexiad*, p. 341.

[26]Nicolle estimated that in order to conduct and sustain the type of operations the Turkish horse-archer engaged in, a ratio of five horses per Turk were needed. *Saladin and the Saracens*, p. 9.

[27]Joinville, p. 203.

As illustrated in the above passage, in order for the arrows of the Turk to have an effect against the heavily armoured Latin warrior he had to close the distance between them. By doing this, however, the Turk horse-archer also invited counter-attacks in the forms of crossbow fire and/or a cavalry charge. It was these battlefield conditions which pushed Turkish tactics to improve their primary weapon in order to shift the balance in their favor.

DIVIDE AND CONQUER

By subjecting the Franks to a constant barrage of arrows, the Turk hoped to cause a weakening of the morale and therefore of the cohesiveness among the ranks. Staying well out of the range of the Crusader's missile weapons, the Turk could subject the Frankish soldier to the strain of a sustained assault. The *Gesta Francorum* describes this tactic of using long-range archery saying that the Turks were "encircling us from all sides" [undique circa nos].[28] By the time the charge reached the Turk's original position, the knight would have faced a rain of arrows while the Turk easily maneuvered out of harm's way. With no hope of retaliation[29], both knight and infantryman alike must have

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[28]*Gesta*, p. 17.

[29]The range of the crossbow at that period versus the range of the Turkish composite bow will be discussed further in the text of this chapter.

felt a total helplessness. There are many instances where the frustrated foot soldier or knight would break ranks to strike a blow despite orders to the contrary.[30] If discipline began to waver and a precedent of unorganized sallies was established, the ranks would begin to open up and the Turk could now pick off the soldiers at his discretion without fear of injury to himself.

In order for this harrassment tactic to work, the Turk had to have a missile weapon capable of exceeding the Franks' most powerful missile weapon--the crossbow. Virtually unknown in the East before the First Crusade[31], the crossbow, known as the *arbalest*, was held in high regard by all who witnessed its devastating effects. The lethality of this weapon was so great that it was banned by the second Ecumenical Lateran Council of 1139 for use in war: "The deadly art, hated of God, of crossbowmen and archers should

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[30]This situation probably happened more often than was recorded. To illustrate the point, one such instance was noted by William of Tyre during Baldwin III's campaign of 1147. Under constant harrassment on both legs of the march, the troops were under strict orders to maintain discipline and not break ranks. A Turcopole auxiliary in the Frankish column, frustrated at his imposed helplessness, charged out of the lines and struck down a Turkish horseman. The troops were heartened by this bold display and began to make individual sorties on their own. R.H.C. Oc., p. 725.

[31]In the *The Alexiad*, the princess Anna Comnena relates that "this cross-bow is a bow of the barbarians quite unknown to the Greeks....verily a devilish invention. And the wretched man who is struck by it, dies without feeling anything, not even feeling the blow, however strong it be." pp. 255-256.

not be used against Christians and Catholics on pain of anathema."[32] This prohibition did not apply, of course, when it was to be used against the infidel. The value of the crossbow is also reflected by the fact that by the 13th century Italy was exporting highly paid, professional crossbowmen as mercenary forces.[33]

Present in every crusade, the crossbow did not become the preeminent missile weapon of the Crusaders until the Third Crusade under the direction of Richard I (1189-1199). Its effectiveness in battle is clearly illustrated in a skirmish that took place outside of Jaffa in 1192 when Saladin attempted to catch the Frankish forces under Richard Lionheart by surprise. Forewarned of the Turkish advance, Saladin was distressed to find the Latin forces drawn up in battle formation when he maneuvered to attack. Saladin's mamluks made a few mounted charges against the Crusader lines, "suffering heavily from the crossbow volleys, but the rest of the troops [Saladin's] simply refused to attack."[34]

The Byzantine Princess Anna Comnena described the crossbows used by the Normans in the First Crusade as having

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[32]Contamine, p. 199.

[33]Nicolle, *The Crusades*, p. 10.

[34]Ehrenkreutz, Andrew S., *Saladin*, (Albany: State University of New York Press, 1972), p. 219.

been drawn by hand while both feet rested on the bow. The archer drew the cord by pulling with his arms.[35] In doing this, the crossbowman wore a leather glove to protect his fingers from being cut by the tension of the cord.[36] The bow of this type of crossbow was constructed out of a single piece of wood, most likely of either yew or ash, and was later appended with a sort of stirrup with which the archer could place his foot or feet to hold the crossbow steady for the draw.[37]

Although the crossbow's rate of fire was significantly less than that of a normal bow, the crossbow's projectile--the quarrel--was unequalled in the amount of power it delivered. The light armour of the Turkish horsemen proved to be little defense against the heavy quarrels of the crossbow. With a slow rate of fire of only three or four shots per minute, the crossbowman was not hindered in his effectiveness considering the Turkish horse-archer tactics of continual harassing excursions.[38] Besides this,

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[35]*The Alexiad*, p. 255.

[36]Payne-Gallwey, pp. 60-1.

[37]Ibid., pp. 57-61. See illustration.

[38]Ibid., p. 37. A military crossbow of the fifteenth century employing the windlass for reloading has a reload time of one bolt per minute. A primative crossbow would have had a much shorter reload rate and giving it a rate of fire of possibly three or four shots per minute. This is still below the rate of fire of the normal bow which Payne-Gallwey sets at six shots per minute.

Fig. 29. The "primitive" crossbow of the type used in the Crusades.

crossbowmen usually had several of these weapons being continuously reloaded as he fired.[39]

Perhaps the greatest advantage of the crossbow was that it required little time to achieve proficiency. A few hours of target practice was sufficient training. It took approximately two years of training to properly prepare an archer of medieval Europe with the bow, most, however, had practiced with their weapon over their entire lives. Archery in Islamic society was a divinely sanctioned practice and was a part of the way of life for the Turk. Due to the complexity of the composite design and the skill to maintain it, to achieve mastery of this weapon was a difficult and lengthy process. The design of the crossbow at this time was, in comparison, a very simple construction requiring little skill to maintain. If all else failed, the crossbow could be wielded in battle as a club.

The superior performance of the crossbow against Muslim warriors and its many advantages in construction, training, and reliability dampened any desire for Western warriors to adopt the Turkish composite bow. However, the concept of using composite construction for the crossbow did become

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[39]Several chronicles explain how to achieve this greater rate of fire. At the battle at Jaffa (explained in the text) in 1192, the crossbowmen were placed in the second row of troops just behind a row of pikemen. Spaced in between these pikemen, the crossbowmen worked in pairs, the foremost as the marksman while the other would reload for him. Smail, pp. 188-9.

popular in the West in the late twelfth century through the mid-thirteenth century.[40] Even though this was an improvement upon the earlier all-wood model, Payne-Gallwey concedes that "this variety must necessarily have been much inferior in power to a crossbow with a thick steel bow."[41] Although no surviving specimens of the military crossbow built before the fifteenth century remain today[42], Payne-Gallwey conducted a number of experiments with a number of fifteenth century crossbows which prove useful for gauging the range of the earlier types. According to his own empirical tests, the typical military crossbow of the fifteenth century (constructed with a steel bow) had a maximum range of 370 to 380 yards--the lethal range being 60 to 70 yards.[43] It follows that the crossbow of the early

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[40]This composite construction is said to have been brought to the West through contact with Muslims during the twelfth century Crusades. In a list of crossbow makers compiled by Baron de Cosson, the name of "Peter the Saracen" is found among the men employed by King John of England in 1205. *Close Rolls of King John*. Bentley. 'Excerpta Historica 395.' from Payne-Gallwey, p. 62.

[41]A number of crossbows are still preserved which have the composite construction for the bow, but they are in such dilapidated condition that they would not be able to withstand experimentation. Ibid., p. 22.

[42]Steel bows would not be introduced as a component of crossbows, however, until the last quarter of the fourteenth century. In the illustrations that accompany Froissart's *Chronicles*, this type of crossbow is frequently depicted. These pictures were drawn in the fifteenth century by those familiar with this type of crossbow. Ibid., p. 90.

[43]Ibid., p. 20.

twelfth to late thirteenth century had a range much shorter than the steel crossbow; a maximum range of 250 to 270 yards with a lethal range of 40 to 60 yards seems to be a reasonable, if not generous, assumption.

As further evidence, Payne-Gallwey concluded through his studies that the crossbow at Crecy (1346)[44] must have been outdistanced by the English longbow "considerably ... in range and penetration."[45] The greatest range ever reliably recorded for the longbow was 340 yards; Payne-Gallwey concludes, however, "it is not probable that the English bowmen of mediaeval days were able to shoot the arrows they used in warfare farther than from 230 to 250 yards."[46] This would put the maximum range of the crossbow of the Crusades at around 200 yards. The Turkish composite bow, in comparison, had a range far superior to this.

Having collected about twenty Turkish composite bows of Ottoman design (the "smooth" form), Payne-Gallwey states that:

> They were powerful weapons of warfare, and, as I have proved in practice, those of only *moderate* power are capable of sending an iron-shod arrow weighing 5s., or one ounce, to a distance of 280 yards. Bows that could shoot a flight arrow 600 yards, and more, would

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[44]These crossbows were the wooden type similar to the one used in the Crusades. See Payne-Gallwey, pp. 6-7.

[45]Ibid., p. 7; Durham, p. 187; Froissart, *Chronicles*, trans. and intro. by Geoffrey Lewis, Harmondsworth, England: Penguin Books Ltd., 1974), pp. 88-9.

[46]Payne-Gallwey, p. 20 of Appendix.

> certainly be able to drive an ounce arrow 360 to 400 yards.[47]

It stands to reason that the short arrow (dart) used by the Turkish warriors with the aid of the *siper* or *majira* would have a range of about 500 yards, if not more. A heavier arrow used with this bow would still have a range well out of the maximum range of the crossbow. These conservative estimates indicate that the Turkish bow ("smooth form") firing "darts" outranged the primitive crossbow by about a factor of two.

The effects of aerodynamic drag on an arrow in flight reduce its "killing power" long before it reaches its maximum range. Designed to withstand the tremendous shock of the crossbow's release, the quarrel was necessarily made of a thick, heavy material. The channel in the crossbow's stock through which the quarrel was propelled required the quarrel to be constructed without some or all of the stabilizing fins which affect its accuracy and range. The quarrel shot from the steel crossbow, for example, lost most of its potential to kill around 150 yards even though it might travel another 200 yards or more before falling to the earth.[48] Using this as a scale, the effective killing range of the primitive crossbows used before the mid-thirteenth century was probably 80 to 100 yards at the most. The

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[47]Italics mine, Ibid., p. 20 of Appendix.

[48]John F. Guilmartin, *Gunpowder and Galleys*, (Cambridge University Press, 1974), p. 144.

"smooth" composite bow, in comparison, using an arrow of reasonable weight would have had killing power beyond a range of 150 yards.[49] These killing ranges, of course, were shortened considerably when against a foe with a heavier armour.

Crossbows were used in a small degree by Fatimid armies and were in use by infantry in Syria and northern Iraq by the eleventh century.[50] Their use must have been very insignificant prior to the Crusades since the Byzantines, having conducted many military campaigns against the Muslims of the Levant, were quite amazed at the weapon when the First Crusaders arrived with crossbows in their arsenals. The crossbow had begun to become popular among Muslim infantry in the late twelfth century and its use was not uncommon by the mid-thirteenth century. The use of the crossbow by Turkish horse-archers was not very widespread--mainly because it was almost impossible to reload on horseback.

As discussed above and in the previous chapter, the Turks used a number of devices to increase the range of the bow. One such method was the use of darts with a channel guide.[51] Very light in construction, these darts were

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[49]Ibid., p. 155.

[50]Nicolle, *The Crusades*, p. 27.

[51]This channel guide is called a *majira* or *nawak*. The *siper* is also a type of channel guide, but does not

slender shafts of only eight to twelve inches in length. Some had nocks and some did not; those darts without nocks were especially advantageous since they were easier and faster to construct and could not be used by the enemy if it failed to hit its mark. Since the dart necessitated a draw which would take the tip of the shaft inside the arc of the bow, it was used in conjunction with the *majira/nawak* or the *siper*. With the force of the composite bow behind it, the dart could travel phenomenal distances and allow the Turk to remain well out of range of the deadly Frankish crossbow.

The instances of these darts being used are numerous in the texts of both Arab and Frankish chroniclers. Since these light-weight darts lacked the momentum to make them effective for piercing Western armour, they were clearly designed for long-range harrassment.[52] With this goal in

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allow for a draw to the extent a *majira* would. Both were used in conjuction with Turkish horse-archery. The *majira* was a recent invention of the Muslim horse-archer. Nicolle places its origins in the late eleventh century. Nicolle, *Saladin and the Saracens*, p. 7. See pages 104-5 for a more detailed discussion of this device.

[52]Although relatively ineffective against the Frankish soldier, the mounts of the knights tended to suffer more. The battlefield at Balat after the defeat and death of Roger of Antioch on 28 June 1119 is described by the Arab Historian Kamal al-Din: "Some who were there said that they had walked over the battlefield, to witness the splendid miracle sent by God, and had seen dead horses bristling like hedgehogs with the arrows sticking out of them." *Arab Historians of the Crusades*, translated from the Arabic by Francesco Gabrieli, (London: Routledge and Kegan Paul Ltd., 1969), p. 39. Describing the dead men and animals as looking like porcupines and hedgehogs from all the arrows is also found in descriptions by William of Tyre. R.H.C. Oc., p. 788. Also see footnote below.

mind, the Turkic horse-archers would endeavor to send large volleys of these darts instead of shooting on an uncontrolled, individual basis. The words "densitas" [thick], "imbrium" [a rain], "grandine" [great], are used by William of Tyre to express the virtual torrent of arrows used by the Turks against the Franks.[53]

The effects of this tactic are vividly described by the knight Jean de Joinville in his *Chronicle*. He states that they (the knights) were "all covered with the darts that failed to hit the sergeants" who were formed up in front of them. Picking up a gambeson for protection, he cheerfully comments that "it did me good service, for I was only wounded by their darts in five places, and my horse in fifteen."[54] The barrage was so intense that "behind the place where the Templars stood there was a space ... so thickly covered with the Saracens' darts that the earth could not be seen by reason they were so many."[55] Even though the darts did not usually kill, the wounds which they inflicted allowed for infection and disease to take hold.[56]

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[53]R.H.C. Oc.: Taken from the Second Crusade (1146), p. 721, and a campaign against Saladin in 1177, p. 1040.

[54]Joinville, pp. 195-196.

[55]Ibid., pp. 202-3.

[56]Ibid., p. 209.

When conducting this type of high volume, long-range archery, a large part of the impact of the volley is psychological. Two or three thousand archers loosing their arrows at one time produces a spectacle which invokes a survival instinct just as surely as being on the receiving end of a cavalry charge. Surviving a hail of arrows and expecting another with no way to retaliate must have surely been a miserable set of circumstances! Examining the battlefield situation shows that this tactic of attacking the morale of the Frank was often successful in creating the situation necessary for victory--separation of their cavalry from the infantry.

PATHS TO VICTORY

By destroying the cavalry, the sole offensive arm of the Frankish military field unit, the infantry were doomed to assured decimation. To achieve this division of forces, the *morale* of the foot-soldier and the knight became the focus of Turkish tactics. There were primarily two methods the Turk used to open the ranks and/or draw out the Frankish knights: 1)long-range harassment with archery, and 2) the use of cavalry charge feints. By far the least dangerous to the Turk, the use of archery as the path to victory was by far the most preferred between the two options. Against such tactics, the best defense against total annihilation was to sustain discipline among the ranks.

In close cooperation, the Frankish cavalry and infantry gave each other mutual support on the battlefield. Separation, however, often led to the defeat of a Latin army. The greater range of the Turkish composite bow allowed the Turk to safely send his arrows into the infantry formation without fear of retaliation. Without cavalry, the infantry man was usually without any avenue of retreat which would effectively place him out of the reach of the Turkish horse-archer. He now faced a foe whom he could not harm. Added to all this, his armour weighed him down considerably causing exhaustion and, in the hot Syrian sun, dehydration. The plight of the foot-soldier is vividly recorded by Oliver of Paderborn as the Crusaders fought the Turkish horse-archers in Egypt:

> The heat of the sun was intense, the foot soldiers were burdened with the weight of their arms. The difficulty of the way increased the heat, and those who had brought wine with them drank it unmixed in the distress of their thirst because of the lack of water.[57]

Unsupported, the infantryman would be able to hold out for a time if he had missile weapons, but this would only last until he ran out of arrows. His only options would be to either fight to the death or surrender (which, for the lowly foot-soldier, normally meant death anyway). Frankish

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[57]Oliver of Paderborn, *Historia Damiatina*, trans. by John J. Gavigan, (Philadelphia: University of Pennsylvania Press, 1948), pp. 41-2. There are many other recorded instances of this problem: e.g. Hattin and Arsouf.

cavalry without an infantry "base" to work from would also face a great possibility of defeat against the Turk.

Following the initial confusion after a charge, the Latin knights would fall into disorder as they came to a disjointed halt. The light-armoured horses of the knights would be open to the Turk's damaging arrows without the masses of infantry to hide them. Against the Turkish horse-archer, the vulnerable mount of the Frankish knight was soon killed leaving the knight in the same predicament as an infantryman except in probably a much worse situation since he would not have the mutual support of other soldiers. Writing during the Second Crusade, Odo of Deuil poignantly illustrated the predicament of the Latin knight without the support of infantry:

> The Turks killed the horses, which, though not able to gallop [due to famine], were nevertheless of value in carrying the heavy armor, and the mail-clad Franks, now on foot, were overwhelmed among the thick-pressing enemy as if they were drowned in the sea;[58]

Without long-range weapons, the knights were at the mercy of the Turks if they extended themselves too far from their infantry. This situation is described by Odo when a lord with a body of knights pressed their charge too far:

> Then and there the Turks from afar surrounded him and shot arrows and, without damage to themselves, killed him more easily than they hoped; for that man had neither bows nor arbalests, and hunger and toil had deprived his knights of swift horses.[59]

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[58]Odo, p. 119.

Since the Frankish knight normally did not use a missile weapon, against the Turk the Frank was an easy target, for the Turk could normally outdistance the heavily-armoured Frank. The Turk's traditional mode of combat was well suited to accomplish this divide and conquer tactic.

An example of this Turkish tactic of divide and conquer working successfully was the battle of Harran[60] in the spring of 1104. Determined to relieve the garrison at Harran, Baldwin II marched into Syria at the head of a total of twelve thousand troops--three thousand of which were knights. Within these troops were the forces of Bohemund, Prince of Antioch, and Joscelin, Count of Edessa. Minus the soldiers left behind as garrisons, this army represented the full fighting force of the Franks of northern Syria. The movement of this army into the western reaches of Syria forced the indigenous Turks to react and also field an army. Over ten thousand strong, a force of Turkish horse-archers intercepted the Franks before they reached the vicinity of Harran. Decoying the Frankish knights away from the main body of soldiers with a false retreat, the Turks attacked these separated forces in detail sending repeated volleys of their arrows into their ranks. Lacking a sufficient number of missile weapons themselves, the foot-soldiers were

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[59] Ibid, p. 95.

[60] R.H.C. Oc., pp. 443-7; Oman, I, pp. 320-4; Runciman, II, pp. 41-4; Smail, pp. 177-8.

extremely vulnerable to the Turks. Bohemund was able to rally his soldiers and encamped on a hill for the night.

Finding that his forces were ill-equiped to fight the Turks, the next morning Bohemund decided to retreat back to Edessa. As the Franks retreated, the Turkish horsemen drove against their lines with cavalry charge feints, forcing the Frankish knights to defend their infantry and charge in return. As this tactic was repeated on all fronts relentlessly, the Christian forces finally broke up and lost any semblance of cohesion. Now at point-blank range, the Turkish horse-archers killed the heavily armoured soldiers as the Franks made futile efforts to close with swords.[61] Of the orginal army, over six thousand dead marked the retreat of the Christians.

Besides illustrating the tactic of long-range archery, Harran also shows the purpose and effectiveness of the use of charging maneuvers by the Turks. Normally this action would be the last resort, but in this battle the Turk sensed the despair of the Frank and knew that the danger of Frankish missile fire was minimal. If more crossbows had been brought and the return march continued without engaging the cavalry, the outcome could have been much different. However, if the Franks succeeded in maintaining order

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[61] "...fuga salutem quaerebant, quam non potuerunt invenire. Nam hostes, rejectis arcutius, et eorum officio neglecto, gladiis instantes cominus, pene omnes interficiendo deleverunt." R.H.C. Oc., p. 446.

against long-range harrassment *and* the Turks were pressed to bring about a decision through battle, the Turks could attempt to force the situation by initiating the second of their two tactics: feint charges.

This second tactic consisted of using a large body of horse-warriors to charge the Frankish lines with the intent of halting or turning away at the last moment. If the Frankish forces failed to respond after repeated use of this tactic there was little else the Turk could do other than actually engaging in hand-to-hand combat. When performing this tactic of feigned charges, the Muslim forces might actually form themselves into three battalions (al-Babain), but usually the Turks would just group together along a broad front and rush the enemy (Arsouf) in small groups. This charge would normally be lead by the *askar* of the Turkish prince or princes in command and was further augmented by those tribal Turks who would follow them.

This action usually caused one of two responses from the Franks: either the infantry-men facing the charge begin to waver and yield before the Turkish horsemen or the Frankish cavalry charged out to meet the Saracen cavalry. Either way, the Turk had accomplished his objective. If the infantry were to break, the Turk could continue his charge with assured success. If the Franks sent forth their knights, the Latin horsemen would be exposed to the archery of Turks who were hovering around them on all sides.

Continued sorties such as these would gradually wear down the number of Frankish knights with mounts capable of conducting a charge. Since operating in close proximity to the lines of the infantry put the Turk within the "killing zone" of the crossbow, this tactic was used as a last resort. The battle of Arsouf (1191) illustrates this maneuver and the conditions warranting its use. In the campaign leading to this battle, the discipline of king Richard Lionheart's troops allowed him to remain in good order through the repeated long-range archery assaults of the Muslims as he moved along the coast towards his objective. Unable to stop him, Saladin was forced to engage him in battle at Arsouf.[62]

With Jerusalem as the ultimate objective, Richard's forces traveled southward from Acre along the coast to Jaffa where the Crusaders would establish a base of operations. In the interest of discipline, Richard ordered that the only female camp followers allowed would be washerwomen (to the dismay and complaint of his troops). Marches would be spaced with a day in between each for resting. With the sea on their right, Richard was able to ensure that his troops would be regularly victualled.

The column itself was organized along strict lines of discipline. Organized into three divisions, the Frankish

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[62]Smail, pp. 161-5; Runciman, II, pp. 53-7; Oman, I, pp. 305-18.

horsemen were divided with Richard and his knights in the van and the Hospitallers forming the rearguard. The foot soldiers were formed into parallel lines on either side of the cavalry: those closest to the shore rested from fighting while those in the other line formed a wall to protect the cavalry. Wearing heavy coats of felt[63], the Frankish infantry were especially well protected against the arrows of the Muslims. In this manner, Richard made his way to Jaffa.

By the 30th, the two armies were coming into closer contact resulting in heavier fighting by the first and second of September. Wearing their felt mantlets, the solid ranks of the Latin infantry were impervious to the arrows of the Turkish horse-archers hovering out of crossbow range. Unable to slow the Crusaders, the Turks made a number of charging feints at the rear of the column to draw out the Hospitallers cavalry and turn the column, but the Franks remained firm, all the while inflicting heavy casualties on the Turks with their crossbows.[64] The following day, seeing that the Franks were continuing their march, Saladin again sent his horse-archers out and ordered them to come to closer quarters with the Frank.[65] A number of charges were

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[63]See pages 35-6.

[64]Based on the account of Beha ed-Din, *Anecdotes et beaux traits de la vie du Sultan Youssof* in R.H.C., *Hisoriens orientaux III*, 251-2., cited in Smail, p. 163.

made thereby forcing the knights to charge also. However, the Franks returned to their column after their charges and did not pursue the Turks. It was the close order which saved the Christians from heavy casualties on that day.[66]

As the Crusader host neared the city of Jaffa, Saladin was forced to commit his forces to an even greater extent. Choosing a plain north of Arsouf as the field of battle, Saladin's forces awaited the Franks on the seventh of September. Richard expected the level of pressure from the Turks to rise as he neared Arsouf and made sure his troops were in extremely tight formation as he reached his destination. The Frankish column traveled in very much the same order as it had at the beginning. As the armies began to engage, the Muslim forces endeavored first to weaken the foot soldiers in front of the Hospitallers with their archery, focusing their offensive on the rear of the column. As the column plodded along, Saladin commanded his Turkish horsemen to make a number of charges and to fight at close quarters hoping to draw out the Frankish knights. The Franks endured the attacks without launching a charge while the infantry fought bravely.

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[65]Beha ed-Din, p. 253., Smail, p. 163.

[66]"Per turmas etiam solito densiores se cohibebat itinerans exercitus. Deducendae extremae legioni praefuerant Templarii, qui tot equos ea die, Turcis irruentibus a tergo, amiserunt quod fere desperanti sunt." *Itinerarium peregrinorum*, p. 257., cited in Smail, p. 163.

The battle continued in this manner for several hours. As the attacks became more intense, especially in the rear, the Hospitallers became extremely agitated and pleaded with Richard to allow them to charge. Ordering them to remain patient, Richard wanted them to wait until the Turkish charges showed signs of weariness and the main body of the Muslim army drew closer. Unable to endure the assaults any longer, however, the Marshal of the Hospitallers led a charge which spread all along the Frankish column. Trying to gain a measure of control, Richard joined the charge himself. With the entire line of cavalry charging at once, the Turks broke and fled the field before the knights. The charge was not pressed for fear of an ambush. Although Richard remained in control of the field, Saladin was able to reorganize his men by the following day and the day after that he was back harassing the Franks again.

The battle of Arsouf was, and is, considerd a victory for the Crusaders. As Saladin's ability to regroup and re-deploy shows, the battlefield casualties for the Turks were not prohibitive. Arsouf was a Crusader victory because Richard was able to disperse the Turks and gain a measure of time without being harrassed on the march. Saladin's orders to his troops show the method of attack quite clearly: initiate long-range archery in order to draw out the Frankish knights; if this fails, then make feint charges to threaten the infantry and frustrate the knights. Even a

highly disciplined force such as Richard's, as this battle shows, has limits to its patience. Still, it was the discipline of the knights which allowed them to obtain a "tactical victory" of sorts and reach their objective.

Writing in the later years of his life, Ousama states that Franks "(the curse of Allah upon them!) are the most wary fighters in the world."[67] This statement is one worth considering since Ousama was an experienced warrior himself, having fought many engagements with the Franks in Syria during the twelfth century. Unlike the crusaders of the First and Second Crusades, the Franks living in Outremer had frequent encounters with the Turk and had learned the nature of the Turk and their manner of conducting warfare. Although not abandoning their traditional way of war, the knights of Outremer were able to fight the Turk most effectively by enforcing strict measures of discipline among the ranks of their forces.

Chronicling the activities of the Crusader States from the First Crusade to the beginning of the Third Crusade, Archbishop William of Tyre had personally witnessed the tactics of the Turks and the way Frankish commanders coped with the problem of discipline. Fully aware of the dangers of a lax attitude when in the field against a Turkish force, William attributed the cause of the fate that befell Balwin

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[67]Ousama, p. 20.

III and his knights near lake Huleh in the Upper Jordan valley to carelessness and lack of military discipline when they were ambushed by Nur al-Din in 1157.[68] The Military Orders (i.e. the Templars and Hospitallers) also recognized the problem and framed their statutes so that the knights would be required to maintain their formation except under specific extenuating circumstances.[69]

In resisting the Turk, it was vital to remain in solid ranks. When King Amalric led an army against Saladin in 1170 to oppose his invasion of Palestine, the army was preserved through the solidity of its ranks.[70] When king Balwin III led the royal army to victory against Saladin in 1177 at Mont Gisard, once again the role of discipline is of great importance: "Ordinant et ipsi nihilominus acies suas et juxta militarem disciplinam agmina digerunt, disponentes qui primi aggrediantur et qui eis sint subsidio".[71] On the march, Frankish forces were even more pressed to ensure that a close formation was maintained. Any dead or wounded were

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[68]"ubi nocte illa longe aliter, quam disciplina militaris exigeret, et imprudenter se habens, non observata castrorum lege, requievit exercitus". R.H.C. Oc., p. 840.

[69]*La Regle du Temple*, nos. 162 and 163. Cited in Smail, p. 129.

[70]"Illi statim in nostros irruentes, tentabant, si unquam possent eos ab invicem separare; sed nostri, propitia divinitate, solidius inter se conglobati, et hostium sustinebant impetus, et iter maturatis gressibus conficiebant." R.H.C. Oc., p. 976.

[71]Ibid., p. 1042.

carried with the column so that the Turks would not know the extent of their arrows' effect upon the Christian numbers.[72] Under no circumstances was the column to separate. William of Tyre records that there were instances where strict orders were established in an army, under pain of severe punishment, to enforce this discipline.[73] When discipline held, the march continued through the midst of the enemy in an ordered fashion [in aciem ordinati per hostes medios]. Unless vastly outnumbered, casualties would be taken but the army would survive. If the leadership was particularly good and the discipline maintained very strictly, it was possible to reduce casualties to a surprisingly small number.

A classic example of the use of discipline permitting a Crusader force to reach their objective without prohibitive casualties is the march of John, King of Jerusalem, from Fareskur to Sharimshah in July of 1220. Secretary to Cardinal Pelagius, Oliver of Paderborn recorded the details of the Crusade.[74] His description[75] of the march which

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[72]Smail, p. 159.

[73]In his campain of 1147, King Balwin III proposed measures to ensure that discipline was maintained: "Nostri autem proposita lege ad eos erumpere non auderent, ne si, contra rei militaris disciplinam ordines solverent, duriorem in se tanquam locorum desertores experirentur sententiam." R.H.C. Oc., p. 725.

[74]Oliver of Paderborn, pp. 72-5.

[75]The italics are added to emphasize the significant points.

follows shows how effective discipline worked against the Turkish way of war:

> The river on the right, covered over with ships, afforded protection in the manner of a wall; on the left side, the foot soldiers served as a breastwork, going forward in line and in a procession, as it were, *in close formation.* The lines of horsemen were stretched out diagonally from the river to the ranks of the foot soldiers, *giving them support and receiving it from them.* The lancers stayed constantly with the archers, sustaining the attack of the enemy with lances close-packed and leveled, if at any time they presumed to rush into close combat.[76] Thus in the danger of horses and horsemen it was provided by prudent counsel that the pack animals should not be wounded. The common people, unarmed, proceeded in safety with their bundles at the bank of the river; clerics, foot soldiers, and women carried water to those farther off; *those who were more experienced against the snares of the deceitful, cautiously sustained the attacks of the enemy in the fore and rear guard. By public edict severe precaution was taken that no one should presume to go ahead of the foremost ranks or to fall behind the*

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[76]This shows that the orchestrater of the march, Pelagius, knew of the charging feignt tactic of the Turkic horse archers.

> *rear line or to break into the line in any wise.* The scouts of the enemy regarding our forces from both sides of the river and marveling at the *order of our military discipline*, tried in vain to inflict losses; but such a great multitude of archers resisted them that we learned that *on that day none of our men had been captured and none of our men had been wounded, who had stayed constantly with the four-sided battle line.* On July 19th the king of Egypt sent a stronger and greater proof of the might which he then had--four thousand horsemen, it seemed, who encircling the people of God timidly enough from without, at a distance, attacked the outermost lines of foot soldiers with arrows. Our men valiantly resisted them, *not breaking their own lines in the least on account of this.* On the following day, they besieged us more fiercely and compelled our men to use up quite a few arrows. In these two days *the few Christians slightly wounded, and the very few dead, took away from the enemy the hope of winning victory.*

Oliver's narration shows a clear understanding of the tactical situation and the measures needed to ensure that the army arrived before its destination intact. Commenting on this subject, historian R.C. Smail concluded that a Frankish force was never defeated due to a "mechanical defect" in their tactical formations. Instead, defeat was

the result of "some failure in leadership or morale which sometimes revealed itself in the untimely separation of the knights and foot-soldiers."[77] This seems to summerize most of the battles during the period. The military prowess of the Turk is evidenced in the clever tactics used to force the Franks to make this "untimely separation". Even greater credit must be given when one considers that these Muslim forces were confronting an adversary with superior arms and armour. Faced with such a formidable opponent, the Turk refined old technologies and developed new ones to facilitate the reduction of the Latin field army.

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[77]Smail, p. 133.

CONCLUSION

Necessity is the mother of invention.

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Over the course of four chapters we have seen that the presence of the Western warrior in the Middle East caused the Muslim military forces which interacted with them to adopt the "smooth" form of the Turkish composite bow. From design analysis based on archeological evidence, it is evident that this new form was shown to give the Turkish horse-warrior a more reliable weapon with greater capacity for both range and penetration. With the addition of supporting technologies, these augmented qualities of the "smooth" design allowed the Turk to meet the new threat with less danger. By conducting their tactical maneuvers at greater distances, they reduced the chance of being struck by crossbow quarrels. Considering that the Crusaders were probably the most heavily armed and armoured soldiers in the world at this time, this transition from the "angled" to the "smooth" design was a logical progression. What is unclear, however, is the vehicle by which this change took place throughout the Muslim countries during the twelfth century.

The manner in which battle is conducted is influenced by the type of weaponry found in the arsenals of both opposing military forces. The advantages and limitations of technology are realized through encounters with the enemy and the resultant knowledge can be used to good effect by the wise commander. Technological development of the weapons of the contending forces will be driven by the continual contact of these forces over an extended period of time, modulated and shaped by the internal social and cultural dynamics of the opposing systems. In a modern industrial society, the time it takes to re-equip a military force with weaponry modified through combat experience is relatively short. Not having the benefit of such resources as research and development laboratories or assembly line manufacturing, considerably more time was required for the transmission of new ideas and technological development in the Middle East. The pace of change was defined by a number of factors discussed below.

Archeological evidence shows that the older form of the Turkish composite bow was slowly phased out over the length of about two centuries. This is not surprising considering the context in which this change occurred. Muslim society in the Levant in the twelfth and thirteenth century was in a very chaotic state. Muslim princes were virtually autonomous potentates and were in constant conflict not only with the Crusader forces, but also with their surrounding

Muslim neighbors. The Islamic military force structure was a loosely organized coalition which lacked control over most of its parts. It was most likely within this body, however, that the transformation was initiated and spread.

As discussed in chapter one, the core of Muslim armies during the time of the Crusades was the *askar* of the individual prince. As a "military aristocracy", these elite bodies of troops had the wealth, time, resources, and skill to experiment with different designs. Mamluk *furisiyya* manuals[1] contain lengthy chapters on the construction of composite bows, and the presence of chapters on supporting technologies suggest that the Mamluks were active in seeking ways to improve upon the capabilities of their primary weapon. Because the mamluk's prowess with the weapons of war was recognized and respected in Muslim society, their example would be scrutinized by the tribal contingents and mercenary forces which joined a prince during a military campaign. Over years of continual exposure to these new designs the tribal bowyers would undoubtedly endeavor to copy this design. Considering the time and care it took to construct the composite bow, the Turkish bowyer would

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[1]Based on the examination of three manuscripts which were available to me. Nicolle confirmed that the mamluks under as-Salih, the Bahriyya regiment, and its successors used the "smooth" form of the composite bow exclusively. As an elite corps of professional horse-archers of incredible ability, it makes sense that they would be using the advanced design. From a telephone interview, 6 August 1991.

naturally want to create the most perfect design possible.[2] Conversely, it was probably bowyers clinging to the traditional methods of their ancestors who account for the number of instances of the "angled" form being represented in various artifacts of the late thirteenth century. Whether this was the actual method for the dissemination of technology in the Muslim East of the Middle Ages we can only speculate. Nevertheless, the available evidence supported by engineering and tactical analysis suggests that my hypothesis is viable. Further research in this area may uncover evidence to support or repudiate this conjecture.

Besides illustrating the importance of the role of technology in history, this study also shows the need for historians to expand their research to include other disciplines. This topic of composite bow design is a case in point. What may seem a tactically stagnant period of history according to chroniclers of that era, may be a military revolution when viewed in light of evidence produced by archeology or iconographic analysis. Still, it is only through the application of the principles of physics that the differences in design begin to be understood. Combining all three disciplines allows one to obtain a

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[2]The art of bowyery was almost mystical in its ideas concerning the construction process. The many referrences to the Koran in bowyery manuals show the serious desire of the bowyer elevate his art above other weapons. See page 75.

deeper appreciation of that period of time and the significance of events which, examined separately, only provide pieces of the puzzle.

This study also clearly reemphasizes that there is much work to be done for the historian in fields outside the sphere of Europe. Western civilization has been the primary focus of research for most modern historians. Whether this Eurocentrism is due to the difficulty of using other languages, cultural prejudice, lack of interest, or any other reason is difficult to ascertain. In any case, the history of any society is inherently valuable in itself, for history is little more than the study of human behavior. The processes by which man overcomes adversity is instructional whether that adversity comes from economic hardship or from a military threat.

APPENDIX A

THE ETHNIC ORIGINS OF THE TURK

The ethnic origins of the Turkish people has been a subject which has remained a puzzle to the modern historian. The title "Turk" itself has traditionally been a "catch-all" term for all the races of men who lived in central Asia before recorded history. The Turks which were to play such a critical role in the Crusades were tribal inhabitants of central Asia for many years before became Muslim. Before this period, the archeological evidence points to China and Southern Siberia as the probable homeland of this people. Harold Lamb, quoting Czaplica, Koelle, and Vambery, mentions that in the fifth century a clan broke away from the people known as the Hiung-nu and settled in the Golden Mountains between the Gobi Desert and China.[1] Called by the Chinese "Tou-kie", meaning "helmeted people", these people were still very much different from those who would later embrace Islam and eventually fight against the Crusaders. Over the following centuries these tribes of "Turks" would continually move westward in a number of migrations.

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[1]Hurley, p. 223.

Turks did not become a factor in the Levant until the reign of al-Mus'tasim (833-42 A.D.) when the practice of using Turkish slaves as troops (*ghulams*) first began. With the arrival of the Seljuk Turks and the creation of the Great Sultanate in 1055, Turks had firmly established their power in the Middle East. Over the course of the next century, great migrations westward of entire tribes of free Turks took place.

APPENDIX B

CHRONOLOGY OF THE CRUSADING PERIOD IN OUTREMER

1096-1099	FIRST CRUSADE
1097	Siege of Nicea
	Battle of Dorylaeum
	Siege of Antioch
1098	Capture of Antioch
	Edessa taken
1099	Jerusalem captured
	Latin victory over Fatimids at battle of Ascalon
1101	Reinforcements for Jerusalem are defeated
	Baldwin defeats the Fatimids at Ascalon
	Arsuf is captured by Crusaders
	Caesarea captured by Crusaders
1102	Baldwin I defeated by Fatimids at Ramla
1104	Acre captured
	Franks of Antioch defeated at Harran
1105	Tancred defeats Rudwan of Aleppo at Artah
	Latins under Baldwin defeat Egyptian army at Ramla
1107-1110	Crusade of Norwegians under king Sigurd
1109	Tripoli captured by Crusaders

1110	Sidon captured by Crusaders
1113	Balwin I defeated at al-Sannabra
1115	Turks defeated at Tell Danith
1115	Raymond of Antioch and Balwin of Edessa defeat the army of Bursuq near Sarmin
1119	Battle of the Field of Blood (Ager Sanguinis)
	King Baldwin is defeated at Hab by Il Ghazi
1123	Fatimid expedition defeated near Yibneh
1124	Tyre captured by Crusaders
1125	Baldwin III defeats the Turks at Azaz
1126	Baldwin defeats the Turks at Marj es-Suffar
1138	Byzantine Emporer enters Antioch
1142	Byzantines attack Antioch
1144	Zangi recaptures Edessa
1147-1148	SECOND CRUSADE
1147	Conrad III and the Germans defeated near Dorylaeum
1148	Louis VII and the French defeated near Cadmus
1148	Failure of Second Crusade before Damascus
1149	Nur ed-Din defeats Raymond if Antioch at Fons Muratus
1153	Ascalon taken by king Balwin III
1158	Byzantine forces Antioch to submit
1163-69	Franks campaign against Egypt
1163	Amalric's first Egyptian expedition
1164	Amalric's second Egyptian expedition; Nur al-Din defeats the Franks at Harim

1167	Amalric leads third Egyptian expedition; Shirkuh defeats allied armies of Egypt and Jerusalem at al-Babein.
1168	Amalric's fourth Egyptian expedition
1169	Amalric's fifth Egyptian expedition allied with Byzantium
1171	Saladin banishes Fatimid caliph and establishes Abbasid caliph in Egypt.
1176	Byzantine army destroyed by Turks at Myriocephalum
1177	Saladin defeated at Mont Gisard by Baldwin IV
1179	Saladin defeats King Baldwin IV at Marj 'Ayyun
1183	Saladin takes Aleppo
1187	Gerard de Ridefort is defeated at Fountain of Cresson (140 Frank knights vs. 7000 Turks)!
	Franks defeated at Hattin; Jerusalem surrenders
1188	Saladin takes Saone and Kerak
1189-1192	THIRD CRUSADE
1191	Recapture of Acre
1191	Latin victory at the battle of Arsuf
1192	Saladin held off at battle of Jaffa
1202-1204	FOURTH CRUSADE
1203	Crusaders take Constantinople
1218-1221	FIFTH CRUSADE
1219	Damietta captured
1228-1229	SIXTH CRUSADE
1239-1240	CRUSADE OF THEOBALD OF CHAMPAGNE
1239	Frankish defeat at Gaza
1240	Teutonic order defeated at Liegnitz
1244	Crusaders defeated at Gaza

1247	Ascalon retaken by Egypt
1248-1254	SEVENTH CRUSADE
1249	Damietta taken by Crusaders
1250	Battle of Mansourah
1260	Mongols defeated by Mamluks at Ain Jalut
1261	Constantinople retaken by the Byzantines
1265	Caesarea and Arsuf taken by Baibars
1266	Safad and Galilee taken by Baibars
1268	Jaffa and Antioch taken by Baibars
1271-1272	CRUSADE BY EDWARD OF ENGLAND
1291	Acre falls to the Mameluks and the Franks are ousted from Syria

APPENDIX C

SOUTHERN SYRIA IN THE TWELFTH CENTURY

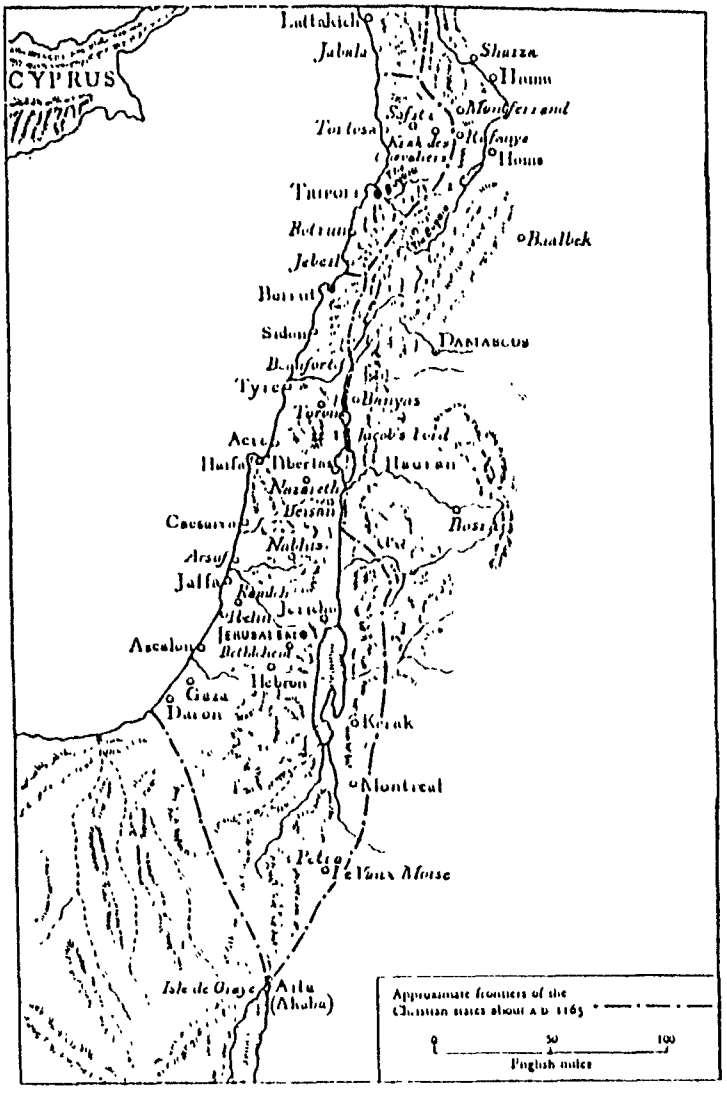

Fig. 30. Southern Syria in the twelfth century.

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