

**Getting from here to there and  
back – The impact of a few  
transportation innovations on history**

Class 2

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# What We Will Cover Today

- Finish up on horses
- The impact of the camel
- The Impact of the sailing ship
  - The full-rigged ship
  - Cannon
- The impact of the steam-powered vessel
  - Steamboat
  - Steamship
  - Refrigerated steam-powered vessel

# Firearms and the Horse

- The invention of firearms made the knight obsolete since bullets could penetrate the knight's armor
- Despite the coming of firearms, warrior elites on horseback with their stress on individual hand-to-hand combat resisted acceptance of the longbow and gun since it threatened their elite status
  - Thus cavalry charges persisted into the wars of the 19<sup>th</sup> century and even into World War I

# Firearms and the Horse - 2

- Despite elite warrior resistance, the horse cavalry's role by the 19<sup>th</sup> century became that of:
  - scouting,
  - screening of infantry movements,
  - raiding enemy supply lines,
  - transport of supplies and soldiers to the battlefield,
  - transport of artillery pieces, and f
  - foraging
- Battles of cavalry units, such as the Civil War battle of Brandy Station, were between men on horseback armed with rifles and pistols.

# Firearms and the Horse - 3

- Paradoxically, the large conscript armies of the 20<sup>th</sup> century required large numbers of horses simply to meet the massive logistical demands for supplies and ammunition.
  - In World War I, every army depended on horses to move supplies from railheads to the front
  - In World War II, the German and the Russian armies both relied on horses for their logistics

# Firearms and the Horse - 4

- In the 21<sup>st</sup> century, the horse still has had a role in war
  - In the Sudan, the Arab Janjaweed fighters use horses in their wars in Darfur, western Sudan, and Eastern Chad
  - In Afghanistan, U.S. Special Operations Command (SOCOM) used horses in the northern mountains of Afghanistan

# The Horse Cultures of the Plains Indians - 1

- The horse played a major role in the Spanish conquest of the Aztec and Inca empires
- With the discovery of the silver mines at Zacatecas, Spanish rule and horses spread to north central Mexico
- By the early 1600s, Spanish rule and horses had spread to the Pueblo settlements of the American Southwest.
  - In 1680, the Pueblos revolted
    - Led to the escape of thousands of Spanish horses

# The Horse Cultures of the Plains Indians - 2

- Before the horse, the North American prairie had few human inhabitants
  - The tough sod without a steel plow discouraged farming
  - The buffalo and other plains animals were too fast to provide a dependable food source
- The horse's speed and mobility enabled hunters to single out a specific animal and kill it at close range with a bow-and-arrow
  - The Comanches of Texas were the first to use the horse to hunt buffalo.

# The Horse Cultures of the Plains Indians - 3

- The horse impacted the Amerindians in ways other than that of hunting buffalo
  - Made travel across the Plains easier
  - Led many tribes to relocate to the Great Plains
  - As buffalo-hunting tribes increased in number and size, intertribal wars became common
    - In the Southwest, the Comanche won out over their Apache rivals, forcing them westward where they amalgamated with the Pueblo to become the Navaho

# The Horse Cultures of the Plains Indians - 4

- The horse and the warrior culture that it engendered enabled the Plains Indians to resist Euro-American settlement of the Great Plains
  - The result was a series of Indian wars that lasted through much of the 19<sup>th</sup> century
  - These wars ended only when the Amerindian food base – the buffalo – was destroyed

# If the Horse Had Never Been Domesticated

- The impact of the horse can be illustrated by comparing the Old World which had the horse to the New World which didn't
  - In the Old World, agriculture, metallurgy, and alluvial civilizations all preceded horse domestication. All of these also arose in the New World
  - With the horse, the Old World saw the emergence of the nomad horse cultures of the steppes. Without the horse, the prairies remained undeveloped and largely uninhabited.

# If the Horse Had Never Been Domesticated - 2

- Horses by their load carrying capability and speed
  - Promoted trade in commodities and products that could not be easily carried by human porter or llamas
    - After their equestrian conquests, both Persian and Chinese rulers embarked on extensive road and canal construction to promote trade. There was no such construction in the Americas
    - The Silk Road, especially under the Mongols, promoted extensive trade between China, the Middle East, and Europe. There was no equivalent Silk Road in the Americas, only intermittent sea contacts between MesoAmerica and South America
  - Fostered the dissemination of ideas and inventions to a much greater degree than existed in the Americas

# If the Horse Had Never Been Domesticated - 3

- In the Old World, trade and idea dissemination promoted the growth of metallurgy. In the New World, metallurgical advances around the Great Lakes did not reach MesoAmerica or the Inca domains
- In the Old World, the horse enhanced military capabilities, fostered technological innovation, and permitted the creation of empires. In the New World, empires were limited by logistic inadequacies and Aztec-Incan armies were technologically inferior to their Spanish enemies

# If the Horse Had Never Been Domesticated - 4

- Without the horse:
  - Old World civilizations would have remained isolated in their alluvial valleys
  - The Central Asian steppe would have remain undeveloped and largely uninhabited
  - The empires of Persia, Alexander, Rome, and Genghis Khan would never have been created
  - The great inventions of steel, paper, printing, gunpowder, and the zero might well have never been diffused across Eurasia

# Muybridge Horse Photographs



# Impact of the Camel

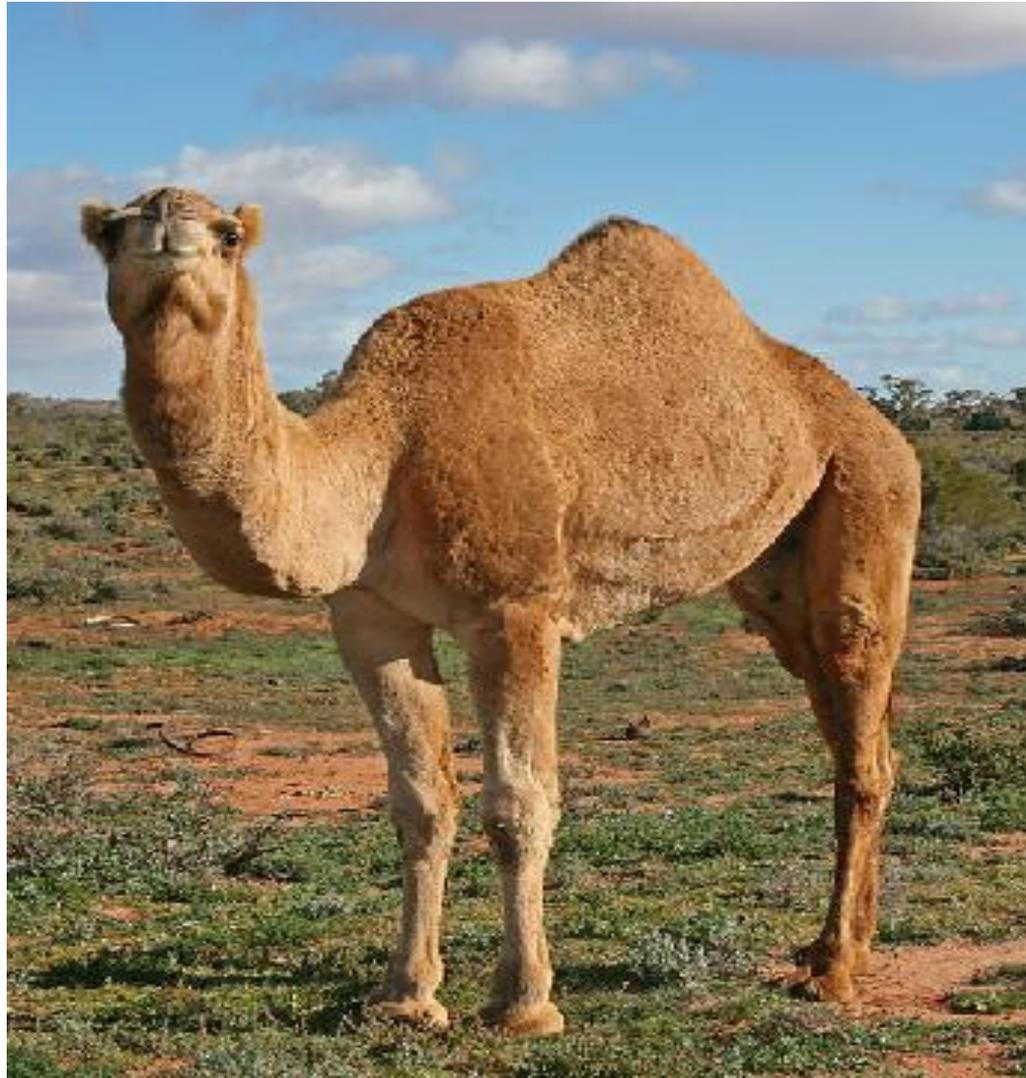
# Notes About the Camel - 1

- There are two types of camels
  - The Arabian camel or dromedary which has one hump
    - It inhabits the Sahara and Arabian deserts, the Middle East, North Africa, and Australia
  - The Bactrian camel which has two humps
    - It inhabits the Gobi and Taklamakan deserts, Central Asia, and Mongolia

# Bactrian Camel



# Arabian Camel



# Notes About the Camel - 2

- Camels do not store water in their humps, but distribute it uniformly throughout their bodies
- Camels can go days, even a few weeks in exceptional circumstances, without water, by drinking up to 50 gallons at a time
- The Bactrian and Arabian camel can interbreed
  - Bactrian stallions and Arabian females were often bred to produce a hybrid super camel that had remarkable stamina and strength & was used extensively along the Silk Road

# Notes About the Camel - 3

- A camel can carry up to 900 lbs for short distances. It was also used for riding, tilling the land, pulling carts, as a source of meat and milk, and for long-distance caravans across the desert
- When crossing a hot desert, the camel can carry between 120-200 kilograms (55-90 lbs) of cargo across a desert for 8-12 hours a day at 2.5 to 5.0 miles an hour (in addition to the water it needed for drinking)
  - Thus, an average camel could carry 160 kg (73 lbs) for 10 hours at roughly 3.5 mph – 35 miles per day
- The Arabs used the dromedary, but both types of camels were used on the Silk Road as carriers of trade goods

# Notes About the Camel - 4

- The Arabian camel was first domesticated in Arabia
  - From there it spread to the Middle East with the spice trade
  - From the Middle East it spread east to Persia and the Indus Valley and west to North Africa and the Sahara
  - Replaced the bullock (castrated bulls) as a mode of desert transport
- Camels were not widely used in combat since they could not deliver the momentum and power of a charging horse
- Camels were indispensable in the desert for the logistical capability they provided
  - Used to carry the water and forage needed by the horses
  - With camels, Arab armies could traverse the desert to make surprise attacks on enemy garrisons and troop concentrations

# Arab Conquests - 1

- In 224, Parthian rule in Persia was replaced by Sasanian rule. This touched off a long series of wars between Rome-Byzantium and Persia
- After a long, mutually exhausting war, Arab invaders in 636 defeated the Byzantines and conquered Persia with the aid of the Arabian horse and the dromedary camel
  - Arab invaders were aided by large sections of the Syrian and Egyptian populations who resented persecution of Nestorian and Monophysite (Coptic) Christians by their Orthodox Byzantine rulers

# Arab Conquests - 2

- From the Middle East, the Arabs advanced eastward into Persia and Central Asia and westward into Egypt, North Africa, and Spain
  - Arab conquest of North Africa (present day Libya, Tunisia, and Algeria) was aided by Berber resentment of Roman-Visigoth rule
- In 711, an Arab-Berber army led by Tariq ibn Ziyad landed near Gibraltar, defeated the Visigoths at Guadalete, and by 720 conquered all of Spain except for the Asturias

# Arab Conquests - 3

- At Tours in 732, Frankish infantry defeated Arab cavalry
  - One reason the Franks won was that they placed their army on a wooded hill, forcing the Arabs to charge into a wooded area
  - As a result of the battle, Martel decided that he needed a significant cavalry force
    - This led to the development of feudalism as a means of supporting and equipping a professional cavalry force

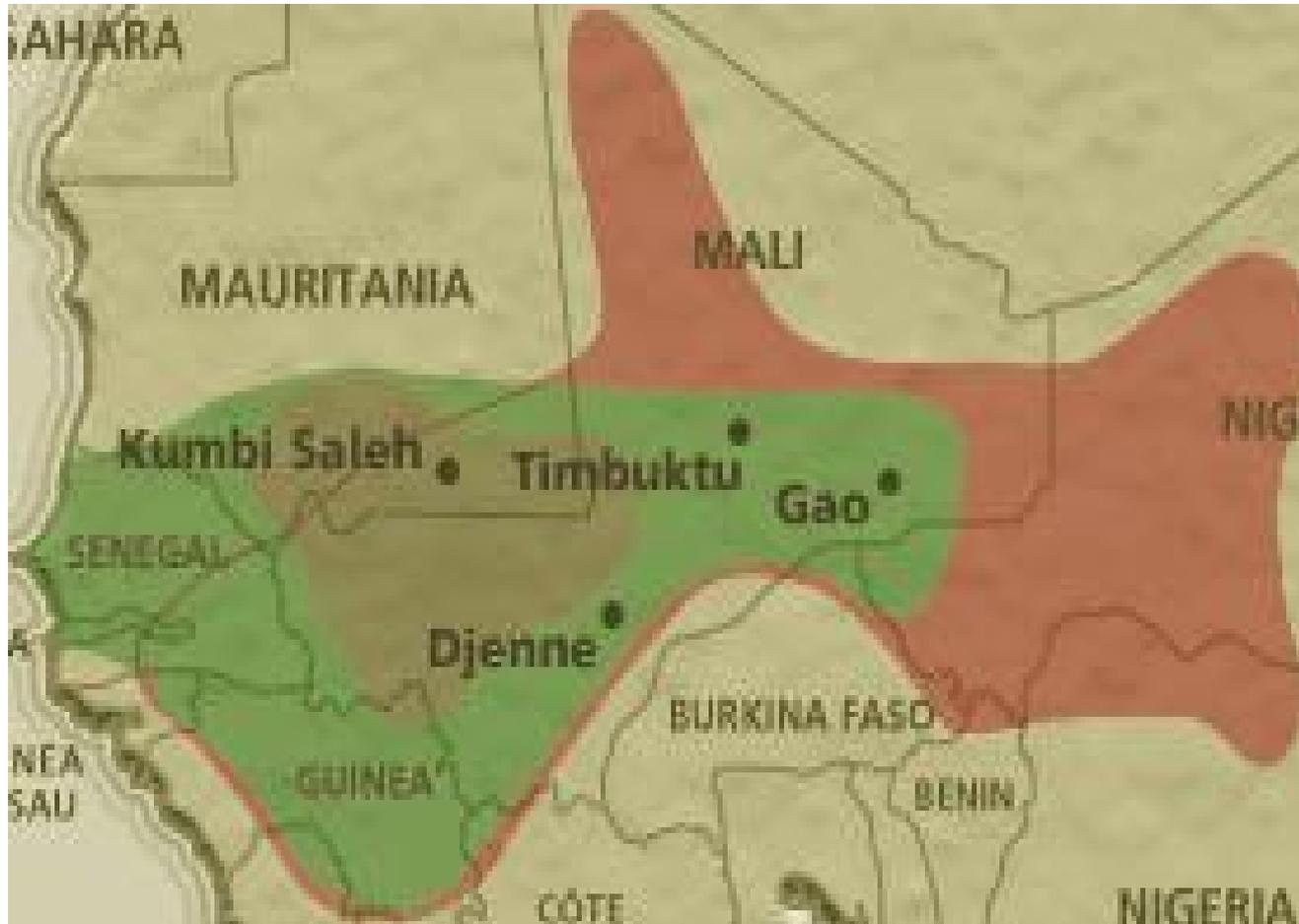
# Effects of the Camel - 1

- With the invention of the camel saddle, the camel replaced wheeled transport in large parts of the Middle East and North Africa
- Because they were capable of crossing inhospitable deserts, they brought Tibet, central Asia, the Arabian peninsula, and sub-Saharan West Africa into the world trading economy
  - Led to a massive camel caravan trade between North Africa (including the port of Ceuta), Mali (where rock salt was mined) and Timbuktu

# Effects of the Camel - 2

- In 1324-25, Musa I (aka Mansa Musa), ruler of the Mali Empire, went on a pilgrimage to Mecca
  - He brought with him 80 camels (each carrying anywhere from 50-300 lbs of gold) and spent very freely en route
    - One of the places he visited en route was Ceuta
- In 1415, Ceuta was captured by the Portuguese
  - After capturing Ceuta, the Portuguese heard about Musa's famous pilgrimage and decided they needed to find the mines that produced all this gold
    - Blocked by Islamic control of the desert route, the Portuguese decided to go via sea down the west coast of Africa
    - In their explorations, the Portuguese discovered islands that could grow sugar and that the African kingdoms would sell or trade the slaves needed to make the sugar plantations profitable

# Kingdom of Mali



# Effects of the Camel - 3

- The logistical capabilities of the camel led
  - The importation of camels into Australia and later the subsequent creation of a large population of feral camels
  - The creation of the U.S. Army Camel Corps which existed from 1857 to 1865
  - The creation of camel units by the British, French, German, Spanish, and Italian colonial armies

# Impact of the Ocean-going Sailing Ship

# Early Ships – Oared Galleys

- Ships could be oared galleys or sailing ships
- Both types had their advantages and disadvantages
- Galleys
  - Had good acceleration, were very maneuverable, and could make way on windless days
  - Required a large crew to man the oars
  - Could not venture for long out of sight of land
    - Crew had to be fed so landfall had to be frequent
  - Could not carry a large number of cannon

# Early Ships – Sailing Ships

- Sailing ships revered the advantages and disadvantages of oared galleys
- Sailing ships
  - Were high-sided and more seaworthy, especially on the oceans
  - Were difficult to maneuver
  - Could not accelerate on command
  - Were helpless when becalmed
  - Could accommodate large cargoes
  - Could be handled by small crews that were easily sustained over a long period of time
  - Could accommodate a large number of cannon

# Medieval European Sailing Ships

- Medieval northern European ships were known as 'cogs' with a single, massive, square sail.
  - Cogs used clinker planking (overlapping wooden planks)
- Medieval Mediterranean and Indian Ocean sailing ships used the Arab lateen sail or triangular sail

# Cog



# Lateen Sail



# The Full-Rigged Ship

- In the mid-15<sup>th</sup> century, the lateen-rigged Mediterranean ship was married to the square-rigged north Europe-Atlantic ship (and the stern rudder added) to produce the full-rigged ship
  - There were two variations of the full-rigged ship
    - The Carrack – a 3-masted ship with a foremast and main mast rectangular sail and a mizzenmast lateen sail
    - The Caravel – a 3-masted ship with 3 lateen sails

# Carricks & Caravels

- *Carricks* were largely-ocean going vessels
  - They were large 600+ ton ships
  - Columbus' flag ship, the *Santa Maria*, was a carrick
- *Caravels* were smaller in size
  - They were smaller than the carrack – from 60 to 120 tons
  - 2 of Columbus' ships were caravels

# Carrack



# Caravel



# Later Version of the Full-Rigged Ship



# Other Sailing Innovations

- In the 14<sup>th</sup> century, the compass arrived and the astrolabe, cross-staff, and quadrant were developed
- Medieval portulan charts evolved from a set of written sailing instructions into maritime maps showing coastlines, port locations, parallels, and meridians
- By 1500, a *spritsail* was attached to the mast jutting forward from the bow
  - It provided leverage against the rudder, enabling vessels to sail as close to 80° to wind and also to pull away from a leeward shore

# Why America Was Not Discovered Until 1492 - 1

- Before 1492, European intellectuals, rulers, & sailors knew the earth was round
- They also had a good idea of the circumference of the earth
  - 24,000 miles as opposed to our 25,000
  - This meant Asia lay about 10,000 to 12,000 miles west of Europe
- 15<sup>th</sup> Century European ships were too small to carry the food and water needed to sustain crews on such a voyage

# Why America Was Not Discovered Until 1492 - 2

- Columbus radically underestimated the circumference of the earth
  - His estimate was 18,000 miles
  - He also calculated that Japan was only 3,500 miles west of Europe
- What saved Columbus and his crew was the fact that the Americas were about 3,000 miles west of Spain

# Why America Was Not Discovered Until 1492 - 3

- The fall of Constantinople in 1453 caused spice-trade costs to go through the roof
  - Retail prices of spices in Europe skyrocketed as a result of Turkish price gouging
  - The alternative overland travel route via the Silk Road became too dangerous
- This led to the European desire to seek new routes to the East
  - Led to the Portuguese sailing around the tip of Africa into the Indian Ocean
  - Led to the Spanish (and later the English and French) sending explorers to the West

# Impact of cannon - 1

- Prior to the invention of cannon and gunpowder, oar-driven galleys would ram enemy vessels, allowing marines to swarm onto the enemy vessel
- With the invention of cannons, ship battles became artillery duels at very short range
  - Until the 16<sup>th</sup> century, cannons were located on the open top deck to fire over the rails
  - With the gun port – a hinged door built into the side of a ship – cannons could now fire from lower decks and carry more and heavier guns just above the waterline
    - When the ship was sailing, the ports – closed and caulked – kept out the sea
    - During a battle, the gunners opened the gun ports and fired away

# Impact of Cannons - 2

- Led to the cannon-armed sailing ship replacing the oared galley
- Led to the seaborne expansion of Europe and the Age of Exploration
  - Allowed Europeans to establish trading posts and forts on the coasts of Africa and the Indian Ocean
    - In 1509, the Portuguese defeated the Muslim fleet off the Indian port of Diu to win naval supremacy in the Indian Ocean
  - European sailing ships could carry many more cannon than Ottoman galleys, Arab dhows, or Chinese junks
    - This enabled European ships to sink native ships and bombard native ports
    - European ships could project force ashore by supporting landing parties with cannon fire and by moving cannon ashore

# Effects of the Full-Rigged Ship

- Allowed the Portuguese to colonize islands off the coast of Africa where sugar could be grown
  - Since sugar was a labor-intensive crop, the Portuguese began importing African slaves and establishing sugar plantations to grow and process the sugar
    - Formed the template for slavery in the Americas
- Allowed European ships to exploit the fishing grounds of the North Atlantic and the Newfoundland banks
  - Fishing and later whaling played a major role in the development of the New England economy
  - Fishing in turn led to shipbuilding, timber exporting, and barrel-making
- Made possible the triangular trade that linked New England, the Caribbean, England, and Africa

# Wooden Casks

- In the 17<sup>th</sup>-18<sup>th</sup> centuries, wooden casks were the shipping containers of the day
  - Even fragile items (packed in straw or sawdust) were shipped in them
  - Shippers of wine and hard liquor noticed that the process of shipping improved the flavor, taste, and smell of the product
    - Led to the process of storing wine and liquor in casks

# Piracy and Smuggling

- The combination of the full-rigged ship, cannon, and the European wars over colonies and fishing rights led to piracy and smuggling
  - During wartime, nations gave their nationals the right to prey upon enemy merchant shipping for profit
    - The U.S. Constitution gave Congress the right to grant “Letters of Marque and Reprisal and make Rules concerning Capture on Land and Water”
  - Smuggling (to avoid payment of import taxes) was common and the English attempts to suppress it in the American colonies played a major role in precipitating the American Revolution

# Clipper Ships

- The fast American privateers of the War of 1812 paved the way for the American clipper ships
  - The clipper ships led to a vast increase in the tea trade with China
    - The growing demand for tea in Britain led to the growing importation of Chinese porcelain which was used as ballast and as a protection against leakage of sea water into the tea crates
      - The demand for tea cups and saucers that could hold hot tea led to the rise of the British porcelain industry
        - » Wedgwood China

# Clipper Ship



# Suez Canal

- The growing importance of the tea trade led the French to build the Suez Canal
  - This in turn led to the coal-burning steamship replacing the sailing ships in the tea trade
    - Clipper ships could not handle the Red Sea winds
      - Had to sail around the Cape of Good Hope or South America to get from Britain to China and back
    - Steam ships could use the Suez Canal and cut sailing time in half vis-à-vis the clippers

# European Voyages of Discovery

- Brought Europeans into contact with cultures that were very different
- Challenged core European concepts
  - Neither the Bible nor the Greek philosophers mentioned the Americas (or Australia or Antarctica)
- Led to the Columbian Exchange
  - Eurasian crops and animals began to be raised in the Americas
  - American crops began to be cultivated in Europe, Asia, and Africa

# The Columbian Exchange

- Europeans and Africans, along with their animals and insects, introduced diseases into the Americas with devastating effects
  - Malaria, yellow fever, mumps, measles, chicken pox, smallpox, and influenza killed a large proportion of the American Indian population
- Led Europe to shift its external trade from the Levant to the New World
  - Led to the economic decline of the Islamic world

# The Columbian Exchange - 2

- Led to a change in European, Asian, and African dietary habits
  - Imagine Thai, Indian, or Chinese cuisine without chili peppers or sweet potatoes
  - Imagine Western Europe and Russia cuisine without the potato
  - Imagine Italian cuisine without the tomato
  - Imagine African cuisine without manioc or corn

# European Discovery of Hunter-Gatherers

- The discovery by Europeans of hunter-gatherer bands in the Americas and the Pacific Islands had some very interesting intellectual consequences
  - Led to the creation of the concept of the ‘noble savage’ living in an unspoiled Eden and unaffected by the vices of civilization
  - Led to the concept that private property was the root of all evil – e.g. Jean Jacques Rousseau
  - Led to the concept of “primitive communism” – an era devoid of class struggle and exploitation of man by man – e.g. Karl Marx & Friedrich Engels
  - Led to the concept that society could be based on “free association” rather than submission to traditional authority

# Impact of the Steamboat & Steamship

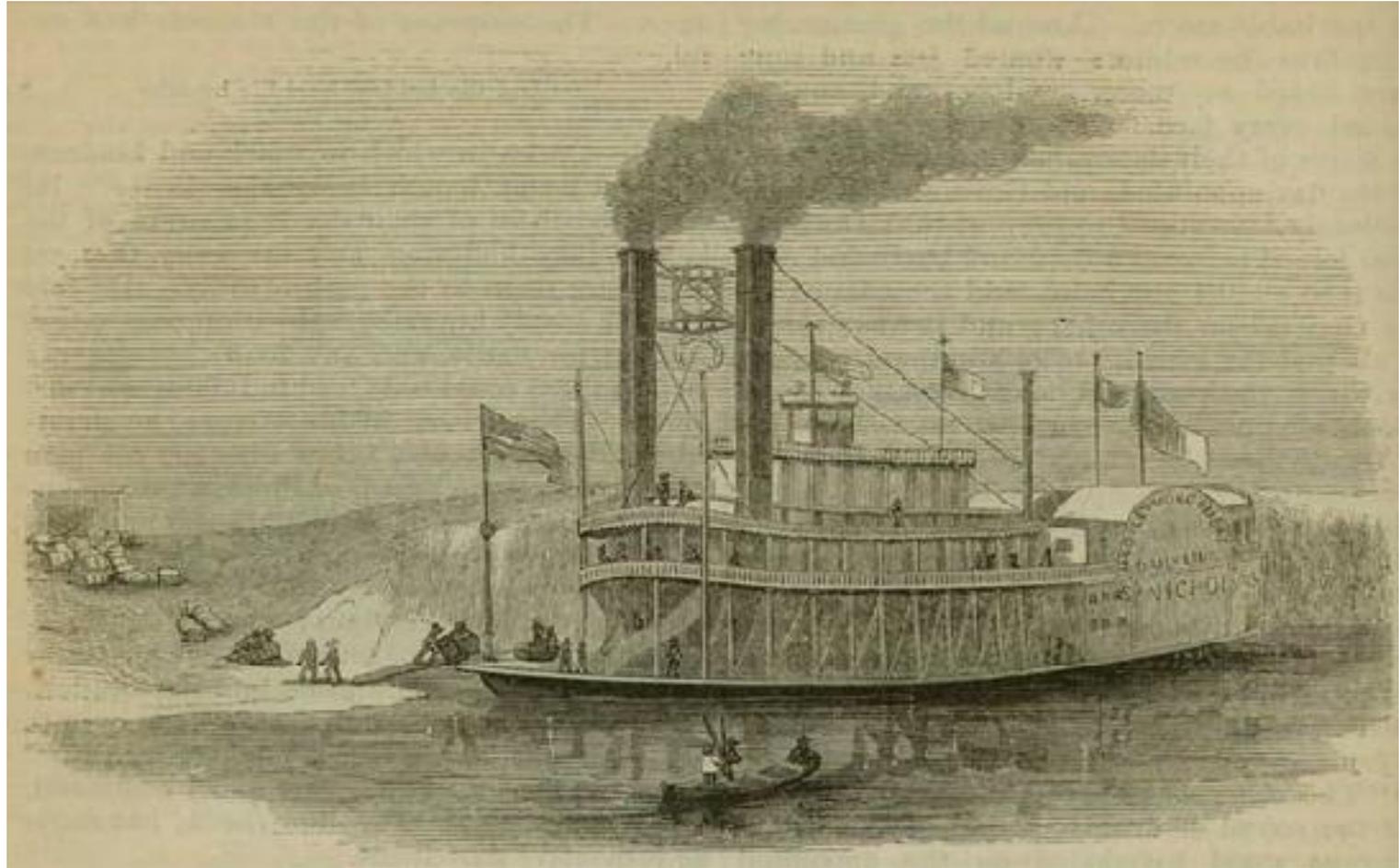
# Definition

- Steamboat = a boat driven by steam power; specifically : a shallow-draft vessel used on inland waterways
- Steamship = a : a ship propelled by steam b : an engine, machine, or vehicle operated or propelled by steam

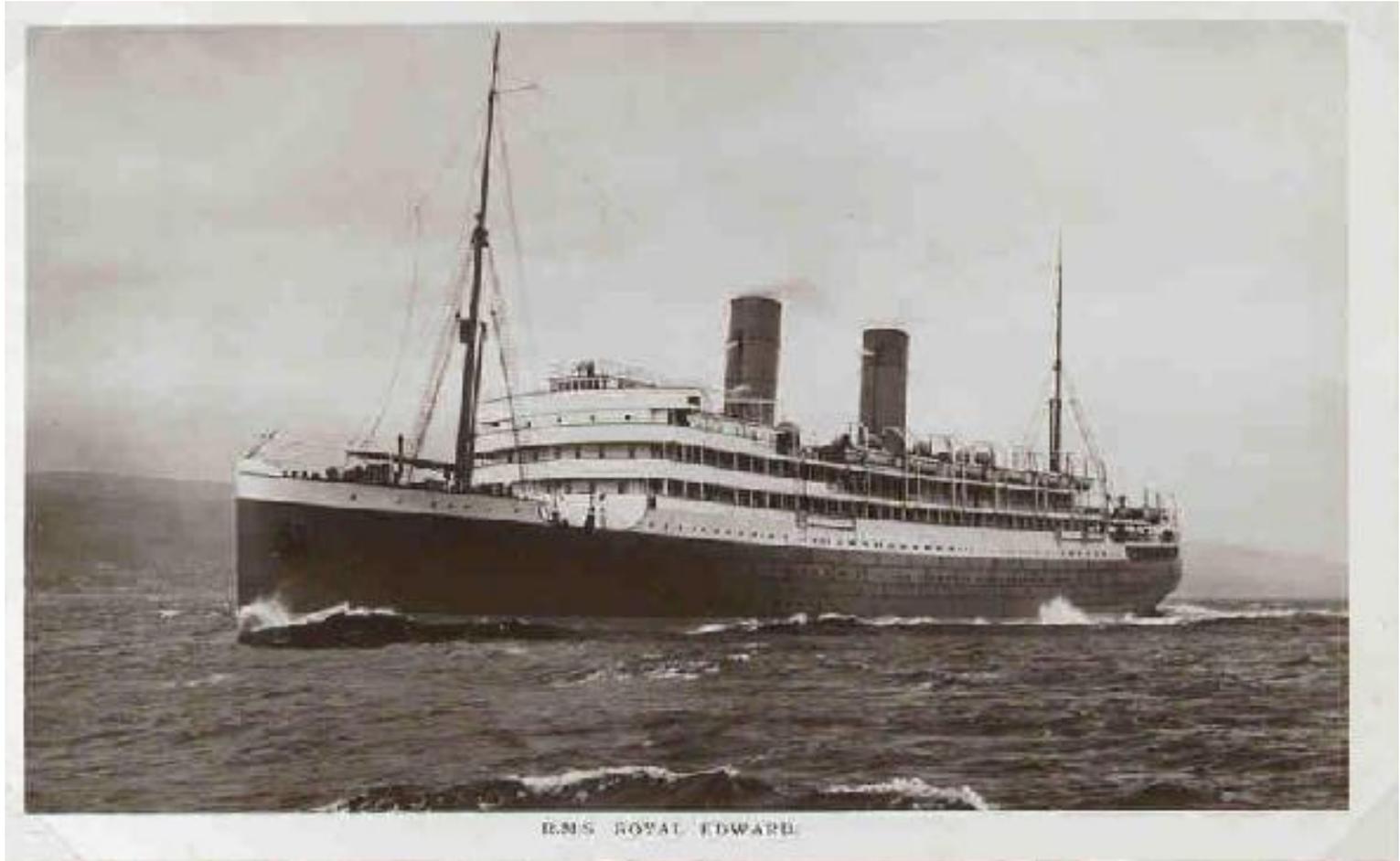
# Steamboats & Steamships

- The term steamboat is usually used to refer to smaller steam-powered boats working on lakes and rivers, particularly riverboats; steamship generally refers to larger steam-powered ships, usually ocean-going.
- Screw-driven steamships generally carry the ship prefix "SS" before their names, meaning 'Steam Ship', paddle steamers usually carry the prefix "PS" and steamships powered by steam turbine may be prefixed "TS" (turbine ship)

# Steamboat



# Steamship



# History - 1

- The concept of the steamboat was an outgrowth of the steam engine
- The first working steamboat (with rotating paddles) by Marquis Claude de Jouffroy sailed in July 1776
- In the 1789s, James Rumsey and John Fitch both built working steamboats
- In 1802, Patrick Miller & William Symington built the *Charlotte Dundas* which towed barges along the Forth and Clyde canal to Glasgow

# History - 2

- In 1803, Robert Fulton built a steamboat on the River Seine.
- In 1807, he built the *North River Steamboat* (also known as the *Clermont*) which began regular passenger service between New York City and Albany
- Fulton's success was soon followed by the use of steamboats on major U.S. rivers and also on the great lakes
  - First steamboat on the Ohio and Mississippi sailed in 1811

# History - 3

- Steamboat traffic including passenger and freight business grew exponentially in the decades before the Civil War.
- First steam-powered vessel to cross the Atlantic was the hybrid steam- and sail-powered *SS Savannah* which sailed from Savannah GA to Liverpool in May-June 1819
- The first steamer to sail the Atlantic was the Dutch-owned *Curacao* which sailed from near Rotterdam to Surinam in 1827

# History - 4

- The first regularly scheduled trans-Atlantic crossings by steamer began in 1838 with the SS *Great Western*
- The first East Coast (New York City) to West Coast (San Francisco) steamship service began in October 1848 via Cape Horn
- Steamers with screw propellers began replacing paddlewheel ships in the 1860s-1870s
- The first trans-Atlantic steamer built of steel began sailing in 1879

# History - 5

- Steamships dominated trans-Atlantic passenger travel until the 1960s when jet airplane flights replaced steamships
  - The last scheduled liner voyage to cross the Atlantic was the *Queen Elizabeth 2* in 1986
- In 1884, Sir Charles Parsons devised the marine steam turbine engine.
  - It gradually replaced the traditional reciprocating steam engine due to the turbine's small size, low maintenance, light weight, and low vibration
  - The first steam turbine ship was the *Turbinia*, launched in 1894

# Impact of the Steamboat

- Revolutionized domestic transportation by making it easy for boats to travel upstream and do so at much less cost and much greater speed than before
- Created new legal and political precedents that would have immense significance in later years
  - Supreme Court case of *Gibbons vs. Ogden*
  - Legislation that established the authority of the Federal Government to regulate an industry in the interest of public safety

# Impact of the Steamboat - 2

- Subjected their passengers and cargoes in the early years to the dangers of boiler explosions, often with large-scale loss of life
  - This, in turn, led to the first Congressional regulatory legislation and the first regulatory Federal personnel
  - Also led to the precedent of Federal Government research grants

# Steamboat Act of 1838

- Provisions
  - Had provisions for the prevention of collisions and the control of fires aboard ship
  - Required the inspection of hulls and the carrying of lifeboats
  - Required federal judges to appoint competent boiler inspectors who would semi-annually inspect every steamboat boiler, ascertain its soundness, certify it with a recommended working pressure, and issue a certificate of navigability
  - Made steamboat owners liable to both criminal penalties and to civil suits for damage to persons or property for a boiler explosion, with the fact of an explosion considered prima facie evidence of negligence
- Had little effect in reducing boiler explosions

# Steamboat Act of 1852

- Provisions
  - Set maximum allowable working pressures (110 lbs per sq. in.)
  - Required every boiler to be tested yearly at 1 ½ times working pressure
  - Set boiler material construction standards
  - Required all steam engineers to be licensed
  - Authorized boiler inspectors to order repairs
  - Established boards of inspectors to investigate accidents and law infractions, giving them subpoena power
- Did reduce steamboat accident fatalities by about 35%

# Impact of the Steamboat - 3

- Turned Cincinnati OH into a major hog meatpacking center
  - The presence of a large amount of lard led William Proctor and James Gamble to form a partnership to turn some of that lard into soap
    - This initiated an early replacement of an item previously manufactured in the household by a mass consumer product

# Impact of the Steamboat - 4

- Fostered a demand for Federally-financed internal improvements, especially the dredging of rivers and harbors (as well as the building of roads and canals)
- This demand in turn provoked opposition from those in inland areas who would not benefit from such improvements and from those who feared the erosion of states rights
- These policy differences help define, and became a bone of contention between, the Whigs who favored such internal improvements and the Democrats who opposed them

# Impact of the Steamboat -5

- Fostered a mutually beneficial and symbiotic relationship with the Post Office
  - Steamboats aided in the transport and delivery of mail; the Post Office gave lucrative mail delivery contracts to the steamboat owners
  - Provided a model for the relationships the Post Office developed with the railroads

# Impact of the Steamboat - 6

- Helped start and facilitate travelling for pleasure
  - Affluent Americans begin to use the steamboat for “nuptial journeys”
  - Wealthy Southern planters begin to come North during parts of the Summer months

# Impact of the Steamboat - 7

- Along with breech-loading rifles and machine guns, the steamboat allowed Europeans to penetrate into the interior of China and Southeast Asia
- Along with quinine, the steamboat allowed Europeans to penetrate into the interior of the continent of Africa
  - This allowed commercial and eventually political domination of the African hinterland. Formerly, Europeans avoided the African interior because of the likelihood of being infected with malaria

# Ocean Steamers

- While steam power was an obvious advantage for boats on rivers and lakes, it was much less of an advantage on ocean-going ships because the amount of fuel that had to carry limited the amount of space available for carrying cargo
  - Thus, early steam-powered ocean vessels were hybrids, using steam to maneuver independently of the wind and sail to conserve fuel

# Ocean Steamers - 2

- In 1840, Samuel Cunard [Cunard Lines] developed transatlantic commercial steamships that used coal rather than wood (which took up more space)
- Steamers made possible regularly-scheduled transoceanic trips with exact times of departure and scheduled times of arrival at a destination

# Ocean Steamers - 3

- Steamers were much faster than sailing ships
  - In the 1840s, It took a westward-bound sailing ship an average 34 days to cross the Atlantic; it took a steamship only 14 days to cover the same distance
  - In 1775, it took a sailing ship 36 days to sail from New York City to London; in 1850, it took a clipper ship 14 days; in 1901, it took a steamship 8 days

# Ocean Steamers - 4

- In comparison with sailing ships, Steam powered ships:
  - Could be constructed of iron/steel rather than wood
  - Could be much larger than sailing ships
  - Could carry more cargo
  - Required fewer men to operate
- As a result, shipping costs dropped, especially as the technologies of the screw propeller and marine steam turbine engine became common
  - Between 1879-1902, the cost of shipping 8 bushels of wheat from Chicago to London fell from an average 11 shillings to less than 3 shillings

# Refrigerated Ships

- By the late-1870s, refrigerated ships had been developed that could transport frozen meat and fish from the U.S., Canada, Australia, and New Zealand to Europe
  - This vastly increased the amount of food that was traded. From the 1850s to 1913, food exports rose from 4 million tons per year to 40 million tons

# Consequences of Steamships - 1

- Faster, cheaper, and safer transoceanic travel
  - Facilitated the large-scale emigration of Europeans to the United States, Canada, Brazil, Argentina, Australia, New Zealand, and South Africa
- Allowed an international market in wheat, rice, corn, meat, butter, wool, and other commodities to develop
  - This impacted negatively on the landed nobility and aristocracy of Russia, Germany, Poland, and Austria-Hungary

# Consequences of Steamships - 2

- The economic decline of the landed aristocracies, both in absolute terms and relative to newly-emerging industrial elites, led many in these aristocracies to espouse Tory Socialism on the one hand and extreme Nationalism, Imperialism, Militarism, and Anti-Semitism on the other

# Consequences of Steamships - 3

- Ended the centuries-old practice of piracy
  - Steamships were too expensive for pirates to purchase and too fast for pirate-manned sailing ships to capture
  - Only with the development of fast ocean-going motorboats and containerized cargo ships with only a handful of crew members would piracy (in areas of East Africa and Strait of Malacca