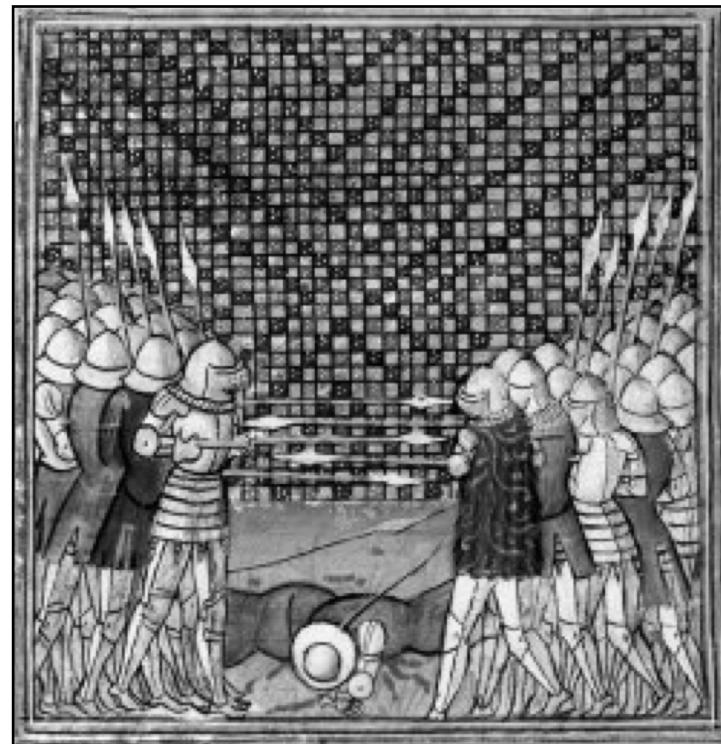


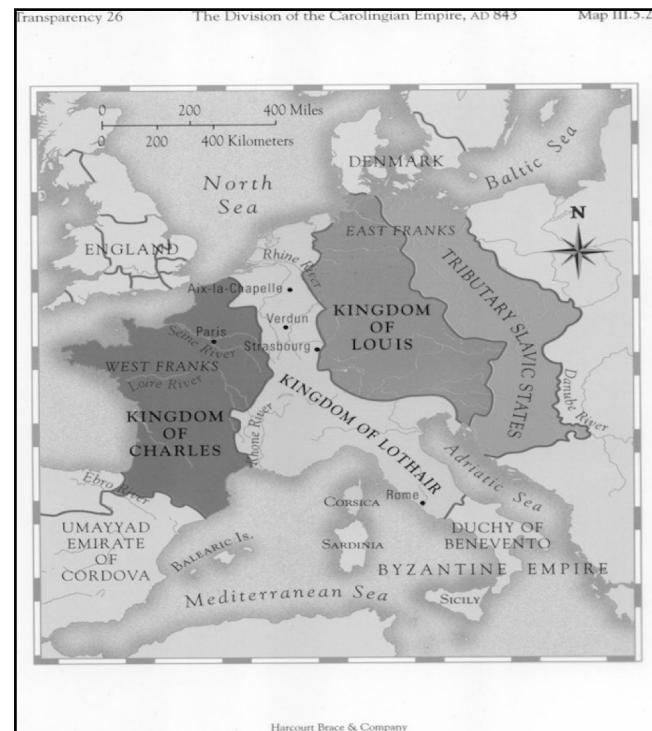
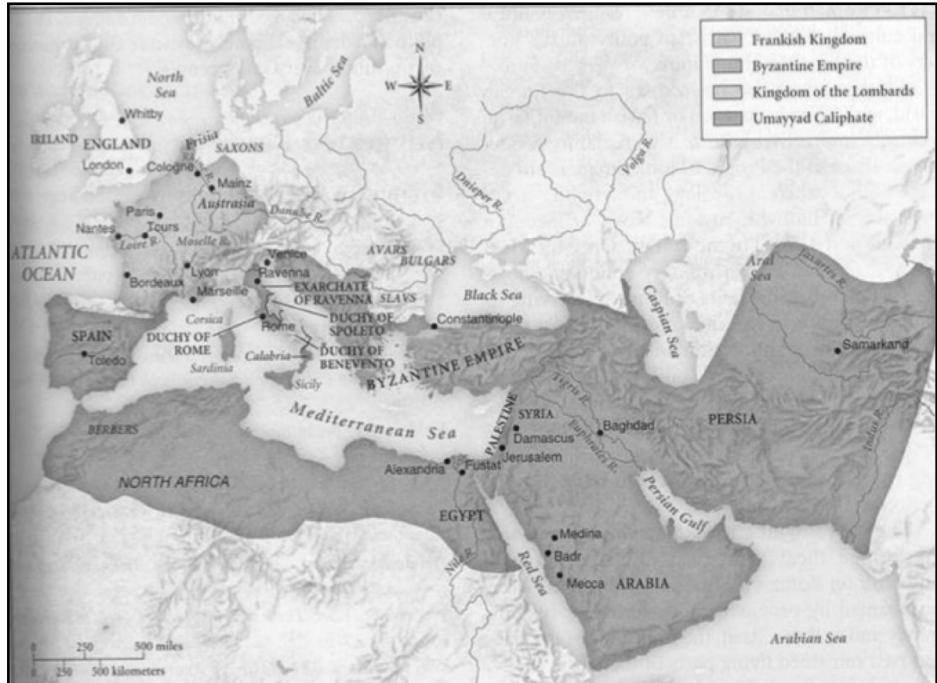
Medieval Technology: Warfare



- Three major themes that we'll follow
 - incremental vs. radical innovation
 - war was a process for the transmission of technology
 - how/why do things become obsolete?

Medieval Warfare

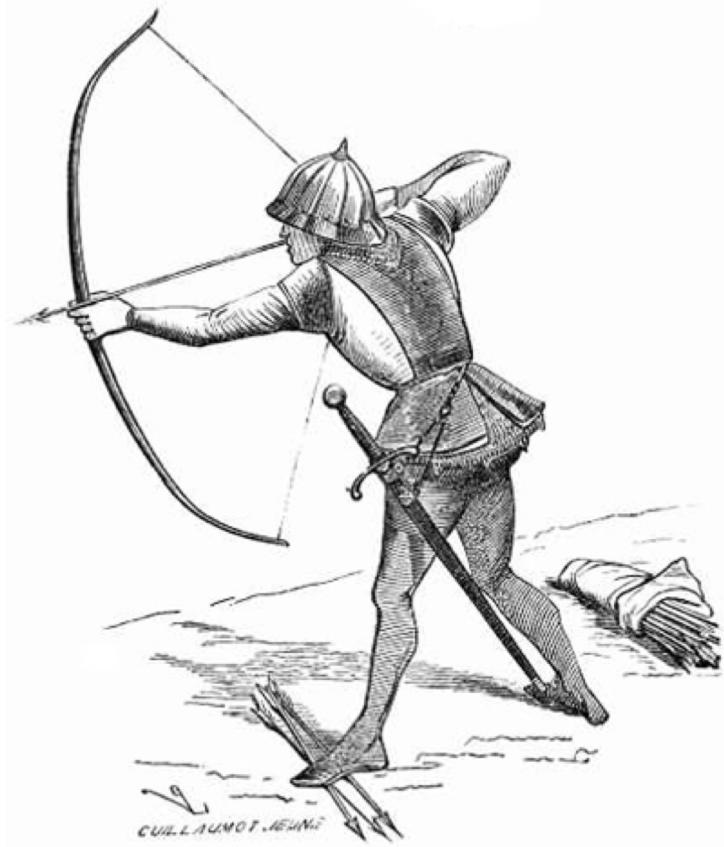
- war was endemic in the Middle Ages
- the three principal civilizations were evenly matched militarily by c. 10th century
 - the West, Byzantine, Islam
- the first major military power in the West were the Carolingians
 - under Charlemagne



- *Bellifortis* (early 15th century)
 - means “strong in war”
 - was fully illustrated treatise on military technology
 - written by Konrad Kyeser, German military engineer
 - published only in 1967
- summarized works from Antiquity but also added new information
 - trebuchets, battering rams, crossbows, cannons, ships, chariots, incendiary devices, ladders, torture instruments

Bows & Archery

- Short Bows
 - transmission of technology
 - Central Asians (Huns & Avars) → Byzantines → Arabs (7th to 8th centuries)
- Crossbow
 - had a trigger and a groove
 - some had a foot stirrup
 - from contacts with Chinese in 10th century to Western Europe
 - became primary weapon of archers
 - migrated to Arab/Islamic civilization in 12th century
- Longbow (13th century)
 - Welsh → English
 - advantage?
 - read Long, p. 65



Figs. 24 and 25.—Varlet or Squire carrying a Halberd with a thick Blade; and Archer, in Fighting Dress, drawing the String of his Crossbow with a double-handled Winch.—From the Miniatures of the "Jouvenel," and the "Chroniques" of Froissart, Manuscripts of the Fifteenth Century (Imperial Library of Paris).

Siege Warfare

- What was siege warfare?
- Method of overpowering:
 - castles (esp. made of stone)
 - towns with strong boundary fortifications
- Originally wooden castles easier to overpower
 - by fire, tunnels, etc.
 - stone castles required new technologies
 - cycle of technological development
 - defense \leftrightarrow offense

Siege Engines: Trebuchet

- basic trebuchet
 - rotating beam pivoted on an axle
 - a short arm and a long arm (w/ sling for projectile)
 - early ones were pulled by teams of men
 - the traction trebuchet
 - problem? inconsistent
 - later ones used heavy weights
 - the counterweight trebuchet
- Questions from documentary
 - how did this trebuchet technology emerge in Western Europe?
 - via China (also Byzantium), Islam/Arab empires (particularly, the Abbasids), then to Europe
 - read pp. 126-127
 - what was the relationship between defense and offense (archers vs. trebuchet) in terms of the range of the trebuchet?
 - how did ‘engineers’ make decisions about the design of the trebuchet
 - through experience and testing
 - sometimes through geometry
 - were drawings made to scale?
 - what was the ‘block and tackle’ system
 - what different types of counterweights?
 - lead vs. swinging counterweight
 - what kind of payloads?
 - p. 128
- conclusions
 - used very effectively for c. 250 years, mid-12th to early 15th centuries
 - trebuchet vs. castle?
- replaced by?
 - gunpowder cannons in late 15th century
 - but there was a long period of overlap

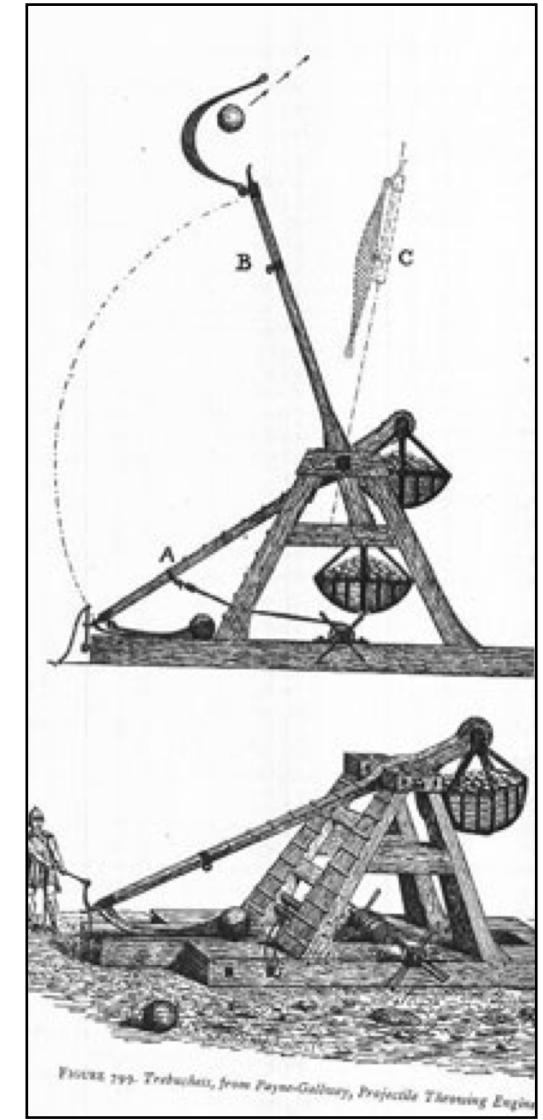
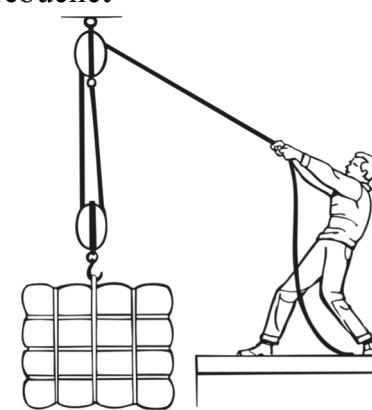
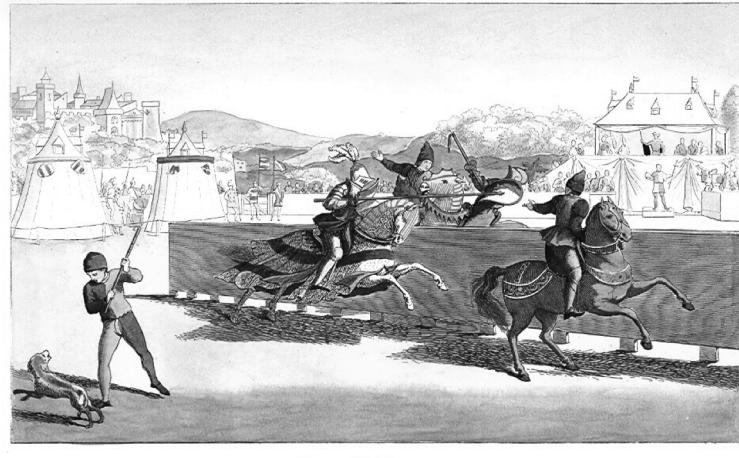


FIGURE 7.93: Trebuchet, from Payne-Gallwey, *Projectile Throwing Engines*

Jousting

- game between two horsemen using lances as part of a tournament
 - emerged in late Middle Ages
 - popular with nobility
 - needed a license to joust after 1194 (King Richard I's tournament decree)
 - discontinued as knighthood declined in 16th century
- What was the point of jousting?
 - courtly ideals of chivalry
 - younger knights “proved” themselves
 - judicial dispute
 - training
 - usually non-lethal
- [Link](#)

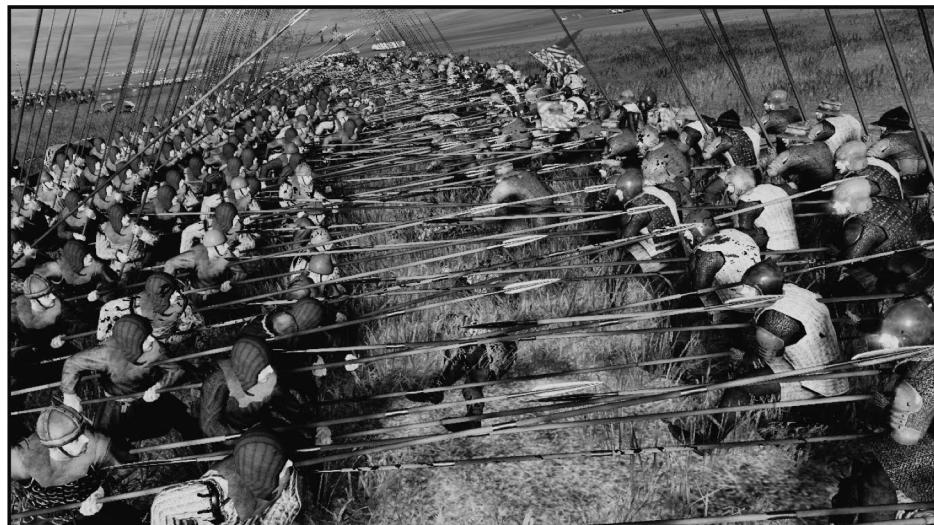


- **Viking technologies**
 - Scandinavian peoples thrived in 8th to 12th centuries
 - seafaring people
 - abundant sources
- probably most important was their ships & navigation techniques
 - seafaring = power
 - ships dependent on abundance of wood
 - built “long ships” using clinker method
 - Oseberg ship
 - found in 1904-05
 - 70 feet long
 - 30 people, 15 oard
 - buried with two women

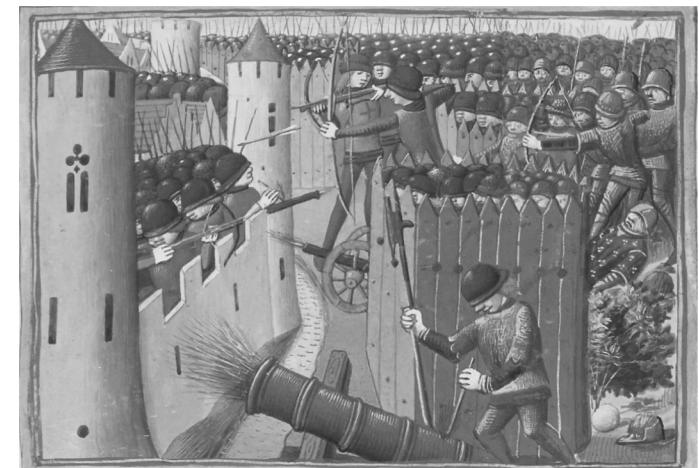


The Oseberg Ship, 8th – 9th century

- **Military Revolution in the Middle Ages?**
 - or evolution?
- Standard weapons in warfare in high middle ages (c. 14th century)
 - counterweight trebuchet
 - longbow
 - crossbow, long bow
 - pike warfare
- Introduction of gunpowder (black powder)
 - appeared in Western Europe in 1320s
 - originally in China in the 9th century
 - into Muslim world in 13th century
 - then to Western Europe through Spain
 - but was difficult to control, inaccurate
 - but did not become central to warfare until 16th century
 - with practice of granulating the powder
 - culverin
 - single-piece muzzle loaded cannon
 - made from saltpeter (potassium nitrate), sulfur, and charcoal



15th century culveriniers
source: *Encyclopedie Larousse*, 1890



Siege of Orleans in 1429
source: Martial d'Auvergne, Gallica Digital Library

- Arguments in favor of a military technological revolution in 16th century
 - gunpowder
 - cannons / artillery
 - bastion fortification
 - increased size of armies
 - read Long, p. 43
 - “Warfare involved...”
 - most important?
 - handheld firearms in early 15th century
 - developed from handheld cannons
 - by late 15th century, proliferation of small handguns
 - what was gone?
 - castles, trebuchets, bows
- in early middle ages, Long argues: read p. 75
- in new phase, c. from 16th century
 - technology assumed a critical role
- implications”
 - democratization of weapons
 - threat to medieval aristocracy
 - aided European colonial excursions in 15th century onwards