From Clubs and Spears to the Invisible Cloak, the Role of Technology in Weaponry

Looking at the historical development, usage and technology related to weapons.
From 3.5 billions years ago till present

Week 1, Nature, the maestro..(3.5 billions years to a few millions years)

Week 2, Pre-historic and Ancient (Up to 500 AD)

Week 3, Medieval to WW I (500 AD to 1914)

Week 4, WW I (1914 to 1918)

Week 5, WW II (1939 to 1945)

Week 6, Post war, Present, Future.. (1945 to present and future)
Last week’s business
Question of the week

• Please answer: True or False?
• The “blood groove” (or fuller) is on a sword to release pressure in the wound and allow the sword to come back out
Answer is: False

• A fuller is often used to lighten the blade, much in the way that an I-beam shape allows a given amount of strength to be achieved with less material.

• When combined with proper distal tapers, heat treatment and blade tempering, a fulleried blade can be 20% to 35% lighter.
And the winner is....
This week

• We will cover from 500AD to just before the WW1 (1914).
During this period

• Bow/arrow, spears, swords continued to improve
  – Need for shield and Armor
  – Fortified palaces (Castles?) became popular

• Gunpowder used for weapons
Sward revisited

KATANA (samurai sword)
The Sword breaker

• Classified as a form of **Parrying dagger**
• used during the Middle Ages.
• was used to capture an opponent’s sword blade.
• Once the blade was caught a quick twist of the sword breaker would snap the opponent’s sword blade.
Trident daggers

• Another **Parrying dagger**
• Used to trap the blades.
• Parrying daggers were used by left hand
• Hence its other name: **main-gauche** (French for "left hand")
Foot Soldier

• After many centuries when horsemen dominate the battlefield, the early 14th century sees the reassertion of the foot soldier.

• Partly this is due to new weapons - the English longbow and the Swiss halberd.

• But the change also involves the return of very ancient tactics.
  – The Greek phalanx, with the long spear introduced by Alexander the Great.
Greek phalanx

- 7th - 4th century BC
- The **phalanx** is a slow-moving but almost irresistible force, with a lethally sharp front edge.
- It consists of a solid block of men, usually eight ranks deep but often more.
- Each rank marches close behind the one in front.
- The first three ranks hold their spears horizontally, pointing them forward, so that three staggered spear points precede each man of the front rank.
- The men in the rear hold their spears upright in readiness.

Read more:
The English longbow: AD 1298-1346

• about 6 ft long used by the English and Welsh for hunting and as a weapon.

• English use of longbows was effective against the French during the Hundred Years War.
Swiss pikes and halberds,

- A **pike** is a pole weapon and unlike many similar weapons, the pike is not intended to be thrown.

**Halberds** is a two-handed pole weapon consists of an axe blade topped with a spike mounted on a long shaft.
Armor

• History of Medieval Armor Timeline
  – Up to 5th century: Two varying armor types:
    • Barbarian armor which was mostly leather and chainmail
    • classical armor which was brass and iron
  – From 5th through the 14th Century: Chainmail was standard and still lasted in part until the 17th
  – 12th Century: Various materials were added to supplement the chainmail chest piece including the gambeson.
13th – 14th Century Chain-mail Armor, Iron
National Museum of Mongolian History
Armor

• History of Medieval Armor Timeline
  – **13th/14th century**: the strength and protection of the chainmail was enhanced by the addition of various plates.
  – **14th century**: The plate chest armor was expanded upon by applying plate to other parts of the body like greaves for the legs and vambraces for the arms.
Armor

• History of Medieval Armor Timeline
  – 15th century: Plate armor came in three different types by function:
    • Battle armor,
    • ceremonial armor
    • Tournament (Jousting) armor.
Armor

• History of Medieval Armor Timeline
  – early 16th-century German plate armor first made for the Emperor Maximilian I.
  – The armor was designed to imitate the pleated clothing that was considered fashionable in Europe at the time.
Castles
Europe in the Middle Ages

• During Medieval times (1066 – 1400), Europe was divided into many small nation-states. Conflicts were common.

• Castles played a central role during this time.
Castles and Kings

• Castles were not just used by the king.
• Most castles were granted by a king to their most loyal subjects, knights or barons, who fought in battle and supported their king.
• The king, starting with William the Conqueror, would give his knights huge estates and permission to build castles.
• In return, he expected these men (most of whom were given the titles of earl or lord) to control their lands as the king's representative, to keep the local population from rebelling, and to force them to work and pay rent to the lord (who then passed it onto the king).
Castle’s Function

• In times of war, the castle served as the base and helped the king or nobleman defend his lands.

• The castle served as home, barracks, armory, storehouse, prison, treasury, and administrative center.
Early Castles

• The first castles that were constructed were not the palaces as we know today. They were defensive walls built around a city for protection from enemies.
Motte and Bailey Castles

• At first, simple wooden homes sat atop a hill or an artificial mound called a motte.

• The bailey was the courtyard within the walls of the castle.

• Ideally, the structures were built on sites that commanded a view of the countryside.
Later Castles

• Through time, castles evolved into fortresses of great strength and were used for military strategy.

• These new kinds of castles were built of large, thick stone, and had many walls and towers.
Concentric Castles

• Concentric castles would have two circuits of walls and flanking towers. The inner wall would be higher than the outer.
Historical Significance

• Because of their military function, castles gained a political purpose. They were the homes of the kings, queens, and other royalty who ruled the land.

• Over time, wealthy landowners were known to construct castles, even if they did not belong to royalty.
“License to Crenellate”

- When a landowner decided to ask permission from the king to build a castle or convert his house into one, a “license to crenellate” was sometimes granted. In 1281, King Edward I granted this one:

  Our beloved and faithful Stephen of Penchester and Margaret his wife to fortify and crenellate their home at Allington in the county of Kent with a wall of stone and lime, and that they and their heirs may hold it for ever. Witnessed by myself at Westminster on the twenty-third day of May in the ninth year of our reign.
Castle
Construction and Protection
Moats

Water, or a wide ditch, very often surrounded the castles.
A wooden bridge that led to a gateway and was capable of being raised or lowered.
Turrets and Towers

A castle turret was a small tower rising above and resting on one of the main towers, usually used as a lookout point.
Battlements

A narrow wall built along the outer edge of the wall walk to protect soldiers against attack.
Merlon - Battlements

Battlements (or crenellation) are the parapets of towers or walls with indentations or openings alternating with solid projections. Merlons are the saw-tooth effect or the "teeth" of the battlements.
Wall Walks

- High at the top of the castle, fighting platforms were built.
- Knights had the ability to shoot arrows at the enemy from an advantageous spot.
GateHouse

The castle gatehouse was the complex of towers, bridges, and barriers built to protect each entrance through a castle or town wall.
Arrow Slits

A narrow vertical slit cut into a wall through which arrows could be fired from inside.
Important Points about Castle Structure:

• Large and great defensive strength
• Surrounded by a wall with a fighting platform
• Usually had a large, strong tower
A Castle's Function:

- Fortress and military protection
- Center of local government
- Home of the owner, usually a king

From: tie.wikispaces.com/file/view/Medieval+Castles.ppt
Weapons used against castles

- Catapults, Trebuchets, Ballista
Weapons used against castles

• Battering Rams
  – Siege Engine
• This is an old concept
  – Assyrian battering about 865-860 BC
And still being used
Weapons used against castles

• **Mobile Assault Towers**, sometimes known as cats, could be assembled from components brought to the site or harvested from the surrounding woods.

• These towers gave an attacking army protection and high positions to fire arrows when storming a castle.

• Some cats were even built higher than a defending castle's towers to give attacking archers an advantage.
The largest castle in the world

Prague Castle
• Kings of Bohemia, Holy Roman Emperors and presidents of Czechoslovakia/the Czech Republic have had their offices.

• The Czech Crown Jewels are kept here

• 570 meters in length and an average of about 130 meters wide (more than 800,000 sf).
Gun Powder

– Changed the dynamic of warfare
– It made Castles obsolete (this is one theory)
– Other theory for castle: It was far more cost-efficient to attack than to defend.
History of gunpowder
Gunpowder plot (1605)

• A group of men led by Robert Catesby, plotted to kill King James and blow up the Houses of Parliament.
• The men bought a house next door to the parliament building.
• The house had a cellar which went under the parliament building.
• They planned to put gunpowder under the house and blow up parliament and the king.
• Someone named **Guy Fawkes** was given the job to keep watch over the barrels of gunpowder and to light the fuse.

• On the morning of 5\(^{th}\) November, soldiers discovered Guy hidden in the cellar and arrested him.

• He was tortured and revealed the entire plot.

• In celebration of his survival, King James ordered that the people of England should have a great bonfire on the night on 5\(^{th}\) November. It is still continued today!
• The **searching of the cellars of Parliament** before the opening of each new session was introduced until 1678. It is also continued!
Interesting and unusual guns
Ribauldequin (organ gun)
• Employed during the early fifteenth century.
• Originally designed by Leonardo Da Vinci.
Gatling Gun

- Designed by Richard Gatling
- Crank controlled gun that had many barrels.
- Display at the The Lake County Discovery Museum (Libertyville, IL)
• The problem of **overheating** was avoided because of multiple barrels.
• The maximum speed for firing was about **200** rounds per minute.
• The shells were gravity-fed.
• Each barrel had its own firing mechanism.
Gatling Gun
The equalizer

- “Abe Lincoln may have freed all men, but Sam Colt made the equal”

— Civil War Era Quote

Colt is also called “peace maker” and “the gun that won the west”.

Machine gun
Dynamite

• Was invented by the and engineer Alfred Nobel (Swedish chemist) and was patented in 1867.
• Nobel tightly controlled the patents, and unlicensed duplicating companies were quickly shut down (does it sound familiar?!)
Alfred Nobel

- Established Nobel prize
  - I am sure you knew that!
  - Started with $9 million in 1895.
  - It would be about $250 million dollars today.
Alfred Nobel

• Had expressed his wish to produce material or a machine which would have such a devastating effect that war from then on, would be impossible.
  – We did that later on with nuclear bombs.
Alfred Nobel

• In 1891, he commented on his dynamite factories by saying to the countess: "Perhaps my factories will put an end to war sooner than your congresses: on the day that two army corps can mutually annihilate each other in a second, all civilized nations will surely recoil with horror and disband their troops."
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Types of explosions

• **Detonation**: involves a *supersonic* front accelerating through a medium and *shock front* (faster than speed of sound).

• **Deflagration**: usually propagates through thermal conductivity; hot burning material heats the next layer of cold material and ignites it.
Cannons

• The cannon, first appearing in the early 14th century in Europe, assumed its classic form at the beginning of the 17th century.

• Until the early 17th century, cannons in a battle were immobile and the two-wheeled gun carriage was slow to be developed.

• It was a shock weapon, most effectively used in mass, and its placement was critical.

• The battery itself was fixed, but fire could be directed to any point within range very quickly.

• This weapon system was most vulnerable to a cavalry attack from the rear, rendering its powerful weapons useless.
Cannon Influence

• Cannon transformed naval warfare.
• It was the cannon that made the fortresses and castles obsolete.
• Also believed to be crucial in Napoleon Bonaparte's rise to power.
Cannons and Castles

• In 1494, the Earl of Warwick reduced Bamborough Castle to rubble in a week.
• In 1523, Philip of Hesse brought the most powerful fortress in the world at Landstuhl, to its knees in a day.
Cannon balls

• Cannon Balls includes:
  – Stone Ball
  – Iron ball or shot
  – Explosive shells
Largest Caliber Cannon

• The Russian **Tsar Cannon** 5.94 meters (19.5 ft) long built in 1586.
• Made of bronze and weighs 39.312 tons.
• The barrel has diameter of 890 mm (35 inches)
Double barreled cannon (Civil War)
Double barreled cannon

• Designed by **John Gilleland**, dentist, builder and mechanic.

• The two barrels have a divergence of 3 degrees

• It was designed to shoot simultaneously two cannon balls connected with a chain to "mow down the enemy somewhat as a scythe cuts wheat".

• It never saw battle.
Double barreled cannon

• After several test fire, it proved to be a complete failure.

• It never saw battle.

• The cannon is on display on the front lawn of the City Hall of Athens, Georgia.
• Double barrel cannons were also used during:
  – English civil war (1642–1651)
  – 16th century in Poland, cannons with as many as seven barrels.
  – Also there were 6 barrel cannon of India
Some Physics..

- Launch angle for maximum height is **90** degrees and for maximum range is **45** degrees.
- At **74** degrees, the height and range are equal.
Observational Balloon

• The first military use of observation balloons was by the French Aerostatic Corps (1794).
• The very first balloon to be used in civil war by the Union (1861-64).
• The balloons were inflated with H2 gas rather than run on hot air.
• Diluted sulfuric acid and iron filings, generated hydrogen.
Observational Balloon

• The Union rose to over 1,000 feet in Virginia and the North was able to shell Confederate encampments for the first time in history, without being able to see them.

• Soon balloons were rising as high as 5,000 feet.

• Because of balloons, the Confederate Army was forced to create dummy encampments and black out their camps at night.
Submarines

• **Leonardo da Vinci** ((1452-1519) developed plans for an underwater warship but kept them secret.

• He was afraid that it would make war even more frightful than it already was.
• What might be called the first "practical" submarine was a rowboat covered with greased leather. It was the idea of Cornelius Van Drebbel, a Dutch doctor living in England, in 1620.
• It had a leather-covered wooden frame.

• The final (third) model had 6 oars and could carry 16 passengers.
• It is believed that to re-oxygenate the air inside these submarines, he likely generated oxygen by heating potassium nitrate or sodium nitrate in a metal pan to make it emit oxygen.

• That would also turn the nitrate into sodium or potassium oxide or hydroxide, which would tend to absorb carbon dioxide from the air around.
• American inventor David **Bushnell** developed the first military submarine in 1775, during the American Revolution.

• The Turtle was used on July 7, 1776, to sneak up on a British battleship and attach an explosive device to the hull of the enemy ship.

• Ultimately, the Turtle's mission failed.
The Turtle
• The first submarine which actually sank another enemy vessel under combat conditions was the CSS HUNLEY built during the Civil War on February 17, 1864.
• **Hunley** was originally intended to attack by means of a floating explosive charge.
Battleships

• The word *battleship* was coined around 1794 and is a contraction of the phrase *line-of-battle ship*, the dominant wooden warship during the *Age of Sail*.

• The term came into formal use in the late 1880s to describe a type of *ironclad warship*.
• The first major change to the ship of the line concept was the introduction of **steam power**.

• He **French Navy** introduced steam to the line of battle with the 90-gun *Le Napoléon* in 1850—the first true steam battleship.
Revolving turret (first use during Civil War)

- Conservators work in the upside-down turret, The U.S.S. Monitor was the Union's first ironclad vessel.

Grenades

• The word "grenade" is the French word for pomegranate.¹

• Incendiary grenades, that use petroleum, were used Byzantine Empire (717–741)

• In China during the 960–1279AD, Chinese soldiers packed gunpowder into ceramic or metal containers.

• Explosive grenades first appeared in Europe during the 17th century
How does it work?
Fun Fact

• During the Civil War, glasses with colored lenses were used to treat disorders and illnesses.
  • Yellow-trimmed glasses were used to treat syphilis
  • Blue for insanity,
  • Pink for depression.
• Thus we get the term, To see the world through rose-colored glasses.
Prize for this week

Fighting Techniques of the Oriental World
AD 1200 ~ 1860
Equipment, Combat Skills, and Tactics
Michael E. Haswell, Christler Jorgensen, Chris McNab, Eric Niderost, Rob S. Rice

Mythbusters Collection 3
MORE THAN 9 HOURS OF GREAT ENTERTAINMENT!