

# The Battle of Garigliano

By: Emily Cooper & Brody Evans

## The Battle



*The Crusaders fight against the Saracens*

The battle of Garigliano was fought in 915 AD between the Christian League and the Saracens. The Christians were personally led by Pope John X and because of his influence he could recruit a large amount of people. The crusaders were victorious in taking a castle from the Saracen control thanks to their greater numbers. In August of 915, a force of Saracens was defeated by the Roman armies controlled by Pope John X, Duke Alberic I of Spoleto and Senator Theophylact. In 916, Pope John X organized a league of

princes against the Saracens and finally defeated them in a great battle; routing them from their stronghold on the Garigliano River.

## The Saracen Composite Bow



*This is a diagram of the composite bow.*

One of the Saracen's most used weapons was called the composite bow. Saracens used about 10,000 archers who would begin the battle by shooting arrows directly at the enemy. At the beginning, composite bows were not that common in battles, but, as time drew on, the Saracens continued to use archers in their armies.

The composite bow was about four feet in height

and can fire the arrow about five times faster than the more common all-wooden bows that the Christians used.

Composite Bows were typically made of wood, horn and shredded animal sinew. They can pack the same power as a longbow but in a smaller, lighter form usable by a mounted archer. Composite Bows can usually be kept strung longer than other bows, for the sting will not snap since the material that makes the string is stronger and the bow is larger than regular wooden ones.

The arrows used for composite bows aren't any different from other arrows other than the fact that the materials used are from the Middle east or north Africa.

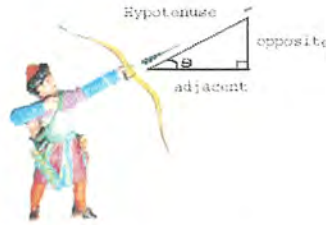
Tactics used with the composite bow tended to be more flexible and mobile than tactics used with the European archers. The people who used it were mostly horse

archers who used the composite bow for hit and run guerilla tactics. The speed of the arrows and its shape was especially created for horseback archers. The Saracen bands that fought against the crusaders used the composite bows on horse back. Since most of the Islamic world at the time was nomadic the Islamic people usually fought on horseback because they were always on the move.

## Bow Physics

The composite bow used many of the physics of projectile motion as do the other weapons of the crusades. The math and physics of the composite bow are as follows.

The arrow starts with an initial velocity of 0m/s. Then the arrow is fired. There is an angle, an opposite side, an adjacent and a hypotenuse side. There is also a horizontal velocity that will stay constant throughout the whole flight.



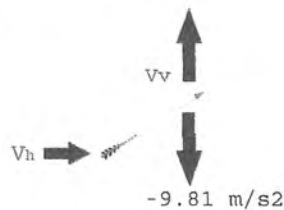
*Picture of the arrow after it is fired from the bow*

The horizontal and vertical velocities can be found using the following equations.

$$V * \cos(\theta) = V_h$$

$$V * \sin(\theta) = V_v$$

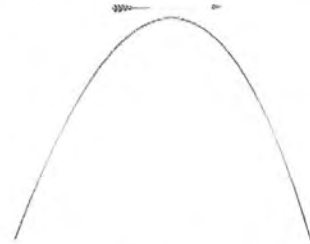
These factors will determine how fast the arrow flies through the air and how far away it lands. Throughout the flight the arrow will fly in a parabolic arc. When flying, the arrow will be decelerating in the vertical direction at a rate of  $-9.81 \text{ m/s}^2$  (gravity).



*Picture of the velocity of a rising arrow*

The arrow slows down and finally reaches the peak of the parabola.

When the arrow reaches the peak the vertical velocity is 0m/s since the arrow has reached the top height. The arrow then starts returning to the ground at a rate of  $9.81 \text{ m/s}^2$ .



*Picture of the arrow at the peak of the parabola.*

To find the time it takes for the arrow to reach the ground use the acceleration formula  $v_f = v_i + at$ . To find the final distance multiply horizontal velocity by time. The equation is  $d=rt$ . The rate is the velocity and the time is the time of the total flight. This concludes the essay on the composite bow and all the physics used in a composite bow.

### Works cited:

The physics of Archery. Brian. 2001.

<<http://www.mrfizzix.com/archery/index.html>

All you need to know about Archery. "Kyle." 1998.

<<http://www.angelfire.com/nh/archery1/index.html>>

The Physics of Medieval Archery. Rees, Gareth. 2000.

<<http://sites.netscape.net/steveadamsgbr/sac/medieval.htm>