



THESIS/ HYPOTHESIS

Did the use of Greek Fire change the way the Byzantine army defended its' empire, and what are the implications for modern society?

SOURCES/ LIMITATIONS OF STUDY

a. Primary and Secondary

Primary:

Image 1: Taken from www.biocrawler.com/.../index.php?dir=7%2F77%2F

Image 2: Taken from <http://itech.dickinson.edu/chemistry/?cat=106>

Secondary:

Alchin, L.K. Medieval Life and Times (2008). Retrieved 16 Feb. 2010 from <http://www.medieval-life-and-times.info/medieval-weapons/greek-fire.htm>

Cheronis, Nicholas D. "Chemical Warfare in the Middle Ages: Kallinkos Prepared Fire." Journal of Chemical Education (1937): 360-365.

Gussman, N., *Burning Question: The Mystery of Greek Fire*. Chemical Heritage Foundation. Molecular Milestones. n.d. Retrieved 20 Feb. 2010 from http://www.chemheritage.org/explore/milestone_greek_Fire.html

Hoydt, Bruce. "The Lost Secret of Greek Fire." Military History 23:2 (2006): 46-72.

Partington, J.P., Hall, B.S. (1960). "A History of Greek Fire and Gunpowder". Cambridge: Heffer. Republished: The Johns Hopkins University Press, 1998.

Roland, Alex. "Secrecy, Technology, and War: Greek Fire and the Defense of Byzantium." Technology and Culture 33.4 (1992): 655-679.

PERSPECTIVES

The authors of our sources looked at Greek Fire through 3 different perspectives; historical, chemical and modern day. Each will be discussed below.

Chemistry Perspective:

In the article titled "Chemical Warfare in the Middle Ages: Kallinkos Prepared Fire", the author Nicholas Cheronis examines the chemical aspect of Greek Fire. He focuses his article on the chemistry composition of the weapon, and the implications for the chemicals. For example their combustibility, and how that would influence the use of the weapon. This perspective is very useful when examining Greek Fire because it helps the reader understand the kind of technology that was available at that time. The author does a good job of giving reasons why he suspects certain chemicals would be used, and this gives the reader a framework in which to look at the weapon.

Historical Perspective:

Rather than focusing on the chemical compounds of Greek Fire the historical perspective examined the role of Greek Fire in a historical context. It looked at the use of the weapon during wars and battles and also the repercussions it had for the future of the Byzantine army. It gives the reader a context where the weapon was used. It shows us that the empire had often been the victim of many attacks, and that something had to be done. It showed the disastrous effect Greek Fire had on attacking armies, and how the secret recipe was lost with the empire.

Modern Day Perspective:

This perspective looks at how Greek Fire has influenced weaponry to date. The articles suggest that the Byzantines were ahead of their time using Greek Fire, and there is evidence of Greek Fire technology still being used today.

b. Awareness of perspectives not taken

In this research assignment we have not looked at the perspectives of the opposing military forces that have had Greek Fire used against them. For example, during the 6th and 7th centuries, there were many attacks on the Byzantines by the Arabs. We have not looked at any recollections by the Arabs during these attacks and if Greek Fire changed the way their armies retaliated.

We were also unable to find many first hand perspectives of Greek Fire. In some of the articles it discussed journal entries by some Byzantines, but we were unable to find any first hand accounts.

ARGUMENT/ DISCUSSION/ EVIDENCE

Introduction

In the 5th and 6th centuries the Byzantium Empire was under siege. They had suffered many devastating battles against the Arabs, and it became necessary that a change had to be made or Byzantium would not continue (Cheronis, 360).

Something was needed to defend against the Arab fleets as well as other opposing armies. Many historians believe that it was the invention of “Greek Fire” that would revolutionize the way the Byzantium Empire would defend itself (Roland, 655).

It would be a man named Kallinikos, “a Greek architect or engineer who had recently escaped from his Arab conquerors in Syria in order, it is said, to bring a new and decisive invention to the Byzantines. He had invented what came to be called Greek Fire, a napalm-like substance that burned in water and could be projected great distances from the bows of ships” (Roland, 655). This substance came to be used as a deadly weapon during siege warfare (Alchin).

Greek Fire would come to have many names including “marine fire”, “prepared fire”, “liquid fire”. The complete composition of Greek Fire is to this day is unknown.

Chemical Composition

In his article titled, "Chemical Warfare in the Middle Ages", Nicholas D. Cheronis remarks, "we may now take the various hypotheses which have been proposed with reference to its composition. The first assumes that Kallinikos' fire was a composition of the "Aeneas type" of incendiaries-that is, rosin, asphalt, pitch, sulfur, and naphtha, with finely divided quicklime" (363) Cheronis continues on to examine the circumstances surrounding how Greek Fire was used. For example, he says that those chemicals would have "required that it should fall on water so that the heat of the hydration should ignite the combustible vapors"(363). Some of the characteristics of the Greek Fire include its ability to burn on any liquid, including water. On top on this fact, this flammable liquid had the ability to adhere to any surface (Heydt, 48).

According to Roland, there were four components that were true of Greek Fire.

"First, it burned in water; some even reported that it was ignited by water, but this is not generally accepted. A corollary of this characteristic was that it could be extinguished only by urine, sand, and vinegar. Second, Greek Fire was always portrayed as a liquid. Third, at least when used at sea, it was always shot from tubes or siphons located in the bows of specially designed Fire ships" (657-8) "Finally, many firsthand accounts of its use report the appearance of smoke and a loud discharge or booming noise when the flaming liquid left the tube or siphon" (658)

The Mystery Behind the Fire

The mystery behind Greek Fire lies in the fact that the recipe for the exact formula died with the Byzantine Empire, but a small number of its contents and characteristics have been recognized and agreed upon universally (Heydt, 48).

In his article titled “The Lost Secret of Greek Fire”, Bruce Heydt discusses the use and secrecy of Greek Fire. He remarks that it was very strange that the Byzantines did not make more use of the destructive weapon. He feels that their “obsession with secrecy” (51) was one of the reasons they did not use the weapon much more. He says that they feared one of their ships would be captured, and the recipe would be revealed to the opposition (51). He also claims that Greek Fire was better used as a defensive tactic rather than an offensive tactic, and this could explain why it was not used more than it was.

War Influences

Greek Fire was used predominately during the naval battles in 678 and 717 A.D. when Arab fleets attacked Constantinople. “The liquid fire was sprayed at enemy ships from the prows of Byzantine vessels or from the walls of Constantinople. Use of Greek Fire in both battles led to resounding defeats of the Saracen fleets” (Gussman).

These Arab attacks were defining moments for the Byzantine Empire. It had shown the attacking fleets that they were able to protect their empire, and they had a weapon that they could not try to compare to. It is unclear what exactly happened to Greek Fire, and why there seems to be no evidence of its use after the 13th century (Partington, xxi). Roland remarks, “the curious record of the use of Kallinikos fire lends credence to the suspicion that it was lost to Byzantium long before 1204. It

also suggests that even if the secret long survived the critical sieges of 678 and 717-18, the obsession to keep it out of Arab hands greatly circumscribed its use" (671).

Implications for the Future

The secret of Greek Fire died with the Byzantine Empire. Whether it was because of obsessive secrecy, or it became obsolete later on because of technical advances, it is obvious that it was a weapon that caused mass destruction and devastation to whoever it came in contact with.

During the 6th and 7th centuries, Greek Fire was one of the most technologically advanced weapon ever produced. It protected and defended the Byzantine Empire against many attacks, and based on research presented by numerous historians, changed the way the Byzantines defended their empire.

Kallinikos' Greek Fire gave way to many more technological advances. As mentioned earlier, Greek Fire was used mostly on ships, and shot out through siphons onto the opposing ship. There is also evidence that Greek Fire could be thrown by hand (Cheronis 365). Chernois remarks that "There is also sufficient evidence that the Byzantines developed and used hand grenades and also the precursors of modern firearms. Kallinikos, then, may be regarded as the "pyrochemist" of the Middle Ages" (365). This demonstrates that the Byzantines were very progressive. The Byzantines had an influential and modern weapon that was more powerful than any weapon of its time, and caused destruction whenever it was used. We are able to see many instances of Greek Fire even in today's society.

Greek Fire has been examined and recreated in today's society as flamethrowers, hand grenades and other common weaponry.

RELATION/SIGNIFICANCE FOR CONTEMPORARY SOCIETY OR EDUCATION

This topic is very historically and contemporarily significant. In many regards, the Byzantines' use of Greek Fire raised the stakes for weaponry in war. With the invention of the weapon, Constantinople became untouchable for a period of time. This forced the opposing armies to critically analyze their own weaponry and eventually retaliate with stronger force. We also see lasting technology that originated during the Byzantium Empire, such as hand grenades and Greek Fire itself.

For students, the topic of weaponry use and invention in an ancient time period is a very interesting research topic. The students would be interested to learn about the lasting effects that the armies of Byzantium had, and their implications for today.

It would also be a great example of how weapon technology is always changing, and being modified. People looking to the past are able to improve on a technology that has already been proven successful.

In conclusion, it is evident that Greek Fire revolutionized the way war was fought in ancient Byzantium. During the centuries of war in the Byzantine Empire, the empire had an advantage over their opposition. As Cheronis states, "No matter what explanation we are willing to take, there is sufficient evidence that the

Byzantines made extensive use of chemical warfare in the Middle Ages, and to this use may be ascribed the continuation of the empire for several centuries" (365)

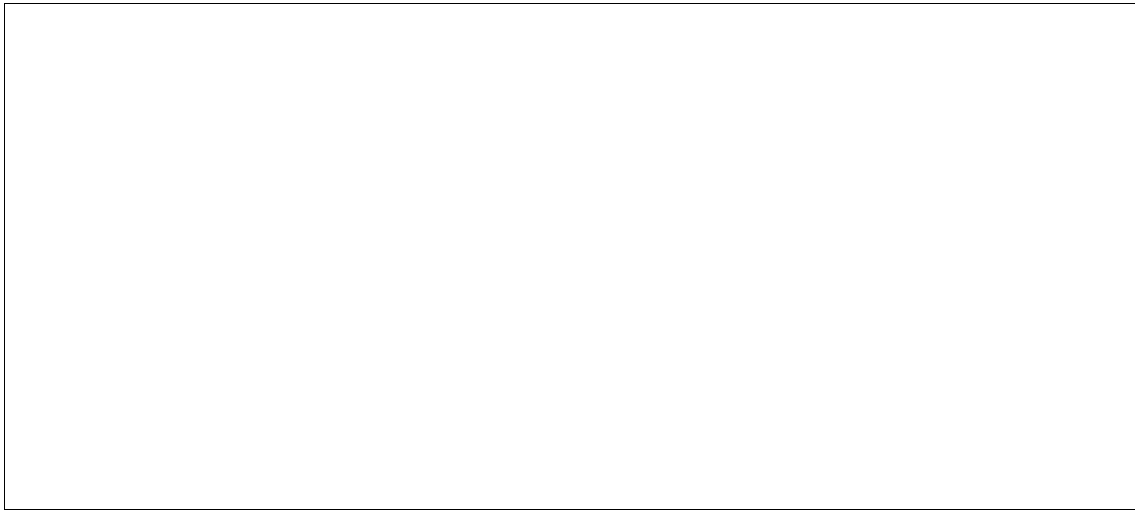


Image 2: Taken from <http://itech.dickinson.edu/chemistry/?cat=106>

States that this picture was taken from the Skylitzes manuscript in Madrid.

In this picture you can see how Greek Fire was used through siphons onto attacking ships.