

Late Medieval

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What the Middle Ages knew

- Map of the world in 1236 and 1350 from Centennial Historical Atlas



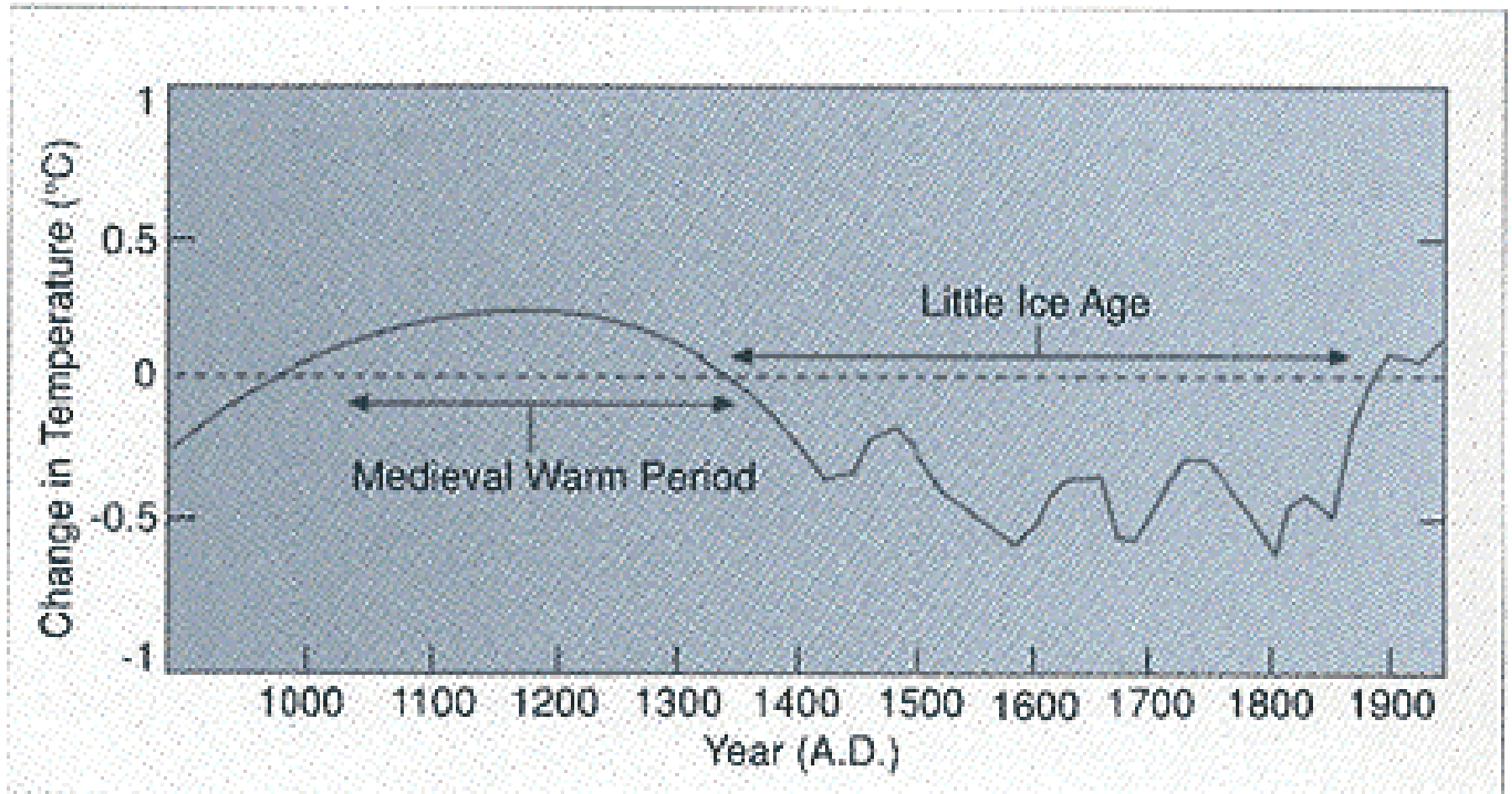
What the Middle Ages knew

- Map of the world in 1236 and 1350 from Centennial Historical Atlas





What the Middle Ages knew



What the Middle Ages knew

- The Church
 - Western Christianity: The Church appoints kings, who are simply better warriors than others (Germanic tradition)
 - Eastern Christianity: The King is anointed directly by God (Hellenistic and Oriental tradition)
 - Benedictine monks: The liturgy is the process by which the monastery acts as intermediary between humans and God (monks don't need to work anymore)

What the Middle Ages knew

- A more humane Church
 - Change of mood about predestination: Man is not absolutely evil and God is absolutely just, thus a man's deed do help towards salvation
 - The priest is God's envoy and has divine powers, e.g. during sacraments (God bestows them on the Pope who bestows them on the bishops who bestow them on the priests)
 - God does not care for the daily problems of humans, but saints (who are semi-human) do and they can perform miracles too: worship of saints
 - The Virgin Mary is compassionate: worship of the Madonna

What the Middle Ages knew

- A more humane Church
 - 1215: Sinners must confess to a priest
 - The priest becomes the moral guardian of the community
 - Processions of flagellants (lay people who aim for monk-like spirituality)
 - Emphasis on purgatory and masses for the dead (Council of Florence of 1031, Pontifical definition of 1259)

What the Middle Ages knew

- A more political Church
 - Clunyan reform: only cardinals can elect the pope (1059)
 - Gregorian reform: primacy of the papacy over the empire, infallibility of the Church, right of the pope to depose emperors (1073)
 - There is a higher source of justice by which even the ruler has to abide. The Church is a parallel power. The power of the ruler is limited.
 - The Church destroys the Empire (Diet of Worms 1122, defense of Italian communes, crusades, collapse of the empire)
 - Donations of land to the Church peak in the 10th century (before the year 1,000)

What the Middle Ages knew

- A more political Church
 - Gregorian reform:
 - a unified world order,
 - social conscience (the Church to be on the side of the poor),
 - political conscience (the powerful are spiritually poor)

What the Middle Ages knew

- A more efficient Church
 - Celibacy of the priests to end nepotism (if a priest has children, he will try to pass on privileges to them)
 - Marriages between members of the same family are forbidden (to encourage donations to the Church by the surviving spouse)

What the Middle Ages knew

- A more political Church
 - Innocent III (1198):
 - Papal monarchy (the Pope is the supreme authority of all archbishops)
 - The Pope is the only interpreter of God on Earth
 - Kings are responsible to the Pope not directly to God
 - The Church becomes a secular power
 - Innocent III and French king Philippe Auguste defeat German emperor Otto IV and English king John at the battle of Bouvines (1214)

What the Middle Ages knew

- A more political Church
 - Innocent III (1198):
 - Fourth Lateran Council (1213)
 - Annual confession mandatory for all Christians
 - Seven sacraments that follow the life of a Christian from birth to death, including marriage
 - Economic and political power of the Church over the individual from birth to death

What the Middle Ages knew

- A more political Church
 - Innocent III (1198):
 - Recognition of Franciscan and Dominican orders, that provide a way for ordinary laymen to share in the spiritual experience without becoming priests
 - Urban IV (1261):
 - The Pope's own law court ("Rota Romana")
 - Extensive taxation of the clergy
 - Local appointments decided by Rome (and determined by Rome's needs not local needs)
 - The Papacy becomes a vast bureaucratic institution

What the Middle Ages knew

- A more political Church
 - The Pope and not the Emperor is the leader of Christianity
 - The Church as the unifying element of Europe
 - The Church control education
 - The Church control the arts
 - Bishops control non-inheritable lands
 - Latin

What the Middle Ages knew

- A more political Church
 - The Church controls the capitalist economy of Europe
 - Income: charitable gifts and taxes
 - Resources: land and minerals
 - Factories: monasteries
 - Output: cathedrals
 - The Church generates both economic demand and supply

What the Middle Ages knew

- A more political Church
 - Medieval synthesis: Church, Cities, Kings (clergy, bourgeoisie, nobility)
 - “The house of God is divided into three: one group prays, another fights and the other labors” (Bishop Adalbert of Laon, 1027)

What the Middle Ages knew

- A more political Church
 - Religious persecutions
 - Persecution of Jews and Muslims (Fourth Lateran Council of 1215)
 - Jews expelled from Britain (1290) and France (1306), massacred in Spain (1391)

What the Middle Ages knew

- Crusades (nine campaigns, 1095-1270)
 - Goal:
 - Defend Christian pilgrimage routes to Jerusalem
 - Retake Jerusalem from the Seljuk Turks
 - Unite a fragmented Christian world
 - Not a goal: invade the whole of the Islamic world
 - Not a goal: convert the Muslims
 - Causes:
 - A more powerful Church unites Europe
 - A more humane Church unites all social classes
 - Population boom throughout Europe
 - Control of lucrative trade routes

What the Middle Ages knew

- Crusades (1095-1270)
 - 1009: The Fatimids destroy the basilica of the Sepulchre in Jerusalem and the pope, Sergius IV, calls on all Christians to avenge the crime
 - The Church does not have political power, let alone military power
 - Leo IX (1048-54) and especially Gregory VII (1073-84) establish the principle that the Church should use military force for holy wars

What the Middle Ages knew

- Crusades (1095-1270)
 - Alexius of Byzantium asks the Pope Urban II for help against the Seljuqs
 - His real goal is to recover Antioch (Syria) not Jerusalem
 - Nov 1095: Urban II in France calls for a crusade to recover Jerusalem where the Holy Sepulchre has been destroyed and Christians have been massacred
 - The Church has excommunicated the German emperor and the French king
 - No European king responds, but many dukes, counts and barons do

What the Middle Ages knew

- Crusades (1095-1270)
 - Urban II turns the vogue of the pilgrimage into a crusade to recover Jerusalem
 - 1092: Seljuq vizier Nizm al-Mulk is assassinated by fanatic Shiites and the sultan Malik Shah dies of natural causes, a coincidence that leaves a power vacuum in the Seljuq empire

What the Middle Ages knew

- Crusades (1095-1270)
 - Crusade I (1095)
 - From Nicaea to Anatolia to the Armenian mountains (where Armenians collaborate)
 - 1096: French knight Godfrey of Bouillon leads the combined armies
 - 1098: First crusader state: Godfrey's brother Baldwin of Boulogne's Edessa/ Urfa
 - 1097-98: Siege of Antioch
 - 1099: Massacre of Jerusalem
 - 1100: Godfrey dies and Baldwin becomes king of Jerusalem
 - Castles to protect trade routes between Syria and Egypt and sea routes to Europe

What the Middle Ages knew

- Crusades (1095-1270)
 - Crusader states
 - Castles to protect trade routes between Syria and Egypt and sea routes to Europe
 - Skilled workers from Spain, France and Italy
 - Succession problem: bad luck
 - » Baldwin I had no child
 - » Baldwin II had only four daughters
 - » Baldwin III married a 12-year-old and died young
 - » Baldwin IV died young of leprosy

What the Middle Ages knew

- Crusades (1095-1270)
 - Crusade I: A popular movement with no leader
 - Crusade II (1147–1148): Two national armies
 - Trigger: Muslims reconquer a crusader state, Edessa (1144)
 - Louis VII of France & emperor Konrad III
 - Summoned by pope Eugene III
 - Both armies defeated by the Seljuqs
 - Crusade III (1190): An alliance of the western powers
 - king Richard of England, king Philippe Auguste II of France, and emperor Friedrich Barbarossa
 - Barbarossa dies on the way to Jerusalem
 - Richard conquers Cyprus
 - Crusade IV: Venezia/Venice loots Constantinople

What the Middle Ages knew

- Crusades (1095-1270)
 - Military religious orders
 - The monk-knight protects the pilgrimage and trade routes, and is not subject to the control of the bishop
 - Knights of St. John of Jerusalem (“Hospitallers”)
 - Poor Knights of Christ and of the Temple of Solomon (“Templars”)
 - Teutonic Knights from Germany

What the Middle Ages knew

- Crusades (1095-1270)
 - Military religious orders after the Crusades
 - Hospitallers settle in Rhodos (1310) and then Malta
 - Templars settle in Cyprus (1291)
 - Teutonic Knights settle in Prussia (1309)

What the Middle Ages knew

- Saladin
 - After the second crusade, Nur al-Din (sultan of Damascus) and the crusader state of Jerusalem fight for influence on Fatimid Egypt
 - Nur al-Din is more determined to destroy the heretic Shiites than the Christian infidels
 - Aladin's king Nur al-Din, the Christian king Amalric and the Fatimid vizier Shirkuh all die (luck!), and Aladin (a Kurdish mercenary) becomes the heir to the Fatimid kingdom (a Shiite kingdom considered heretical by Sunnis) and to Nur al-Din's kingdom
 - Aladin publicizes himself as a fighter for Islam but, until 1187, only conquers Muslim kingdoms
 - 1187: Aladin conquers Jerusalem

What the Middle Ages knew

- Crusades (1095-1270)
 - The Christians give up because:
 - French popes
 - One Hundred Years War between France and England (1337-1453)
 - The cost of war has skyrocketed due to mercenaries and weaponry

What the Middle Ages knew

- Crusades (1095-1270)
 - Why the Christian kings lost the Crusades
 - The rulers were coming from Latin Europe, heirs to the barbaric hordes
 - The subjects were Greeks, heirs to an ancient and superior civilization

What the Middle Ages knew

- Crusades (1095-1270)
 - Consequences:
 - End of medieval isolation of Western Europe
 - Weakening of Constantinople
 - Rise of Italian cities
 - Strengthening of French and English monarchies
 - Exchange of ideas with the East
 - Revival of trade with the East
 - Religious persecution

What the Middle Ages knew

- Decline of the Church
 - 1000: The world does not end
 - Cities nurture new social classes (lawyers, teachers, clerks) that compete with priests and monks
 - The defeat of the German emperor shifts power to the French king
 - France does to the Church what the German emperor wanted to do: subjects it
 - Avignon 1309-78

What the Middle Ages knew

- Love
 - Idealized (Platonic) love
 - Spiritual element
 - Allegorical element
 - Conventions of love discourse and behavior

What the Middle Ages knew

- Chivalry (12th-14th c, originally northern France)
 - The stirrup increases the power of the knights and helps create feudalism

What the Middle Ages knew

- Chivalry (12th-14th c, originally northern France)
 - Importance of mounted warrior to fight Eastern barbarians and Muslims
 - Knighthood an expensive job (armor, horse, weapons)
 - Nobles grant land to mounted warriors in return for their services
 - Tournaments to train the knights
 - Knights/chevaliers form new caste of nobility
 - Initially (1000) they are feared like bandits by the Church, but slowly they devote an ever larger share of their wealth to the glory of God

What the Middle Ages knew

- Chivalry (12th-14th c)
 - Courtly love: devotion to a lady (mostly adulterous love)
 - Knights embrace poetry and music to romance their lady
 - Heroism and Love
 - Asceticism and Eroticism
 - Tournaments as proof of valor and devotion

What the Middle Ages knew

- Chivalry (12th-14th c)
 - Code of chivalry develops: Christian piety, social manners
 - The Peace of God forbids knights from attacking peasants, women, priests, merchants
 - The Truce of God forbids knights from waging war on sundays and holy days
 - Orders of the Knights
 - Code of chivalry inspired by the ideals of Christianity, i.e. transnational

What the Middle Ages knew

- Chivalry (12th-14th c)
 - Increasing popularity of pilgrimage
 - St Peter's, Rome
 - Saint Sepulchrum, Jerusalem
 - Santiago de Campostela, Spain
 - The Church converts the knights into servants of God
 - Violence is bad, except when waged against non-christians
 - Knights protect the journey of pilgrims
 - Eventually, knights also become an offensive, not only defensive, army (crusades)

What the Middle Ages knew

- Chivalry (12th-14th c)
 - Military religious orders of the 12th c
 - Originally founded in Jerusalem to protect the crusader states and escort pilgrims
 - Poverty and chastity vows
 - Their strategic role leads to increased wealth and power

What the Middle Ages knew

- Chivalry (12th-14th c)
 - Hospitalers (the Knights of Saint John)
 - Originally founded (1091) to perform charitable functions near the Church of Saint John the Baptist in Jerusalem
 - Charter based on the monastic rule of Saint Augustine
 - Fortresses in Palestine (Krak des Chevaliers, Belvoir, Margat)
 - Muslim reconquer Palestine and Hospitalers move to Rhodes (1309)
 - Only Christian presence in the Eastern Mediterranean in 1453 (and Malta in 1530)

What the Middle Ages knew

- Chivalry (12th-14th c)
 - Knights Templar (the Poor Knights of Christ, Hugh de Payens, 1119)
 - Founded to protect pilgrims to Palestine
 - Charter modeled on the Cistercian monks
 - Fortresses throughout Palestine
 - Banking system to move money from/to Palestine
 - Complex systems for the transportation of wealth to and from the Holy Land)
 - Cheques (safer than transporting large amounts of gold or silver)
 - The world's first international bankers

What the Middle Ages knew

- Chivalry (12th-14th c)
 - Knights Templar (the Poor Knights of Christ, Hugh de Payens, 1119)
 - Muslim reconquer Palestine and Templars' headquarters move to Cyprus (1291)
 - The Pope dissolves the order and transfers their property to the Hospitalers (1312)

What the Middle Ages knew

- Chivalry (12th-14th c)
 - Teutonic Knights (the Knights of Saint Mary's Hospital)
 - Founded at Acre in Palestine in 1190 to defend a hospital
 - Limited to German noblemen
 - Monastic rule of the Templars
 - Eastern Europe (Prussia in 1226, forcible conversion of the Slavs,
 - Resettlement of Germans into Prussia, rapid expansion to Livonia,
 - Providing protection to the Hanseatic League,
 - Defeated by Poland/Lithuania in 1410)

What the Middle Ages knew

- Decline of Chivalry
 - The Hundred Years' War (1337-1453) requires extensive army of professional mercenaries, not just knights
 - Battle of Crecy (1346)
 - Battle of Poitiers (1356)
 - Battle of Agincourt (1415)
 - Chivalry ideals are obsolete and even suicidal

What the Middle Ages knew

- Decline of Chivalry
 - Battle of Crecy in northern France during the "Hundred Years' War" (1346)
 - Superior “fire power” (longbows and cannons) allows Edward III's much smaller English army of 16,000 to defeat Philip VI's larger French army of 80,000 at the
 - Knights on horseback are defeated by infantry
 - Archers are more important than horses
 - Ever heavier armors become counterproductive (knights need help even to get up)

What the Middle Ages knew

- Decline of Chivalry
 - England: longbow economy



What the Middle Ages knew

- Decline of Chivalry
 - Gunpowder makes the armored knight irrelevant
 - Mercenaries trained on the battleground are more reliable warriors than knights trained in tournaments
 - Military importance of the knight declines, and the importance of chivalry rituals increases
 - Large financial burden implied by the rituals of knighthood

What the Middle Ages knew

- Decline of Chivalry
 - Knights in the nation-state era wage war for the glory of their nation
 - Exclusive social distinction
 - Orders of knights in England, France, Bourgogne, Iberia
 - Code of chivalry specific to each nation

What the Middle Ages knew

- **Decline of Chivalry**
 - **Gunpowder helped destroy feudalism**

Golden Century

- 13th century = Golden Century
 - Improved communications between Europe and Asia thanks to the Mongol Empire
 - Improved business techniques thanks to the Italian merchant colonies of the Crusader states
 - Silver, copper and gold mines of Bohemia, Carpathians and Transylvania for coin minting
 - Improved sea trade in the Northern Sea thanks to supremacy of the Hanseatic League

Golden Century

- 13th century = Golden Century
 - Commercial banking in Italy thanks to large trading companies
 - Rudimentary cheques (transfers of money by written order) and banknotes (promissory notes) fuel inter-European trade (Marco Polo describes Chinese banknotes, which are real banknotes)
 - Courier service thanks to branch offices (“scarsella” between Firenze, Genova and Avignon)

Golden Century

- 13th century = Golden Century
 - Agriculture improved by agronomy
 - Landlords still more consumers than producers
 - Deforestation of Europe
 - Labor-intensive one-crop grain cultivation
 - Land reclamation (both by free mountain peasants, castles, monasteries, city capitalists)
 - Textile improved by spinning wheel (first instance of belt transmission of power)
 - Silk culture in Italy thanks to the Crusade of 1204

Golden Century

- 13th century = Golden Century
 - Manufacturing improved by mills
 - Machines

Golden Century

- 13th century = Golden Century
 - Population boom
 - Population almost doubled between 1000 and 1300 (38 million to 74 million)
 - End of Viking, Magyar and Saracen raids
 - Decline of slavery
 - Expansion of arable land (deforestation)
 - Improved agricultural techniques

Golden Century

- Revival of the town
 - 5th-9th century: towns disappear in northern Europe but still exist in southern Europe
 - 11th-14th century: migration from the countryside increases the population of towns
 - The town is the "Frontier" that people aspire to
 - The countryside is still a feudal world. the town is increasingly autonomous (different laws even when under the same ruler)
 - The countryside is organized vertically (from the lord to the peasants), the town is organized horizontally (commerce)

Golden Century

- Revival of the town
 - The town is the paradise of the merchant (in China and in the Middle East towns existed but merchants were one of the lowest classes)
 - The aristocracy continues to thrive in the countryside, and only in Italy it builds palaces in towns
 - Downside: living conditions deteriorate and foster epidemics

Golden Century

- Birth of the money economy
 - The rise of the towns creates new opportunities for employment for the countryside serfs
 - Flight of serfs to the towns increases the value of labor
 - The lord has to pay serfs to work
 - At the same time agriculture becomes more profitable because demand for food increases due to towns that need to import their food
 - The plague further increases the negotiating power of laborers

Golden Century

- Birth of the money economy
 - Towns are not as self-sufficient as the manor is
 - Food, clothing, raw materials, construction materials
 - Wages and prices are determined by guild regulations, not by the market

Golden Century

- Money
 - Solidus: gold coin of the Romans (used until the 15th c)
 - Denarius: silver coin of the Franks (since 781 the most common coin of Western Europe but available in only one denomination)
 - 1192: Venezia mints the "grosso" (silver, multiples of the denarius), widely accepted in Asia
 - 1231: Friedrich of Sicily mints a golden coin
 - 1252: Firenze mints the golden "fiorino" (one pound of grossi), which becomes the money of international finance in the West



Golden Century

- Money
 - 1266: France (Louis IX) mints the "gros Tournois" (still silver)
 - 1284: Venezia mints the golden "ducato" (also one pound of grossi)
 - 1312: Castilla (Alfonso XI) mints gold coins
 - 1344: England (Edward II) mints gold coins
 - 1457: Portugal mints the "cruzado" (gold coin) using gold from Africa's Gold Coast
 - 1472: Venezia mints the "lira tron" (silver coin) using silver from southern Germany

Golden Century

- Money
 - The Italians adopt gold coinage, ending a long period of monetary confusion
 - But this increases the value of gold
 - Two thirds of the gold imported by Europe is carried by Arabs via the caravan route from Timbuktu in Mali to the Moroccan coast until Portugal occupies the Gold Coast (1450s) and Spain occupies the Americas (1500s)
 - Rich deposits of silver discovered in Saxony and Tyrol (1450s)

Golden Century

- Legal revolution
 - Rediscovery of Roman law (Irnerius in Bologna about 1100)
 - Ideal of universal laws for Christian Europe
 - Emergence of the legal profession: the administration of the law is increasingly delegated to specialists
 - Influence of scholastic logic
 - Literacy of the lawyers produces a body of legal documents:
 - Azo's "Summa" (1210, influential for 4 centuries)
 - Gratian's "Concordia discordantium Canonum/ Decretum" (1140, influential for 8 centuries)
 - Gregory IX's "Liber Extra" (1234)

Golden Century

- Legal revolution
 - Lacking full proof, confession is the main proof (except in England, where the defendant prohibited testimony from the defendant until 1898)
 - Revival of torture in order to extort confession (except in England)
 - Confession under torture is the judgment of God (God would not permit a wrong to be committed)
 - Sacramental confession has become mandatory in the church (1215)
 - 13th c - 18th: Torture common in Europe as a way to extract confession
 - Limited use of imprisonment
 - Widespread use of the death penalty

What the Middle Ages knew

- Age of machines
 - Harnessing energy from water and wind
 - Building a large-scale economy not on human power (slaves, peasants) but on natural energy
 - Roman Empire relies on free labor (slaves); medieval society starts relying on machines to reduce the dependence on labor
 - First technology progress in Europe in 2,500 years
 - Catch: the energy of water and wind has to be exploited on the spot (cannot be transported like coal and oil)
 - A fragmented political landscape encouraged experimentation in multiple regions
 - Exploration and crusades bring Middle-eastern and Eastern technology to Europe

What the Middle Ages knew

- Age of machines
 - Horizontal water mill (Egypt, 2nd c. BC)
 - Vertical water mill (Vetruvius, 1st c. BC)
 - Windmill (Iran, 6-9th c AD)
 - 10th c. AD: mills pervasive in Europe for grinding grain, fulling clothes, pressing olives and tanning (especially in the Islamic world)

What the Middle Ages knew

- Age of machines
 - Monasteries pioneer waterpower and windpower technology (esp Cistercians) predating the industrial revolution (eg to propel iron foundries)
 - The first water-powered iron mills (12th c) were Cistercian (Italy, Germany, England)
 - William the Conqueror's "Domesday Book" (1086) lists 5,624 watermills
 - Dams on rivers to power waterwheels
 - Watermill (11th c) anchored to a water source, which is generally located on a lords' estates
 - Windmill (12th c) is the "commoners' mill" because it can be anywhere

What the Middle Ages knew

- Age of machines
 - Paper-mill (1255 Genoa, 1348 Troyes, 1390 Nuremberg)
 - First water-powered paper mill: Fabriano, 1276
 - End of 12th c: windmill (England, North Sea)
 - 14th c: the tower mill (in which only the top rotates)
 - The Arabs import Italian textiles that are cheap because made with water mills, a technology that the Arabs never mastered
 - Demand for church bells, nails and later firearms creates demand for smelt iron which leads to the “invention” of the blast furnace

What the Middle Ages knew

- Age of machines
 - Water powers papermaking, textile industry and iron forging
 - Mass production of paper stimulates book publishing, first in monasteries then in towns
 - Textile industry is an international trade that links sellers of raw materials and buyers of finished goods in different countries
 - Iron making is one of the first mass production industries

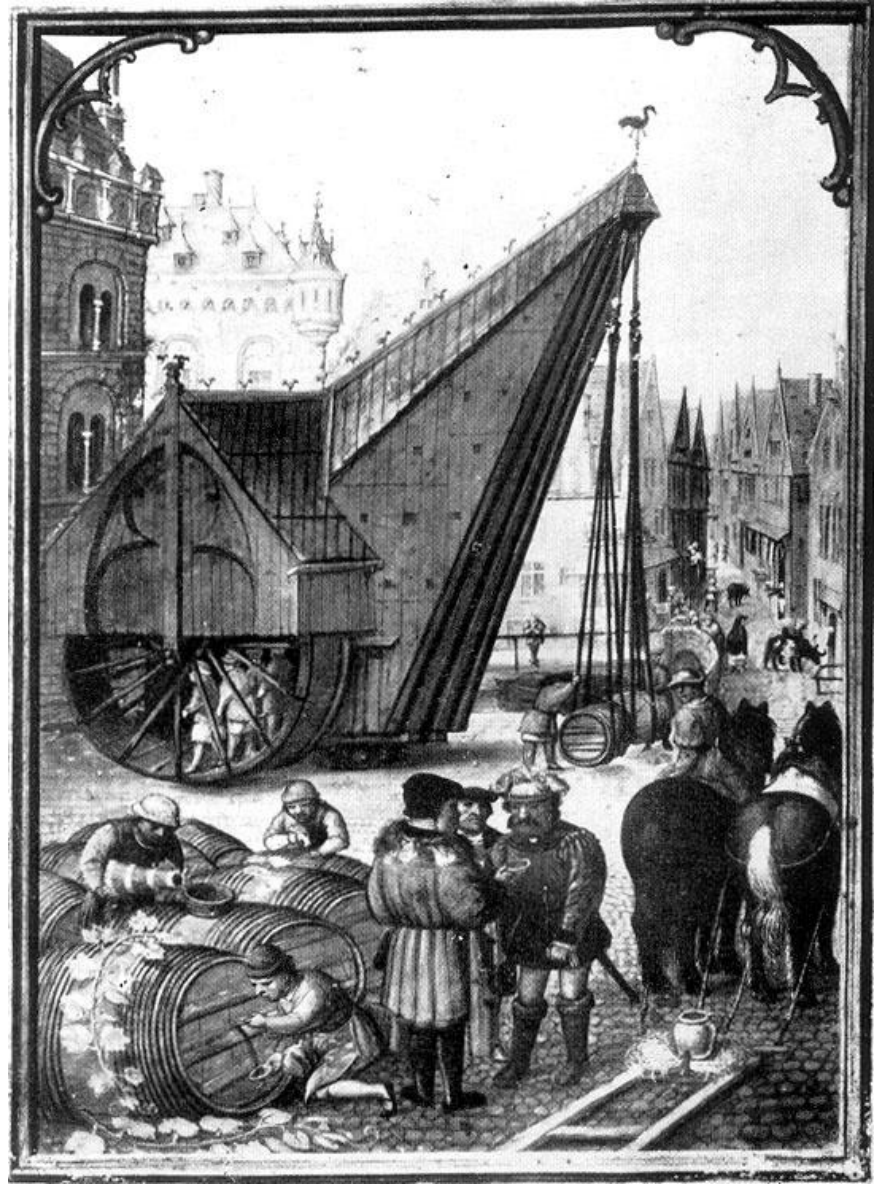
What the Middle Ages knew

- Age of machines
 - Water power used not only for grinding grain (as the Romans did) but also for the textile industry (oldest reference to a fulling mill: 1168) and for sawing
 - No generalized applications of wind/water power, and limited ability to transmit power

What the Middle Ages knew

- Age of machines

The great crane of Bruges



What the Middle Ages knew

- Age of machines
 - 9th c. AD: crank (China, 1 c. AD)
 - 1126: artesian well (invented by the Carthusians in Artois)
 - 12th c. AD: trebuchet (catapult)
 - 12th c. AD: paper (Spain, also from China via Arabs)
 - End of 12th c: windmill (England, North Sea, from Iran)
 - Paper-mill (1255 Genoa)
 - 13th c. AD: mechanical clock and planetarium
 - 13th c. AD: spinning wheel (first instance of belt transmission of power, from China)
 - 1285: spectacles (Italy)
 - 12th c: blast furnace (Sweden)



“Dominican” Frescoes (1352) by Tomaso da Modena in San Nicolo, Treviso (Italy): spectacles of Cardinal Ugo, lens of Niccolò da Rouen, sandglass of Cardinal William



What the Middle Ages knew

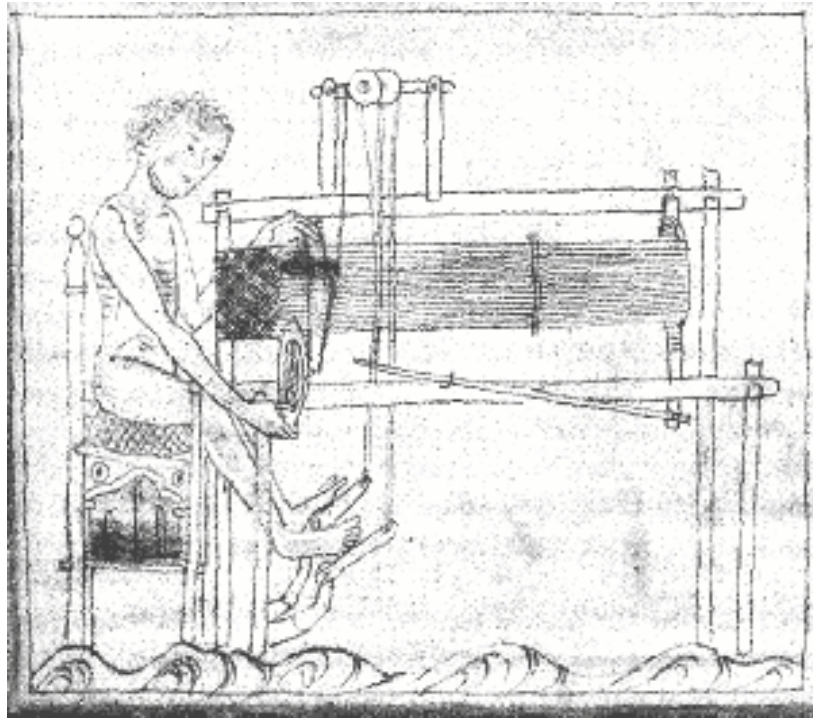
- Age of machines
 - Textiles (11th-12th c)
 - Linen (ancient western technology)
 - Wool (Flanders)
 - Cotton (Pianura Padana)
 - Silk (Sicily, but mostly imported)

What the Middle Ages knew

- Age of machines
 - Milano (12th c) center of military technology (weapons, armors)
 - Cannon (late 13th c)
 - Decline of the castle (15th c)
 - The first Portuguese ship in Guangzhou/Canton (1517) shocks the Chinese because of the cannons
 - Handguns (end of 14th c)

What the Middle Ages knew

- Age of machines
 - Horizontal loom of 1250 (manuscript at Trinity College, Cambridge)



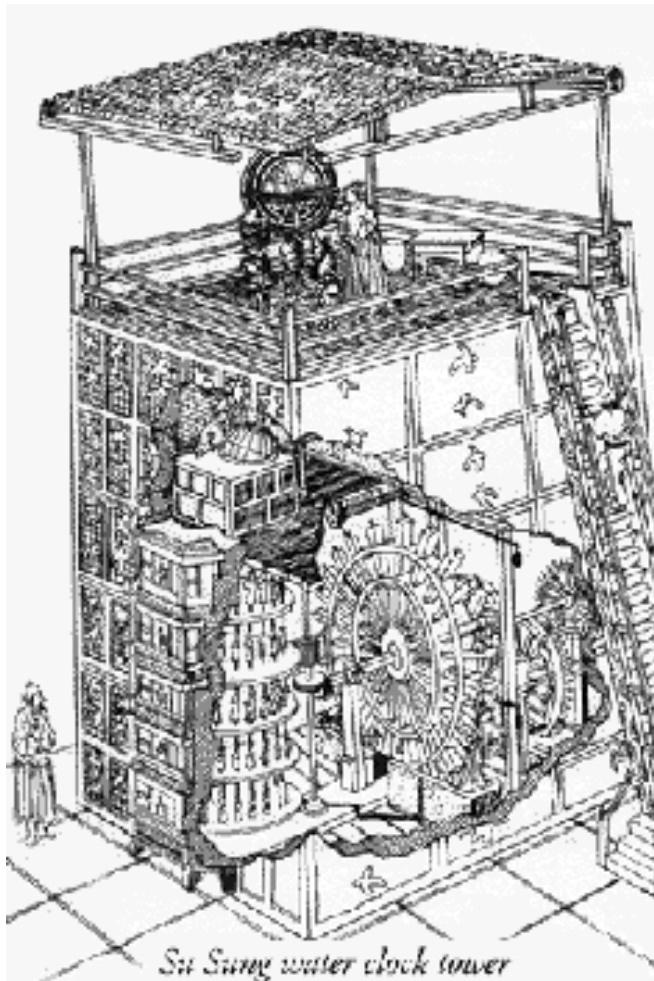
(Frances and Joseph Gies)

What the Middle Ages knew

- Age of machines
 - Most tools are still made of wood because little is known of analytical chemistry
 - Beginning of iron casting in late medieval time
 - Water-powered blast furnace (13th-14th c)

What the Middle Ages knew

- **Clocks**



Miniature from 1250 Bible
Oxford Bodleian Library



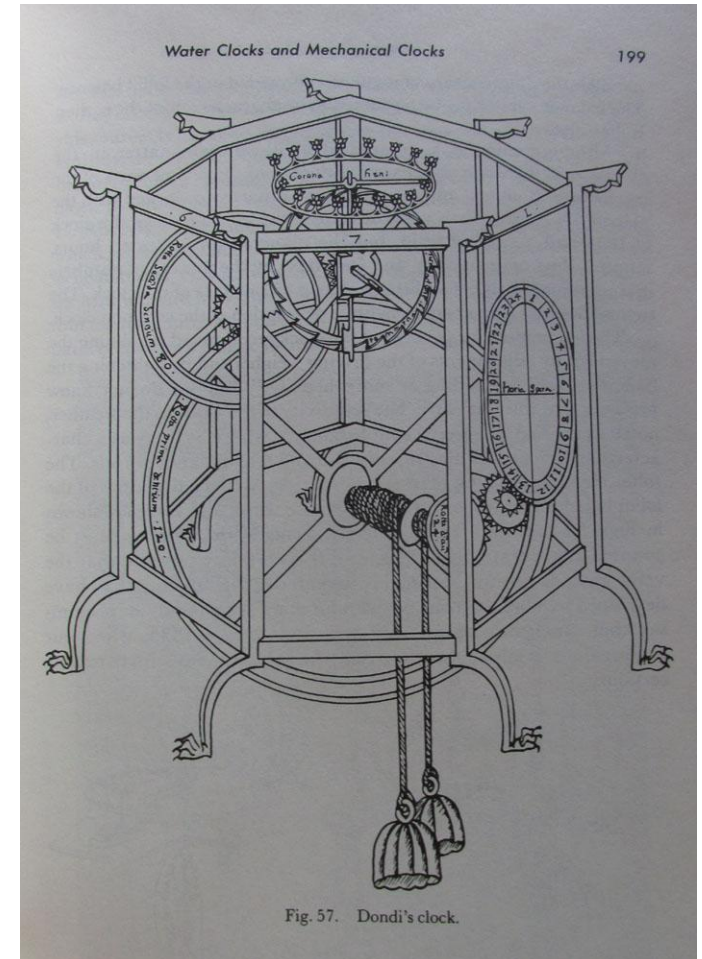
Villard de Honnecourt
(Unknown location, 1230)

What the Middle Ages knew

- Clocks
 - Escapement (end of 13th c)
 - Mechanical clock (13th c - 14th c)
 - First machine made entirely of metal
 - Initially to serve the need of astrologers (astronomical clocks) and made by blacksmiths
 - St Eustorgio (Milano, 1309)
 - Tower of Visconti palace chapel (Milano, 1335, first clock that struck automatically)
 - Giant clock of Strasbourg (1354)
 - First clockmakers (Jacopo di Dondi, who built the clock for the tower of the Carrara palace at Padua, 1344)
 - First household clocks: end of 13th c, made by goldsmiths/silversmiths, not by blacksmiths

What the Middle Ages knew

- Clocks
 - The earliest mechanical clocks could not replace waterclocks and sundials because they were a lot less accurate
 - Clocks were fashionable in the age of the machines
 - Clocks marked the passages of days, months and years, and the revolutions of planets (eg Dondi's clock, 14th c) and only incidentally marked the hour



What the Middle Ages knew

- Clocks
 - Monumental water clocks from Arabs
 - Mechanical clocks develop the technology later applied to geared wheels (geared mills)
 - Timekeeping indirectly leads to power production and transmission
 - Mechanical clocks of Italy: Milano (1335), Modena (1343), Padova (1344), etc
 - Strasbourg (1352), Henri De Vick's (1370)
 - Until the 14th century the day is divided in variable hours because of liturgical chores
 - With the inventions of the mechanical clock the use of equal hours began to spread
 - Domestic clocks begin to spread in the 15th century from around Nuremberg

What the Middle Ages knew

- Clocks
 - Water automata: largely disappeared after the fall of Rome
 - On water automata: "The Book of Secrets about the Results of Thoughts" (11th c) published in Arab Spain
 - On water automata: "The Book of Knowledge of Ingenious Mechanical Devices" (1206) published in Arab Spain
 - Water clocks expensive to build and to maintain: mainly amusement for the courts
 - China: Su Sung's "Heavenly" water clock of 1092 with escapement

What the Middle Ages knew

- Clocks
 - Mechanical alarms for monks (12th C) - Dante's "tin tin sonando" (1315)
 - The "ornamenta" of a church (12th c) include: relics, incense, chalices, bells, and clocks
 - The church tower becomes a “clock” tower
 - Earliest known professional clock-maker: Hermann Josef (1200), sacristan from Steinfeld (Germany)
 - Around this time (13th c): Italian invention of the escapement, probably by monks (500 years after China)

What the Middle Ages knew

- Clocks
 - Around 1330: 24 hours in a day, including the night, and the duration of an hour is the same in every place and in every season.
 - The clock forces ordinary people to think of the night as part of the day
 - The clock replaces the natural flow of time (the flow of individual experiences) with an abstract flow of time (the universal flow of clocks)
 - The clock begins a process of alienation of the individual from its natural environment
 - Before the invention of the clock, only monasteries valued routine daily behavior

What the Middle Ages knew

- Clocks
 - Boom of public clocks in Italy (early 14th c): Orvieto (1308), Modena (1310), Parma (1318), Ragusa (1322) but not clear what technology they used
 - Mechanical clock in the San Gottardo tower of Milano (1336): first tower clock that strikes the hours
 - A galley from Venezia carries a mechanical clock for the sultan of Delhi (1338)
 - Tower clock for the City Hall of Padova (1344)
 - Parallel development: the sandglass



What the Middle Ages knew

- Clocks
 - Giovanni de' Dondi's Astrarium (1364)



What the Middle Ages knew

- Clocks
 - Pope Urban V's "portable clock" of 1365: first portable clock, but requires a "clock carrier"
 - Boom of public clocks in the rest of Europe (late 14th c)
 - Regulation of working time (Cologne, 1374), town-hall meetings, markets, schools, preaching
 - Small portable clocks (15th c)

What the Middle Ages knew

- Clocks
 - Clocks cause people to doubt Aristoteles' principle that nothing moves unless a force is applied: clocks do move because of a "vis impressa"
 - God is the perfect clockmaker (Nicole d'Orasme, 14th c)

What the Middle Ages knew

- Clocks
 - Clock tower
 - The bell of the church tower is the medium to broadcast information in the medieval town
 - Bells also tell the hours
 - The bell is the proud of the townfolks
 - Clocks of clock towers perform a mechanical show as they toll the hours
 - Strasbourg's clock even provided medical advice to the townfolks



GianPaolo &
GianCarlo Rainieri
(Pza San Marco,
Venezia, 1499)

What the Middle Ages knew

- Clocks
 - Clock tower
 - The clocktower “secularizes” time (the first clocks were used in monasteries)
 - Ordinary lay people also acquire a schedule, just like monks had a schedule in monasteries

What the Middle Ages knew

- Age of machines
 - Theophilus Presbyter: “De Diversis Artibus” (13th c), Europe’s first technical manual
 - The art of the painter
 - The art of the glass worker
 - The art of the metal worker
 - Each village acquires its own carpenter and smith

What the Middle Ages knew

- Age of machines
 - Giovanni Tortelli's "De Orthographia Dictionum" (145#) lists these new inventions: clocks, bells, portulan charts, compass, stirrups, watermill, cembalo, organ, spectacles

What the Middle Ages knew

- Age of machines
 - Compass (from China via the Arabs): increases seafaring commerce by making the Mediterranean an open sea regardless of weather and season

What the Middle Ages knew

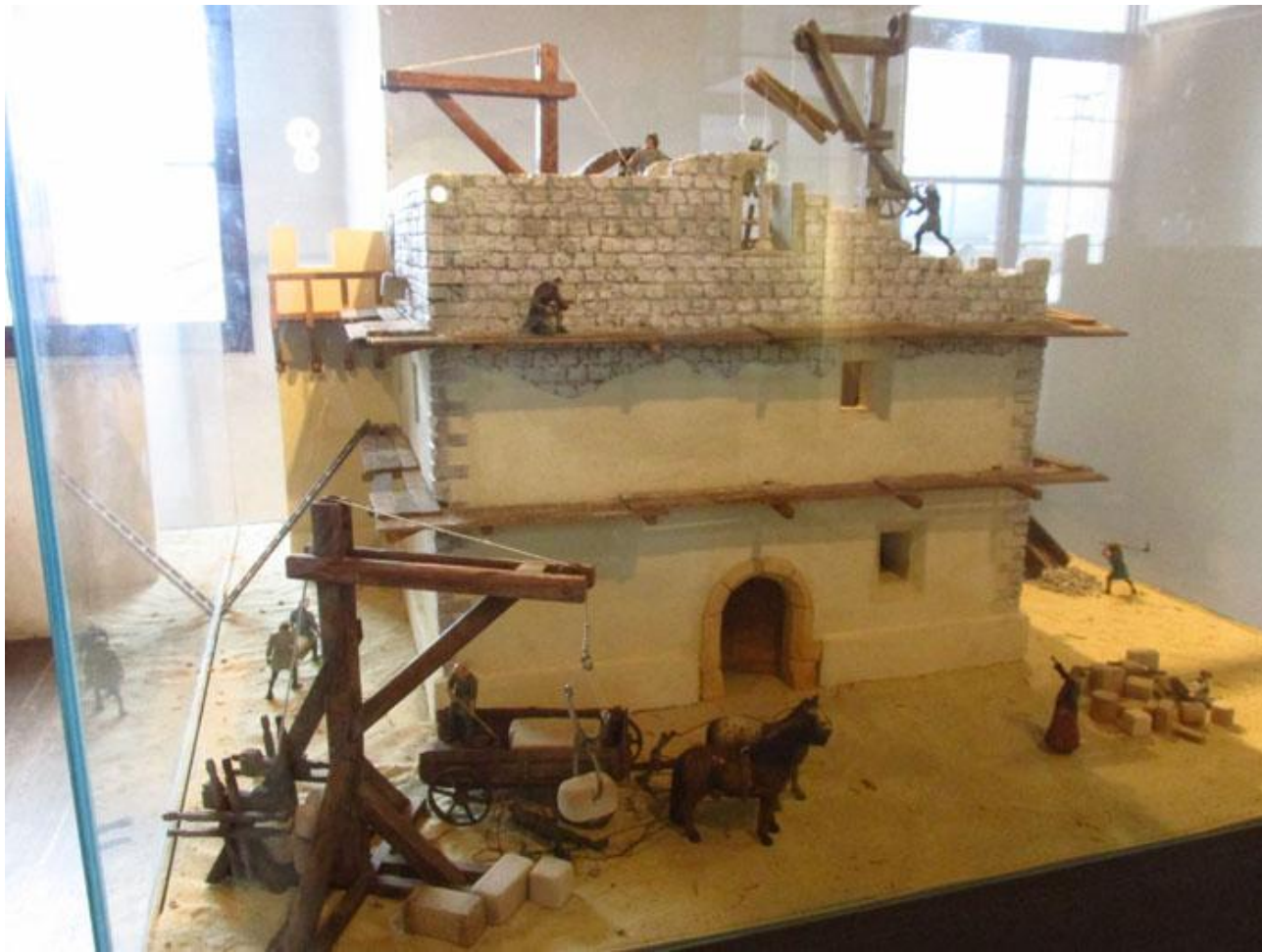
- Age of machines
 - China had already invented most of the European inventions, but they did not spread throughout China the way they spread throughout Europe
 - Inventions spread in Europe thanks to catastrophes: wars, famines, religious persecutions...

What the Middle Ages knew

- **Age of machines**
 - **Masonry Castle**
 - **Langeais, France (1000)**
 - **Hedingham, England (1140)**
 - **Krak des Chevaliers, Palestine (12th c)**
 - **Trebuchet (France, 12th c)**
 - **Crossbow (Italy, 11th c)**

What the Middle Ages knew

- **Age of machines**
 - **How to build a castle**



What the Middle Ages knew

- **Age of machines**
 - **How to build a castle**



What the Middle Ages knew

- Age of machines
 - The Bridge as a meeting and business place
 - Pont St Esprit (1309): new technique of lower arch
 - London bridge (1176-1209): houses and shops
 - Paris' Grand Pont
 - Venezia's Rialto (1255)
 - Firenze's Ponte Vecchio (1333)

What the Middle Ages knew

- Age of machines
 - Deforestation
 - Draining the ocean
 - Reclaiming the marshlands of river valleys

What the Middle Ages knew

- Age of machines
 - The town hall
 - Broletto, Como (1215)
 - Palazzo Vecchio, Firenze (1314)



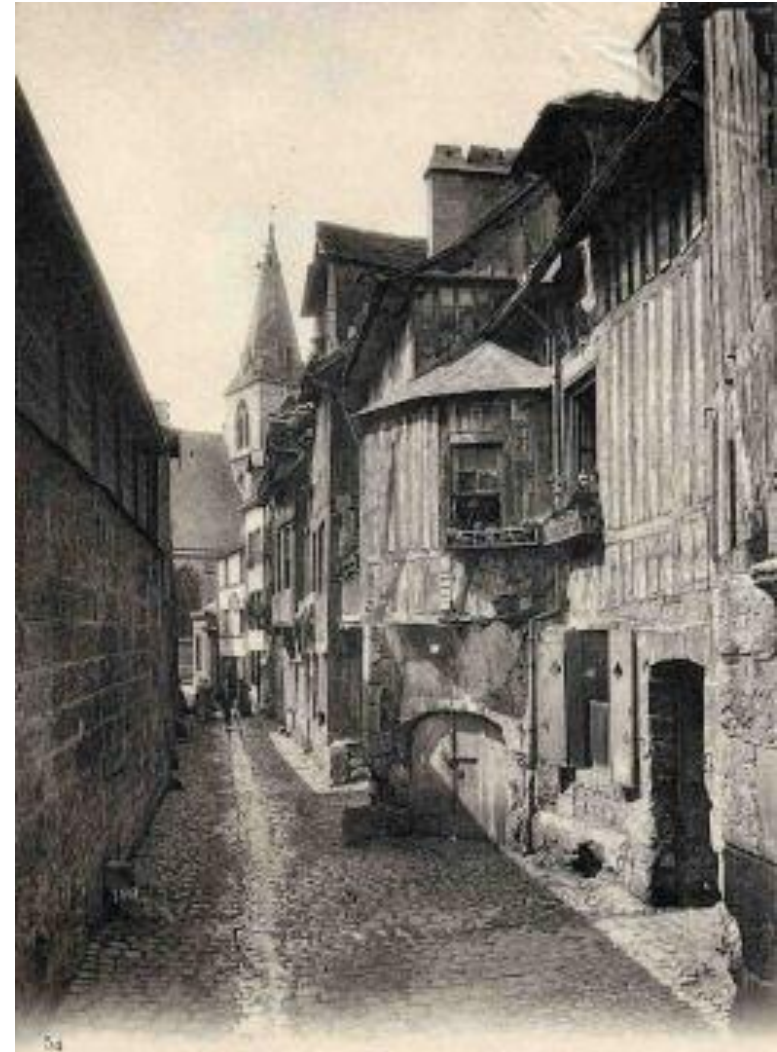
What the Middle Ages knew

- Firenze's Pontevecchio (1333)



What the Middle Ages knew

- Rouen's Rue du Matelas



ROUEN. — La Rue des Matelas

Destroyed in World War II



What the Middle Ages knew

- Paper
 - 100 BC: Chinese paper made of mulberry
 - Paper coexists with parchment for centuries because parchment is more durable (but signatures are easier to erase on parchment...)
 - Arabs make paper with rags instead of mulberry
 - Arab Spain becomes a center of paper making: olive oil mills converted into paper mills

What the Middle Ages knew

- Paper
 - Paper-mill (1255 Genoa, 1348 Troyes, 1390 Nuremberg)
 - First water-powered paper mill: Fabriano, 1276
 - Fabriano papermill (converted felting mills): water-powered drop hammer, wire mold, watermark, ammonia (mostly from human urine), rags
 - First German papermill: Nuremberg, 1390, Ravensburg 1393, Chemnitz 1408, Strasbourg 1445)

What the Middle Ages knew

- Paper
 - Textile and paper trades are linked
 - Europeans mechanize the textile industry and therefore paper-making

What the Middle Ages knew

- Paper
 - Parchment still used for books that have to last (those in libraries)
 - Dante was the last writer to write (or, better, dictate his texts to a scribe writing) on parchment
 - The spinning wheel increases the supply of rags
 - (Only in the 19th century paper began to be made out of trees)

What the Middle Ages knew

- Paper fosters...
 - Accounting
 - Courier correspondence
 - Copying of manuscripts
 - Etiquette of letter writing

What the Middle Ages knew

- Alchemy
 - Elixir of eternal life
 - Transmutation of metals

Golden Century

- Markets of the Champagne
 - Six fairs a year, each lasting two months
 - Chief item: cloth
 - Largest customers: Italians
 - Money exchangers become bankers (12th c)
 - Often the cloth merchant is also a banker
 - Most bankers are Italian ("banco")
 - Decline of Champagne after annexation to France (1285) and opening of the Atlantic route from Italy to the Flanders (1297)
 - Final blows: the Black Death and industrialization of Italy itself that reduce trade with Northern Europe

Golden Century

- Wool 1200-1300
 - Transformation from farmhouse/domestic occupation to international industry
 - England, rich in land for large-scale sheep grazing, exports the greater part of its wool to the Flanders
 - The Flanders, rich in population but not in grazing land, specializes in production of high-quality cloth
 - First manufactured good since the Roman empire to be driven by a broad international market
 - The Flanders-Italian route becomes the main trading route of the 12th and 13th centuries

Golden Century

- Wool 1200-1300
 - Men replace women at the looms
 - Wool production shifts from the countryside to the towns
 - Several specialists participate in the production of cloth
 - Wealthy merchants drive the industry
 - Consequences: concentration of capital and specialization of labor
 - Italians buy cloth at the Champagne fairs (six times a year) and resell it throughout the Mediterranean

Golden Century

- Wool 1200-1300
 - Flanders & England to...
 - Firenze (200 companies in 1336, workday of 16 hours, workweek of 6 days) to...
 - other Italian cities (manufacturing, resale) to...
 - customers around the world
 - (Eventually both England and Firenze become cloth-making centers and compete with Flanders)
 - (Firenze has the advantages of the watermill and of the banking operations)

Golden Century

- Flanders' cloth trade
 - Buys wool from England
 - Sells wool to local weaver
 - Buys cloth from local weaver
 - Sells cloth to local fuller
 - Buys finished cloth from local fuller
 - Sells cloth to local dyer
 - Buys dyed cloth from local dyer
 - Sells dyed cloth at Champagne or Flanders fair
 - Birth of a bourgeois class (drapers) and a proletarian class (the weavers)

Golden Century

- Main trading center in northern Europe:
 - 13th/14th centuries: Bruges (Flanders)
 - 15th/16th centuries: Antwerp (Flanders)

Golden Century

- Bruges



Golden Century

- The skilled worker
 - In 1230 Bologna grants citizenship, tax exemption, and interest-free loans to skilled wool and silk workers willing to relocate to the city
 - First worker in history to strike: the weaver (Douai, 1245)

Golden Century

- Effects of the technological revolution
 - Surplus of goods
 - Markets and revival of trade
 - Higher quality of life and population boom

Golden Century

- Land transportation
 - Bridges
 - Bridge-building boom of the 11th c
 - St Gothard Pass opens to pack animals thanks to bridges (1237)
 - Four-wheeled wagons prevail over two-wheeled carts
 - Comfort
 - “Chariots branlants” of the 14th c
 - Kocs (Hungary) capital of the one-horse, lightweight passenger vehicle
 - Land transport of goods faster (14-35 kms a day)

Golden Century

- Land transportation
 - Overland trade prevails over sea trade until 13th c
 - Route from Venezia/Venice to China is mostly overland
 - Routes from Italy to Northern Europe are overland until 1297 (when Genoa pioneers the route to the Flanders)
 - Peak of fairs: 13th c
 - Decline of fairs: 14th c
 - Itinerant (fair-oriented) trade replaced with permanent (commune-oriented) trade
 - Development of Firenze's textile industry reduces motivation to trade with Flanders

Golden Century

- Revival of sea trade
 - Jews: most extensive trade network in the Mediterranean
 - Italian republics: triangular trade Byzantium-Arabs-Italy (the marketplace of three civilizations)
 - Arabs: only within the Muslim world

Golden Century

- Jewish trade
 - Jewish domination of long-range trade in the 10-11th c
 - Mediterranean world, Middle East, Northern Europe
 - Main bridge between Christian and Islamic worlds (a trusted neutral non-political intermediary)
 - A network of parasiting Jewish communities throughout the Mediterranean world
 - Education (writing, arithmetics, languages)
 - Little motivation for agriculture (frequent expulsions and land expropriations)
 - Venture capital

Golden Century

- Italian trade
 - City-states, and mostly republics, like ancient Greece and Sumeria
 - The marketplace of three civilizations: Byzantium, Arabs, Holy Roman Empire
 - Ruled by wealthy families and despots but defended by mercenary troops
 - Cultural leadership moves from France to Italy (Dante, Petrarca, Giotto)

Golden Century

- Italian trade
 - A state enterprise
 - Supported by a state that invests heavily in an navy
 - Supported by state-level alliances (Byzantium, Franks, Germans)
 - 1015: Pisa + Genoa dislodge the Muslims from Sardinia and the Tirreanean stops being a Muslim sea
 - 1082: Venice obtains favorable trade conditions from Byzantium in return for use of its navy
 - 1088: Genoa+Amalfi+Pisa attack Al-Mahdiyya (Tunisia) and obtain favorable trade conditions
 - 1091: The Normans conquer Sicily
 - Network of acquired/conquered trading posts, defended with military force

Golden Century

- Italian trade
 - Mediterranean world, Middle East, Far East, Northern Europe
 - Venture capital
 - Northern expansion (connecting the Mediterranean and the North Sea via sea)
 - Genoa: sea route to Flanders (Bruges) 1277
 - Genoa: sea route to England 1278
 - Venice: sea trade to Flanders and England by 1314
 - Genoese merchant Lanzaroto Malocello discovers the Canary islands 1312

Golden Century

- Italian trade
 - Eastern expansion
 - Crusades (eventually Venice raids Byzantium)
 - Mongol Empire (guarantees safe passage through Asia)

Golden Century

- Revival of sea trade/ Italy
 - High costs of sea trade: shares of investment (“carats”)
 - Boom of 1150-1277
 - Multiplication of sea routes
 - Direct link between East and West Mediterranean
 - Direct link with the Flanders (1277) and England, causing the decline of Champagne fairs and land routes

Golden Century

- Revival of sea trade/ Italy
 - Population boom and rapid urbanization (by 1500 seven of the ten largest cities in western Europe are in Italy)
 - Emigration of Greek intellectuals to Italian city-states from Byzantium after 1354 when the Ottomans first cross into Europe (prodromes of humanism)

Golden Century

- Revival of sea trade/ Italy
 - Navigation instruments
 - Compass (merchants can sail the Mediterranean all year , even during the rainy/cloudy season when the stars don't help)
 - Navigation charts based on compass reading (printed on paper, hence demand of paper)
 - Hourglass
 - Two trips a year between Venezia/Genova and Egypt or Asia Minor

Golden Century

- Revival of sea trade/ Italian dominance
 - Textiles from northern Europe to Byzantium and Arabs
 - Wood and iron from northern Europe to the Arabs (illegal)
 - Spices, perfumes, cotton and silk from the East to northern Europe
 - Produce and raw materials from the East to Italy's cities
 - Gold from Africa to Italian city-states
 - North-south imbalance: high added-value manufactured goods (England, Flanders, Northern Italy) for produce and raw materials (Arabs, Southern Europe)
 - Slaves from the Slavic countries to the East

Golden Century

- Revival of sea trade/ Italian dominance
 - The fourth crusade (1204) opens the eastern Mediterranean and Black Sea to colonization by the Italian cities and enables travel overland to the Far East (e.g., Polo brothers)
 - After Spain's victory over the Muslims (Battle of Las Navas de Tolosa, 1212) the Italians have to compete with Spain to establish trading posts in Africa (gold, slaves, produce)
 - The Italian colonies in the Black Sea become laboratories for testing new forms of capitalism, world trade and large-scale operations
 - The Vivaldi brothers attempt the circumnavigation of Africa to obtain direct access to the spices of Asia (Genoa, 1291)

Golden Century

- Revival of sea trade/ Italian dominance
 - Sicily under Frederick II is the wealthiest kingdom in Europe with an economy based on slavery and sugar production
 - Discovery, colonization and commercial expansion (as pioneered by the Italian cities) becomes the Western model

Golden Century

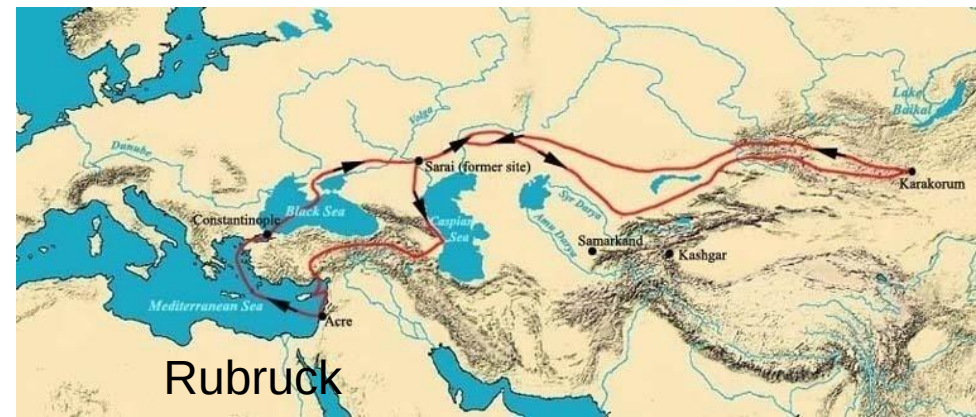
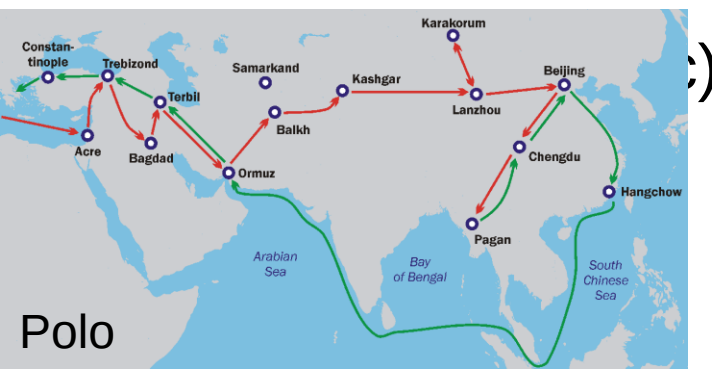
- Revival of sea trade/ Crisis (1291-1453)
 - Failure of Crusades (1291) caused Nautical Revolution
 - Goal: to increase productivity of maritime trade
 - New ship technology that would last till the steamship (combining lateen and square sails, navigational tools)
 - Piracy on the rise
 - The unity of the Mediterranean is shattered again by the fall of Constantinople (1453) and the emergence of the Ottoman empire

Golden Century

- Main drivers of East-West communications
 - Alexander and Hellenistic kingdoms (3rd c BC - 1st c BC)
 - Roman periplus (1st c BC - 5th c AD)
 - Jews of Byzantium, Arab world and western Europe (6th c - 9th c)
 - Venice (9th c - 14th c)
 - Ottomans (15th c)

Golden Century

- Travelogues
 - William of Rubruck's "Itinerarium fratris Willielmi de Rubruquis de ordine fratrum Minorum, Galli, Anno gratiae 1253 ad partes Orientales" (1255)
 - Marco Polo's "Il Milione" (1299)
 - Plano Carpini's "History of the Mongols" (13th c)
 - 1307 The Pope appoints Franciscan missionary Giovanni da Montecorvino archbishop of China (Cathay)



Golden Century

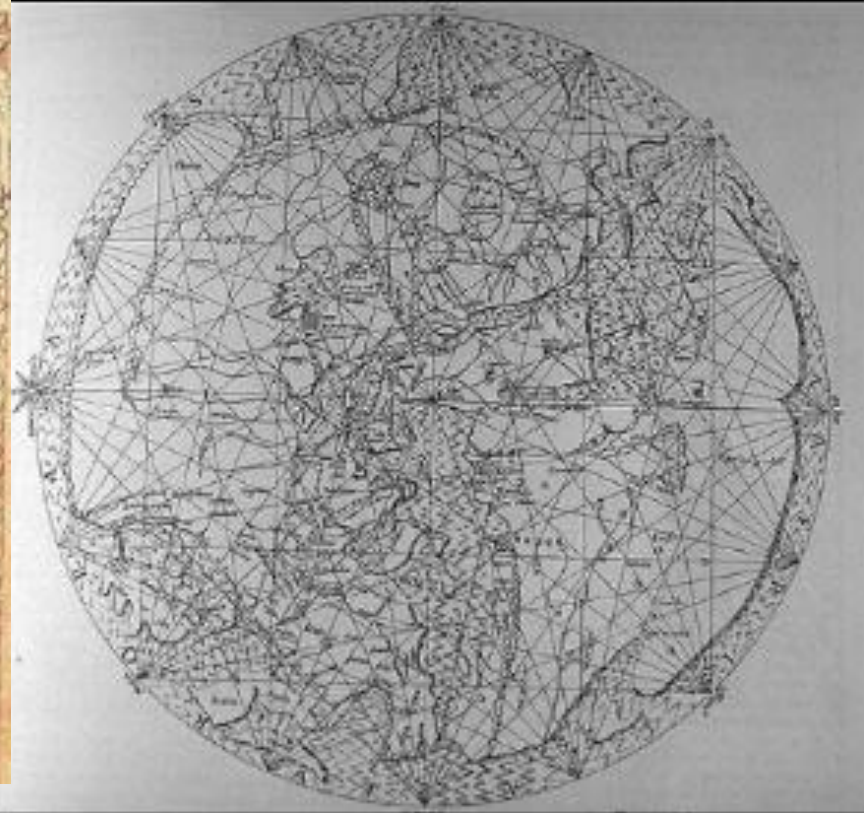
- **Maps/ “mappa mundi”**
 - **Christianity encouraged geography because of the apostolic mission to convert “all nations”**
 - **But Christian maps had Biblical constraints**
 - **Jerusalem is the center of the world**
 - **Paradise is in the East which must be at the top of the map**
 - **Three continents as prescribed by the Bible**
 - **Mythological characters of the Bible (Magi) and monsters (especially in India)**
 - **1409: Latin translation of Ptolemy’s “Geography”**



World Map, Henry of Mainz, 111x.
(oriented with East at the top)



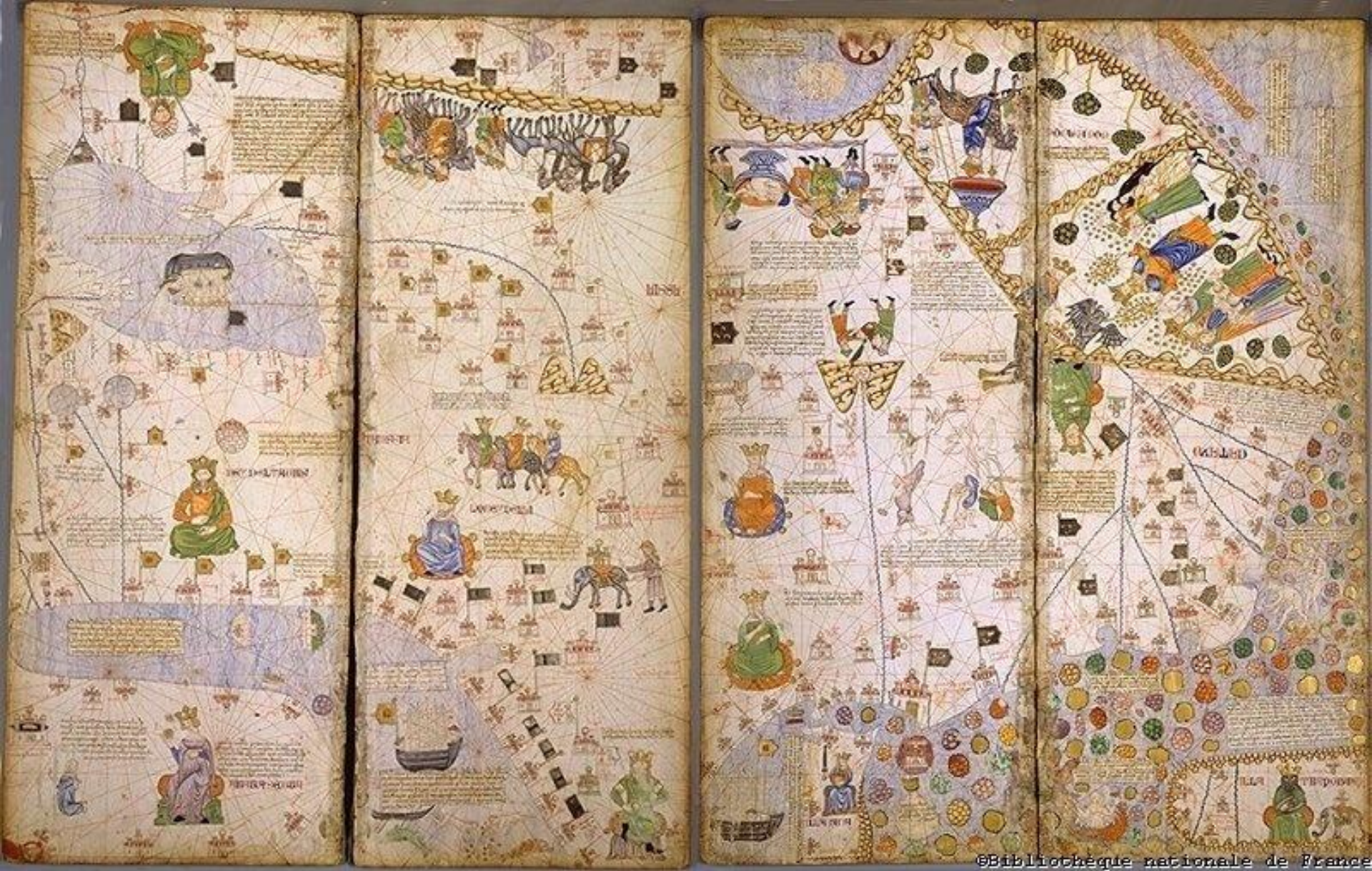
Psalter mappamundi (1225), copy of the great mappa mundi at Westminster Palace
(oriented with East at the top)



Portolan [nautical] Chart, Pietro Vesconte mappamundi, 132x
(oriented with East at the top)



The head of Christ is depicted at the top of the map, with his hands on either side and his feet at the bottom. The Map is centered on Jerusalem with east on top of the map. It represents Rome in the shape of a lion. The map incorporates pagan as well as Biblical history.



Bibliothèque nationale de France

What the Middle Ages knew

- Italian city-states
 - 12th c: Comune (Milano, Venezia, Genova, Firenze, etc)
 - Milano organizes a league that beats the Holy Roman Empire (1176)
 - Venezia conquers one-fourth of Byzantine Empire (1204)
 - 13th-15th c: Signoria (Medici in Firenze, Visconti in Milano, Gonzaga in Mantova, Montefeltro in Urbino, Estensi in Ferrara, etc)
 - 15th c-18th c: States (Ducato di Savoia, Repubblica di Genova, Repubblica di Venezia, etc)

What the Middle Ages knew

- Italian city-states



- 1300:
 - Milano 200,000
 - Venezia: 200,000
 - Genova: 100,000
 - Napoli: 100,000
 - Paris: 100,000
 - Firenze: 100,000

What the Middle Ages knew

- Italian city-states
 - Genova/Genoa
 - Dominates the Western Mediterranean trade
 - 1273: Costantinople grants Pera to Genova
 - Dominates the Central Asian trade via the Black Sea
 - 1284: defeats Pisa
 - 1293: defeats the Muslims that control Gibraltar
 - Dominates the Atlantic route to Bruges via Gibraltar
 - 1348: Black Death
 - 1381: defeated by Venezia
 - Mongol Empire disintegrates
 - Portugal and Spain challenge the Atlantic route

What the Middle Ages knew

- Italian city-states
 - Venezia/Venice/ 6th c
 - Not founded at the intersection of major trade routes
 - In fact founded deliberately away from major trade routes
 - Founded by refugees
 - A by-product of the barbarian invasions of Italy

What the Middle Ages knew

- Italian city-states
 - Venezia/Venice/ 8th c
 - Venetians don't farm
 - Venezia depends on trade for food
 - Venezia's main export product: salt
 - Secondary sources of income: plunder and slaves

What the Middle Ages knew

- Italian city-states
 - Venezia/Venice/ Byzantium
 - 814: A treaty between the Franks and Byzantium recognizes Venezia as Byzantine territory
 - Venezia is more Byzantine than Roman: no amphitheater, no aqueduct, no baths
 - Venezia's architecture is more Byzantine than Roman

What the Middle Ages knew

- Italian city-states
 - Venezia/Venice/
 - Feudal system around Europe: the aristocracy holds the land, the nobles don't participate in commerce
 - Venetian system: the aristocracy runs the commerce while land is not valuable
 - The aristocracy makes money only if Venezia makes money
 - The non-aristocrats can get rich too
 - The distribution of wealth is more equitable in Venezia than in the rest of Europe

What the Middle Ages knew

- Italian city-states
 - Venezia/Venice
 - A republic, not a dynastic monarchy
 - A distributed sea-based economic empire like Athens
 - Sources of wealth: long-distance trade of goods, slave trade and plunder
 - Dominates the eastern Mediterranean trade via Byzantium
 - Establishes a Latin Empire (1204–1261) on Constantinople (succeeds in invading the city that the Muslims had failed to invade for centuries)

What the Middle Ages knew

- Italian city-states
 - Venezia/Venice
 - 1300: Venezia is the most prosperous city in all of Europe
 - The main naval force in the Mediterranean Sea
 - A cosmopolitan city: many foreigners live in Venezia
 - Proto-industrial ship-building: specialization of labor and mass production of ships based on a standard design

What the Middle Ages knew

- Italian city-states
 - Venezia/Venice
 - Sea route to Byzantium (two months)
 - Sea route to Crete (one month trip)
 - Sea route to Trebizond (three months)
 - Sea route to Alexandria
 - Sea route to the Black Sea
 - Overland routes to Austria and Bavaria

What the Middle Ages knew

- Italian city-states
 - Venezia/Venice
 - Most profitable trade: spices to northern Europe (cinnamon, clove, nutmeg, pepper, ginger...)
 - But also: dyes, silk, carpets, gems, incense, cotton
 - But also: slaves (Black Sea)

What the Middle Ages knew

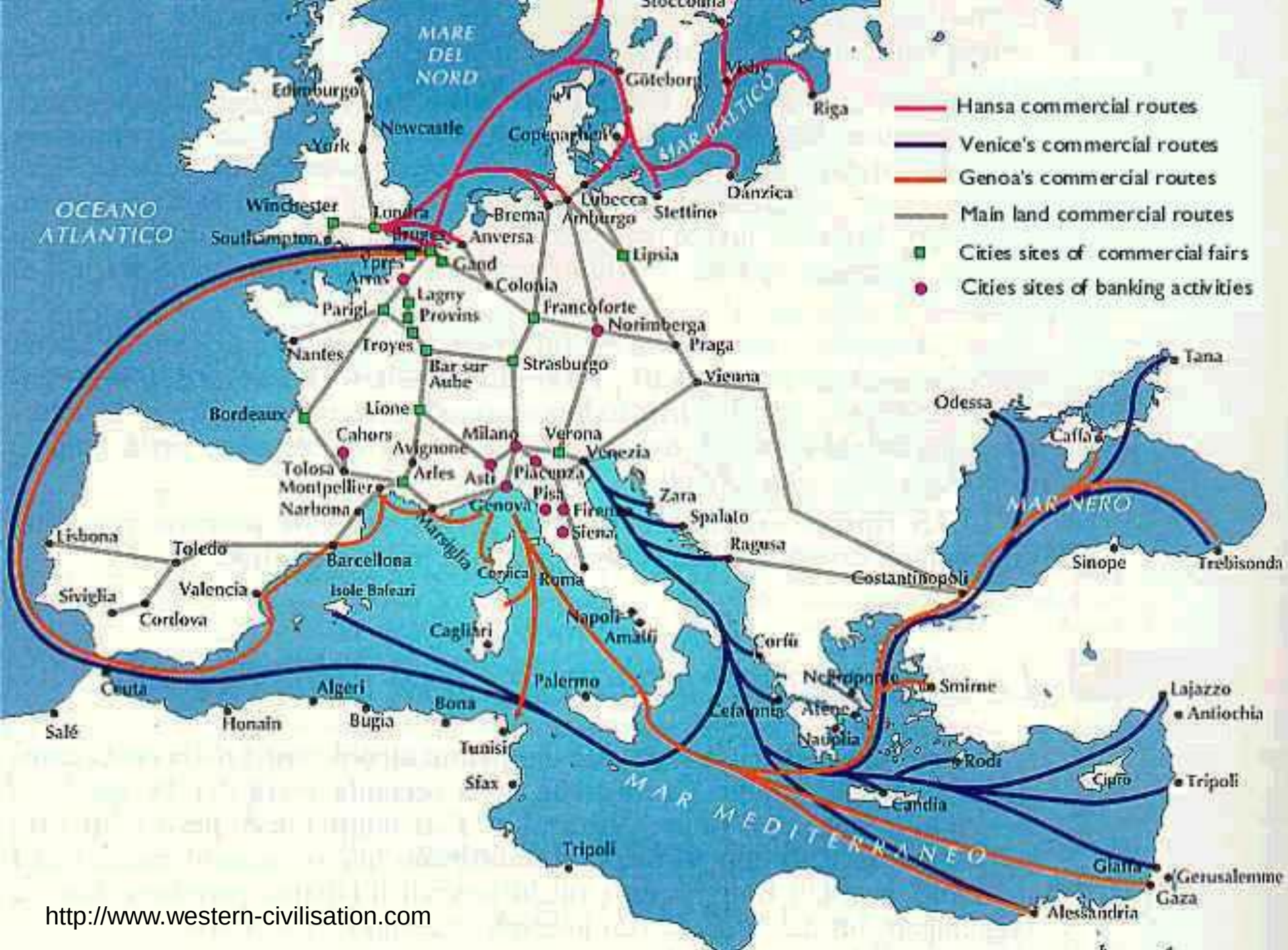
- Italian city-states
 - Venezia/Venice Humanism
 - Greek scholars from Byzantium and Crete traveled to Venezia over the centuries
 - Venezia holds many Greek manuscripts
 - The fall of Byzantium (1453) increased the number of Greek scholars in Venezia and creates a large community of Greek refugees
 - Bessarion's library of Greek and Latin manuscripts (1468)

What the Middle Ages knew

- Italian city-states
 - Venezia/Venice Humanism
 - 1468: Printers move to Venezia because freedom of press (Venezia is a Republic, not a Signoria)
 - Major center of papermaking located around Lake Garda (the Toscolano valley)
 - Venezia is an ideal distribution center because of its sea network
 - Venezia becomes the printing capital of the world

What the Middle Ages knew

- Italian city-states
 - Venezia/Venice
 - Political and commercial ties with the Ottoman Empire (1453)
 - Trade agreements with Ottomans of 1479, 1503, 1522, 1540, 1575
 - Dominates the southeastern trade
 - But seven wars with the Ottomans exhaust it



What the Middle Ages knew

- Italy's spheres of influence
 - North: Holy Roman Empire, i.e. German (951-1176)
 - Center: Pope till 1305
 - South: Arab (878), Norman (1091), German (1194), French (1264), Spanish (1442)
 - 14th-15th centuries: chaos
 - Guelfi (party of the Pope) and Ghibellini (party of the Emperor) split every city-state and keep it in permanent state of civil war

What the Middle Ages knew

- Mercantile cities 1300-1400
 - City-states of the North (Genoa, Venezia, Milano, Firenze)
 - Economic empires (affecting three continents)
 - Aristocracy of wealth (wealth rather than birth)
 - Decline of feudal system (communal system)
 - High political instability
 - Some of the suppliers and customers are the feudal aristocracy (that still owes the land and therefore its natural resources and that has the wealth to buy lucrative items)

What the Middle Ages knew

- Mercantile cities 1300-1400
 - Genoa: republic till 1378 (then Milano)
 - Venezia: republic (ruled by a hereditary aristocracy)
 - Milano: military dictatorship till 1499 (then French, German, Spanish and Austrian)
 - Firenze: hereditary republic (ruled by bankers)
 - Their wealth depends on external conditions
 - Roma: theocracy
 - South: feudal monarchy

What the Middle Ages knew

- Mercantile cities 1300-1400
 - Education
 - Geography
 - Accounting (double-entry book-keeping)
 - Paper (widespread in Italy)
 - Writing
 - Datini family: 120,000 letters between 1382 and 1410
 - Technology
 - Caravel
 - Clock
 - Universities

What the Middle Ages knew

- Mercantile cities 1300-1400
 - The Guilds (wool, carpenters, goldsmiths,...)
 - Membership into the guilds based on profession, not politics
 - Shopkeepers and workers not admitted
 - Male only
 - Membership in a guild a condition for citizenry in the commune (the guilds as the basis for the 1293 constitution of Firenze)
 - Firenze: only 40% of male adult population admitted to guilds
 - Nobility: landowners

What the Middle Ages knew

- Mercantile cities 1300-1400
 - The Guilds of the cities help escape from the system of the lords, and set the foundations for urban power

What the Middle Ages knew

- Mercantile cities 1300-1400
 - Venezia
 - Gateway to Constantinople/Byzantium
 - Eastern spice trade
 - Naval supremacy (technological advances that enabled long-distance and winter voyages)
 - Educational center in Padova
 - 190,000 people in 1422
 - Annexes Crete, Cyclades in Crusade (1204)
 - Annexes Cyprus (1489)
 - Army not of mercenaries but of loyal citizens

What the Middle Ages knew

- Mercantile cities 1300-1400
 - Venezia
 - Aldo Manuzio's printing press (1490)
 - Adopts the Greek language
 - Hires Greek scholars
 - Prints Greek classics
 - Founds an academy of Hellenists
 - Before 1500 about 5,000 books are printed in Italy
 - 2835 in Venezia
 - 925 in Roma
 - 629 in Milano
 - 300 in Firenze

What the Middle Ages knew

- Mercantile cities 1300-1400
 - Venezia
 - The merchants of Venice who sell exotic commodities have never been in India or China themselves until the Mongols create a free trade and free movement area from the Middle East to China

What the Middle Ages knew

- Mercantile cities 1300-1400
 - Firenze
 - Banks and wool
 - Separation of capital and labor (capitalism)
 - Capital: rich European aristocracy

What the Middle Ages knew

- Mercantile cities 1300-1400
 - Firenze's new morality
 - Medieval society glorified the knight and the monk. Capitalist society glorifies the merchant and the banker.
 - Florentine merchant = Greek hero (titanic struggle/competition to excel, status symbol, eternal glory)
 - Florentine merchant = Feudal landlord (acquires status symbol not by birth but by his achievements)
 - No code of behavior for merchants and bankers like there was for knights and monks
 - New definition of “virtue”

What the Middle Ages knew

- Mercantile cities 1300-1400
 - Firenze's new morality
 - Conflict of value systems: Christian values of Church vs Economic values of Capitalism
 - Pagan ancient Rome and Greek provide the new reference model for the new republics and capitalists (1397: a Byzantine scholar is invited to Firenze to teach Greek)
 - Civic duty as the highest value
 - Slave Trade

What the Middle Ages knew

- Mercantile cities 1300-1400
 - Firenze's bourgeois values:
 - Efficiency not necessarily size (e.g., Medici's bank is smaller than previous Florentine banks, but profits are higher)
 - Time is money
 - Income determines expenses (unlike the old feudal aristocracy: desires determine expenses)
 - Realpolitik (religion, ethnicity and ethics are secondary to self-interest)

What the Middle Ages knew

- Mercantile cities 1300-1400
 - Firenze's bourgeoisie: Dante Alighieri
 - Born of an impoverished aristocratic family
 - Secular studies in religious schools and Bologna (law)
 - City politics, love poetry and Aristotelian philosophy

What the Middle Ages knew

- Mercantile cities 1300-1400
 - Firenze - Demographics
 - 1200: 25,000 people
 - 1300: 95,000
 - 1350: 30,000 (plague)
 - 1427: 40,000
 - 1500: 50,000
 - 1600: 70,000
 - Highly urban society
 - 1427: average age 26, median age 22

What the Middle Ages knew

- Mercantile cities 1300-1400
 - Artisans must be able to read, write and compute
 - In 1338 literacy in Florence in the 5-14 age group was 40% (Carlo Cipolla)



Tomb of Cino, Pistoia Duomo, 14th c

What the Middle Ages knew

- Firenze - Economy (1500)
 - Industrial
 - 270 textile workshops
 - 84 wood-carving
 - 83 silk
 - 74 goldsmith
 - 54 stone

What the Middle Ages knew

- Firenze - Economy (1500)

- Financial

- Banks
 - Bardi (1209 branches in Europe and Asia Minor)
 - Peruzzi
 - Medici
 - Bankers of the Pope

- **Trade**

- **England**
 - **Black Sea**
 - **North Africa**
 - **Asia Minor**

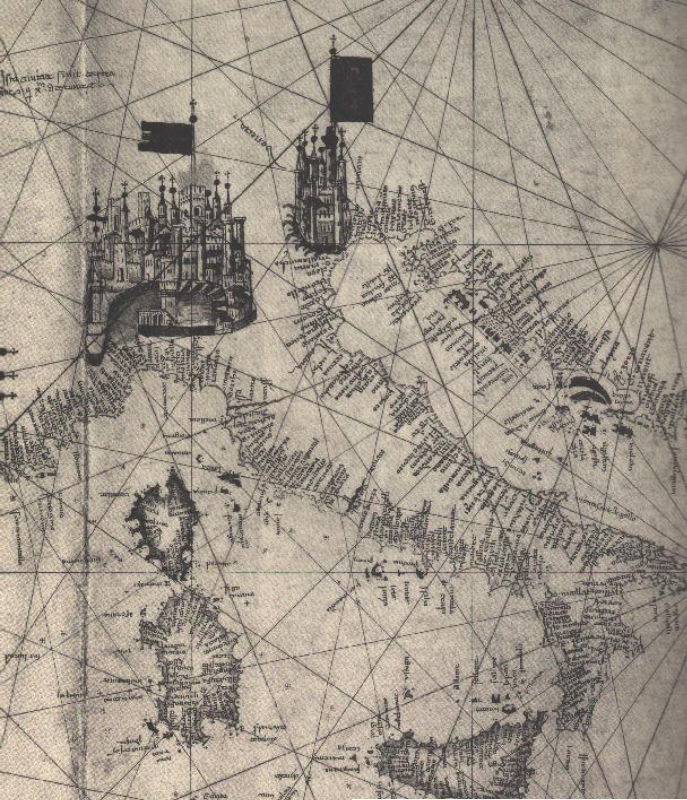
What the Middle Ages knew

- Mercantile cities 1300-1400
 - Tassis (Taxis) family courier service between the city-states (since 1290)

What the Middle Ages knew

- Mercantile cities 1300-1400
 - Inventions of public debt (unknown to Greece and Rome) to pay mercenaries and artillery
 - Firenze's government default (1344) and banking collapse (1343-46) after the wars with Verona (1336-38) and Lucca (1341-43) and the funding of the failed English war against France (1337-1340)

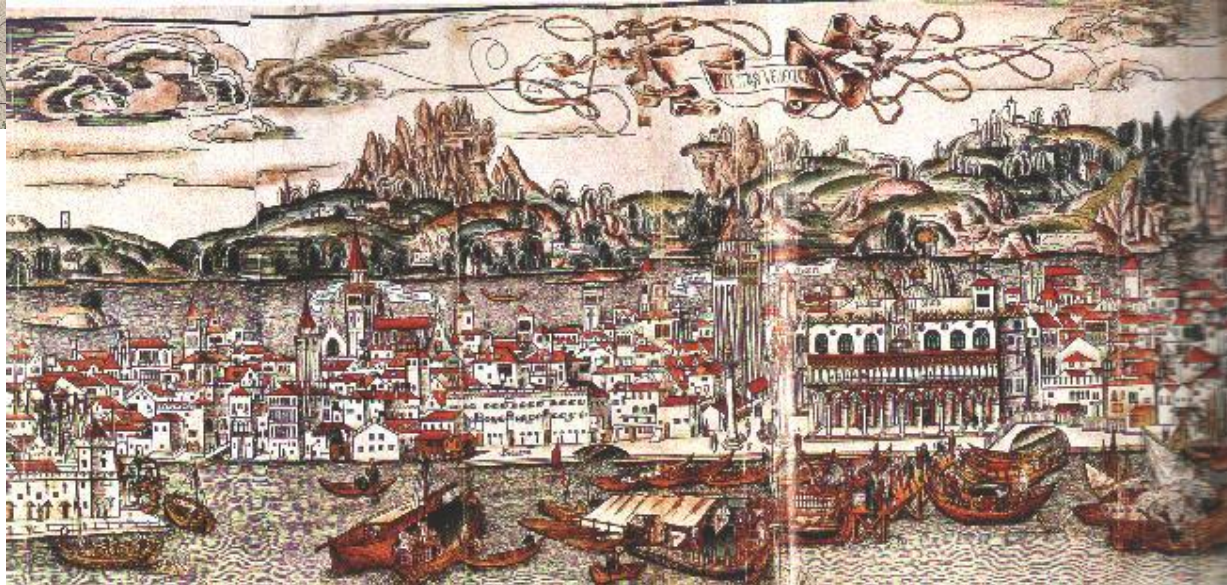
Genoa Venezia 1480



(Museo Correr)



(Museo di Pegli)



(Breydenbach, Bernhard von: Peregrinatio in Terram Sanctam, 1486)

What the Middle Ages knew

- Mercantile cities
 - Milano
 - GDP in 1423: Milano 12M florins, Venezia 11M, Firenze 4M
 - Population: 128,000 (1492)
 - Lodovico Sforza (1494)
 - Most splendid court in Europe
 - Second largest church in the world (Duomo)
 - Leonardo da Vinci (1482)

What the Middle Ages knew

- Feudalism, Urbanization and Capitalism
 - The town develops mainly in the regions that have weak central government: Italy, Holland, Northern Germany
 - Culture of risk is inherent in medieval society, transplanted into capitalism
 - The other place where capitalism will prevail is Japan, that also had a feudal age
 - Feudalism created a distributed system of weak power centers that allowed urbanization to grow that led to capitalism
 - Feudalism like capitalism does not like an absolute state

What the Middle Ages knew

- Feudalism, Urbanization and Capitalism
 - The growth of cities run by merchants is much faster than the growth of cities run by kings, princes, etc

What the Middle Ages knew

- Capitalism and property rights
 - Medieval system of arbitrary expropriation by the lord
 - Feudal nobility cannot hide its wealth (land, crops, animals)
 - The English barons have to use force to obtain the Magna Charta (1215)

What the Middle Ages knew

- Capitalism and property rights
 - Merchants can hide their wealth
 - Commerce requires the right to own property without risking arbitrary confiscation
 - Taxation instead of confiscation
 - Property rights (see Douglass North & Robert Thomas)
 - Property rights are rarely conceded by the state without violent revolts
 - Full confidence in the system had to wait till the 19th century

What the Middle Ages knew

- **Capitalism and lawlessness**
 - Smugglers crucial to undermining the anticapitalistic institutions of the Middle Ages
 - Armed revolts against absolutist power ("terrorism"?) crucial undermining the anticapitalistic institutions

What the Middle Ages knew

- Italian capitalism
 - Bills of exchange instead of cash
 - Minor merchants deposit funds with major merchants to use the major merchant's bill of exchange
 - Major merchant can buy bills of exchange at a discount, indirectly charging interest
 - The trade of bills of exchange circumvents the Church's prohibition of usury (of payment of interest)
 - Birth of a banking system
 - Bills of exchange also allow merchants to hide their wealth from the absolutist ruler

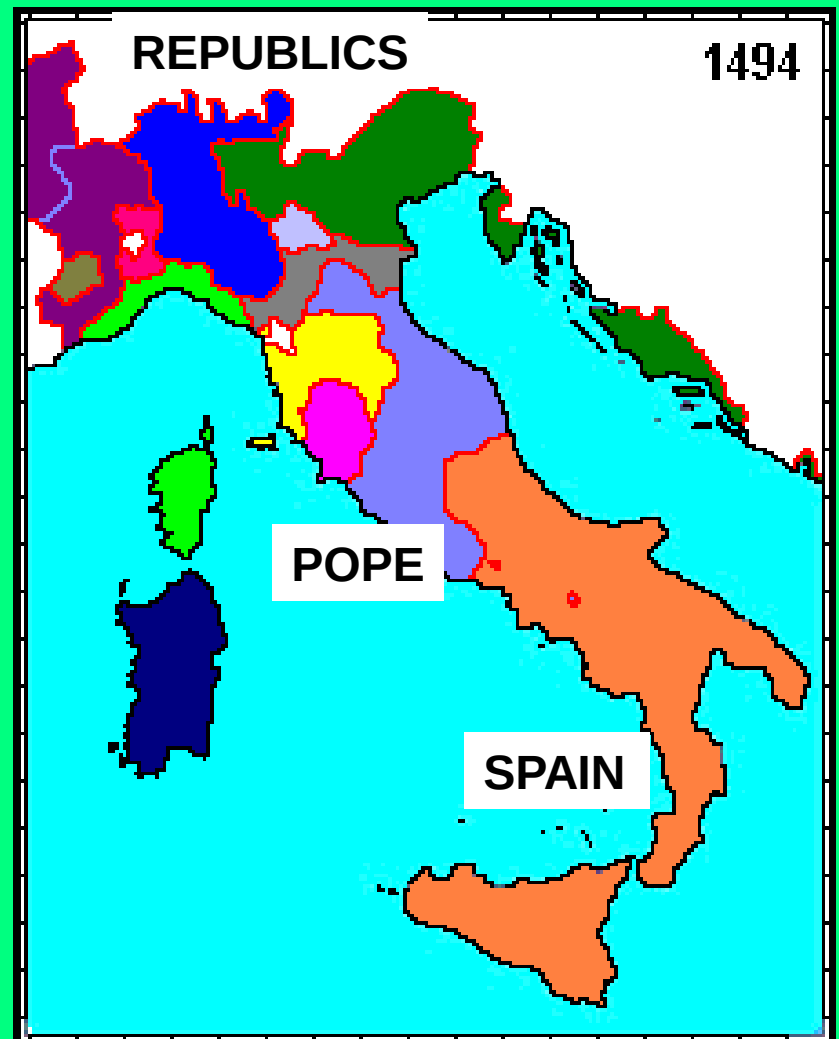
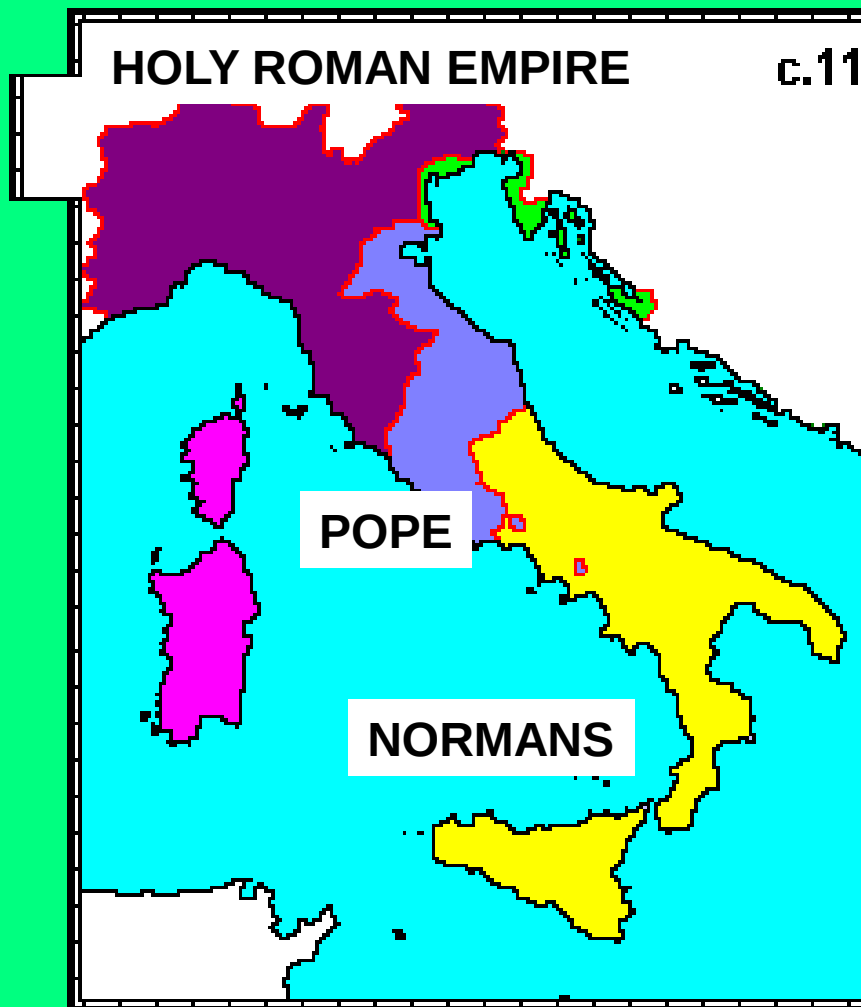
What the Middle Ages knew

- Italian capitalism
 - Insurance
 - Separation of insurance and financing
 - One entity absorbs market risks (the merchant), one entity absorbs maritime risks (the insurer)

What the Middle Ages knew

- **Italian capitalism**
 - **Double-entry Book-keeping**
 - **The value of an enterprise is reflected in its "balance sheet"**

Italy in 1494



What the Middle Ages knew

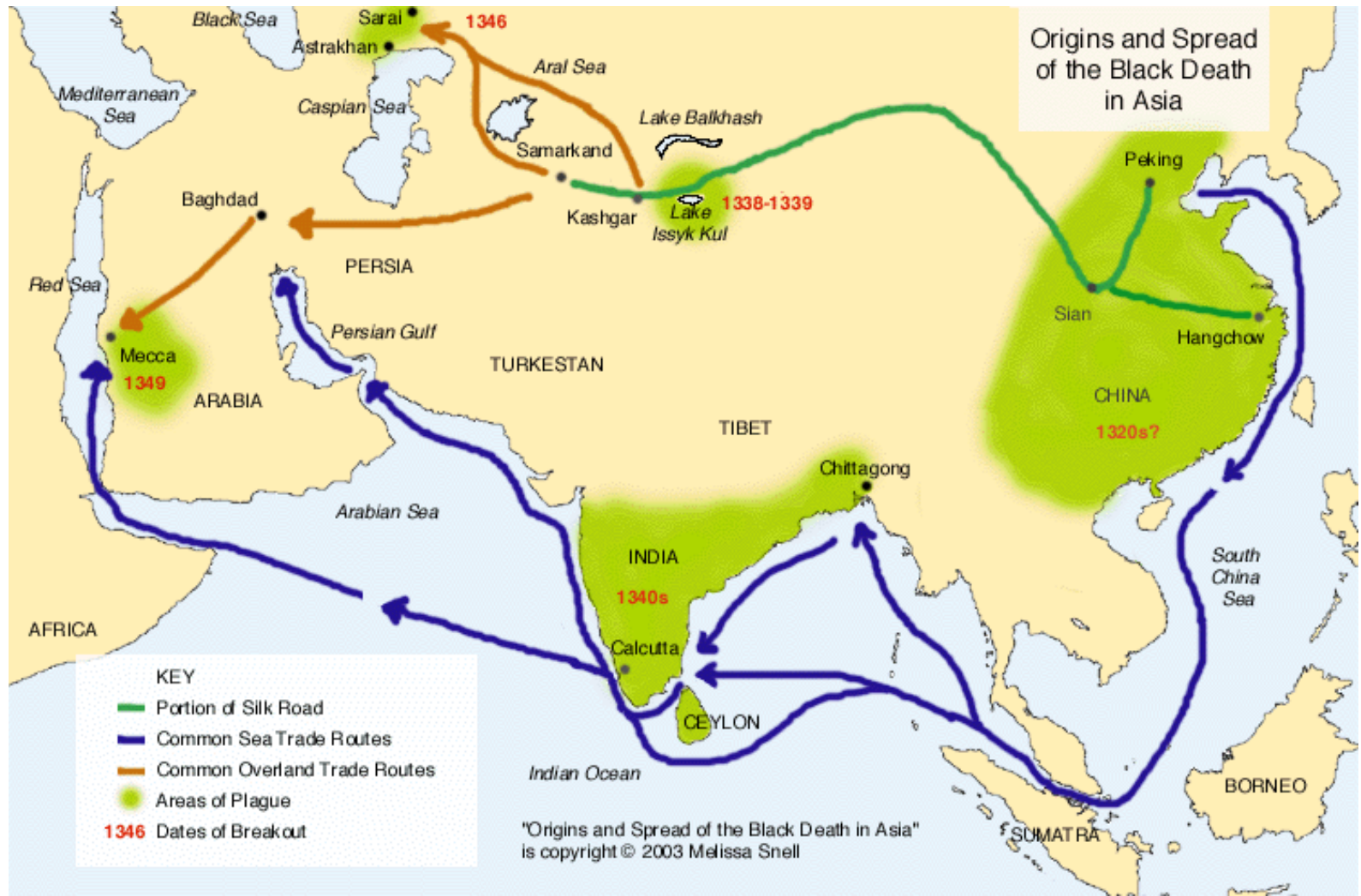
- 14th century = A Century of Disasters
 - Bankruptcies of Italian banks
 - Famine (1315-17) caused by overpopulation
 - Hundred-Years War (1337)
 - Black Death (1348)

What the Middle Ages knew

- The Black Death/ Plague (1348)
 - 25 million people die in 5 years
 - Caused by the urban revolution of the 11th-13th centuries
 - Caused by the revival of international trade (the “pax mongolica” indirectly facilitates the spread of pandemics)
 - The population of Europe (70-80 million) will not reach again the level of 1347 until 1600
 - It caused a social and economic transformation in the 14th-16th centuries

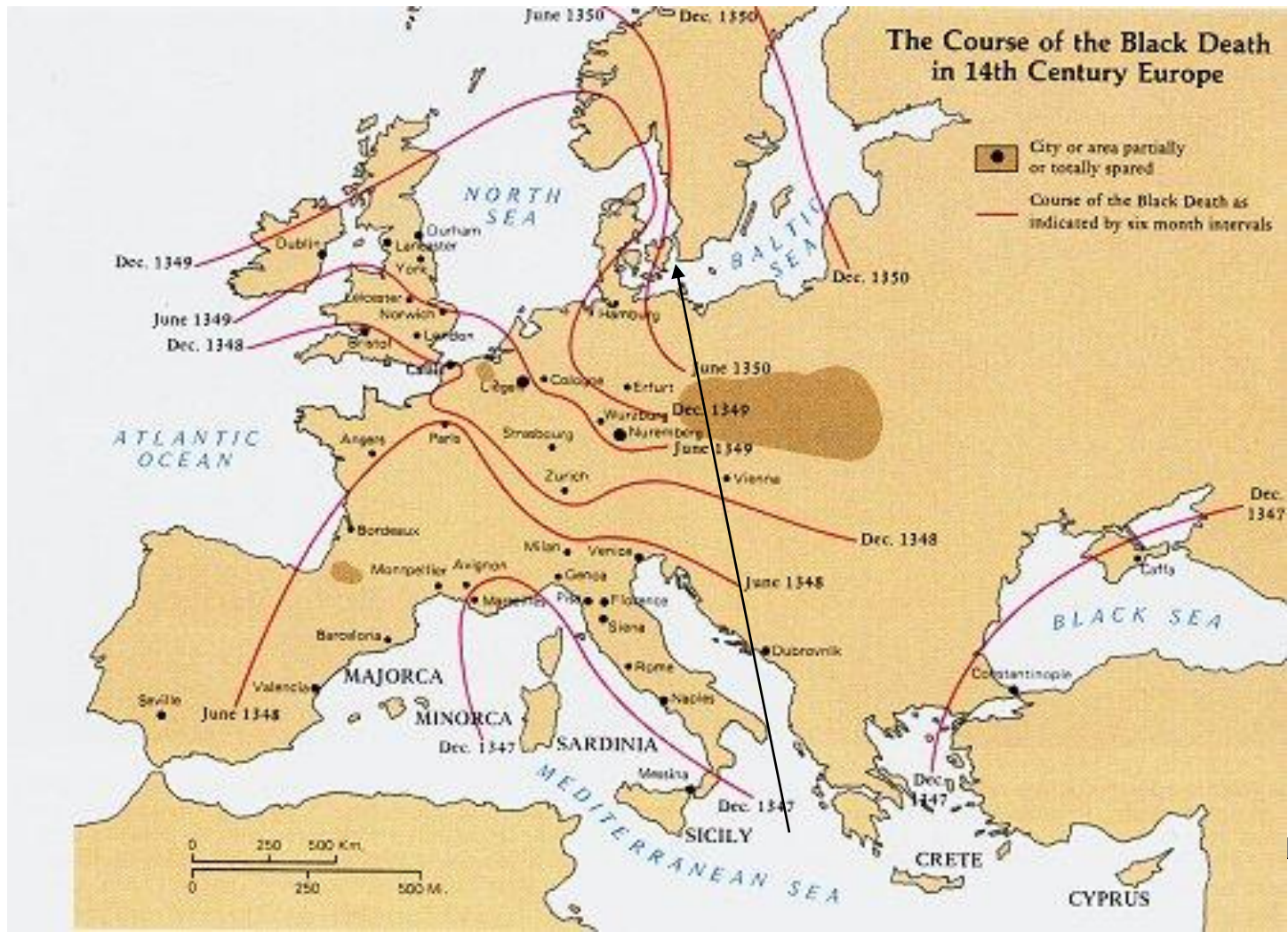
What the Middle Ages knew

- The spread of the Black Death



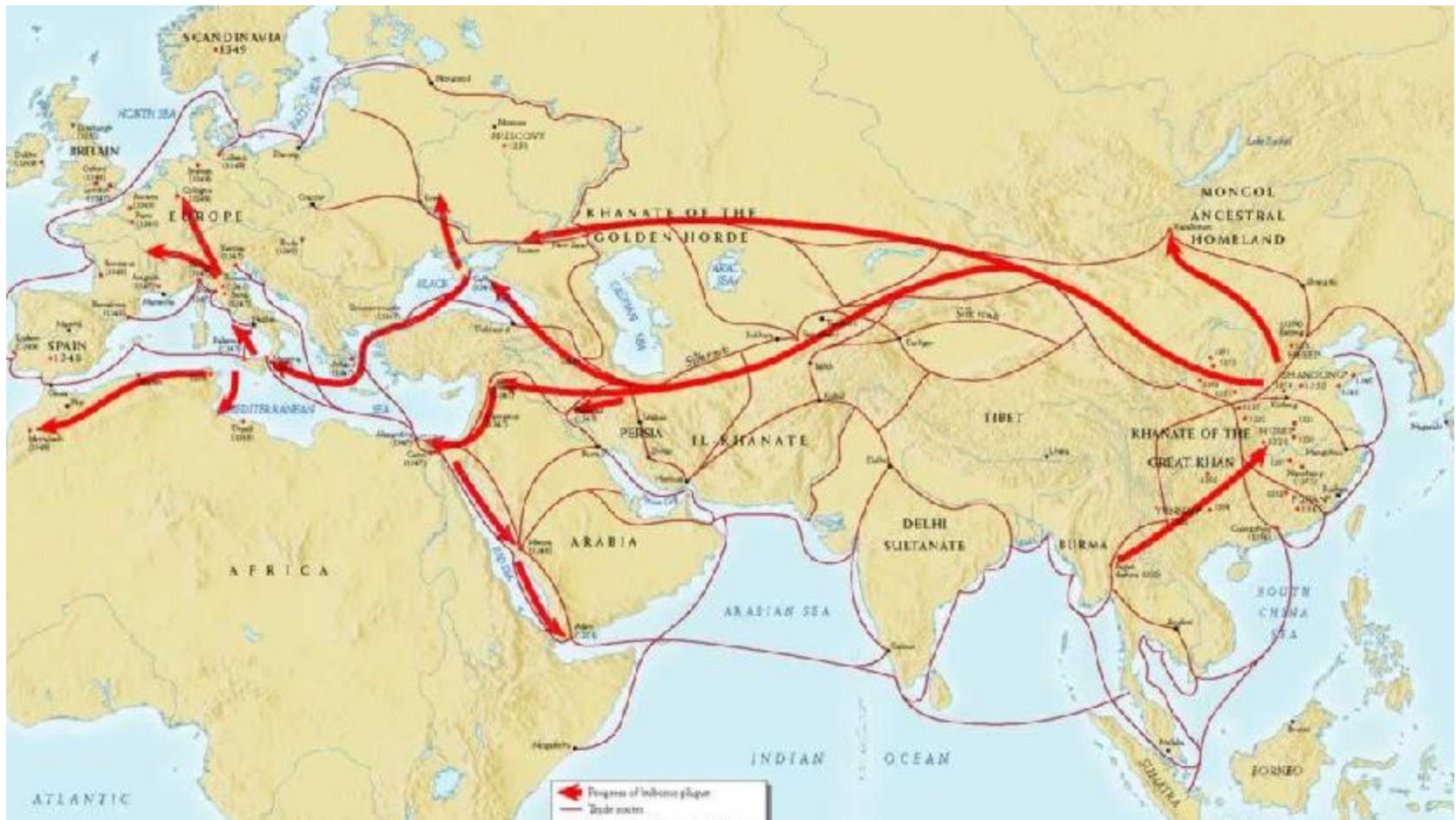
What the Middle Ages knew

- The spread of the Black Death



What the Middle Ages knew

- The spread of the Black Death



What the Middle Ages knew

- The Black Death/ Plague (1347-52)
 - A global Eurasian disease
 - Caused by a bacterium spread by rats
 - A disease that follows the globalized trade routes of the Mongol empire, from China to Crimea, and then the trade routes of the Italians, from Crimea to the Mediterranean Sea and to northern Europe
 - Land and sea routes spread both goods and germs
 - Sea routes enabled by new ship technology
 - Mongols infect Italians during a siege
 - A combination of trade, war, technology and migration can spread a disease that would otherwise remain local

What the Middle Ages knew

- The Black Death/ Plague (1348)
 - Lower population led to
 - Increased land per person led to
 - Higher living standards
 - Meat-based diet
 - Lower prices for agricultural goods led to
 - Lower profits for the estates of the nobles (higher wages and lower revenues)
 - Decline of the power of the landholding nobility

What the Middle Ages knew

- The Black Death/ Plague (1348)
 - Lower supply of labor led to
 - Higher urban and agricultural wages led to
 - Higher prices for manufactured goods
 - Higher living standards in cities
 - Higher social status of workers and peasants
 - Power shift from nobility to trade guilds
 - Investing in technological innovation
 - Decline of nobility led to
 - Stronger central power of the king

What the Middle Ages knew

- The Black Death/ Plague (1348)
 - More bequests from wealthy people led to
 - Creation of national universities which led to
 - Demand for books which led to
 - » Printing press
 - Scarcity of educated people led to
 - Adoption of vernacular languages instead of Latin in the universities

What the Middle Ages knew

- Death before the plague
 - Triumph of Death at Pisa's Camposanto (1330)



What the Middle Ages knew

- Death after the plague
 - Danse Macabre (Jean LeFevre: “Je fis de macabre la dance”, 1376)
 - Trionfo della Morte (Camposanto of Pisa, 1350)
 - The Art of Dying (Germany, 1400)

What the Middle Ages knew

- Death
 - Dance of Death
 - Cimetière des Innocents in Paris (1424, lost)
 - St-Paul's in London (1430, lost)
 - St Mary's in Lübeck(1463)



Lubeck

What the Middle Ages knew

- Death
 - Death and the Maiden
 - Hans Baldung Grien (1517)



What the Middle Ages knew

- Black Death
 - Winners:
 - Hanseatic League reaches its peak in the 15th century
 - Portugal becomes a world power in the 15th century
 - Lombardy becomes an economic power
 - The working class

What the Middle Ages knew

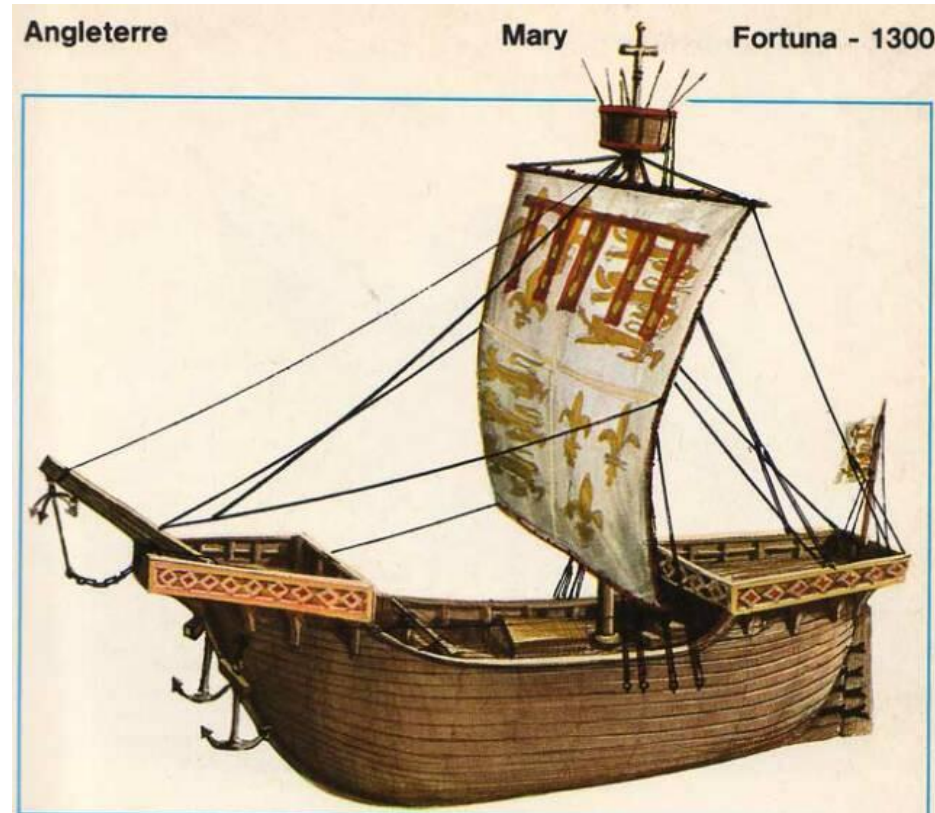
- Population
 - 1000: 35 million in Europe (including Russia)
 - High child mortality rate: (Bianca of Castilla loses 7 children in the 13th century)
 - 1300: Many regions of Italy reach a population density that won't be reached again until the 20th century
 - 1348: The plague kills 25 million people
 - 1337-1453 Hundred Years War
 - 1350: 80 million
 - Epidemics, wars, famines (war is the least murderous of the three but frequently causes the other two)
 - 1500: 80 million

What the Middle Ages knew

- Population
 - 1500: 80 million
 - Some more epidemics
 - 1600: 100 million
 - 1618-48 Thirty Years War
 - 1668: The last plague epidemics
 - A young population

What the Middle Ages knew

- **Transportation**
 - **Jean II of France's journey by sea from Bordeaux to London takes 12 days in 1357**



What the Middle Ages knew

- Transportation
 - Atlantic Ocean: winds always blow in the same direction (as opposed to the reversing seasonal monsoons of the Indian Ocean)

What the Middle Ages knew

- Transportation
 - 1418: Prince Henrique/Henry (“the Navigator”) of Portugal sets up at Sagres a community of astronomers, sailors, cartographers and ship builders to expand Atlantic exploration (the equivalent of a research lab)
 - 1424: First expedition to Africa
 - 1434: Gil Eanes reaches the Cape and explores the western coast of Africa
 - 1436: Afonso de Baldaya reaches Rio de Oro in Africa

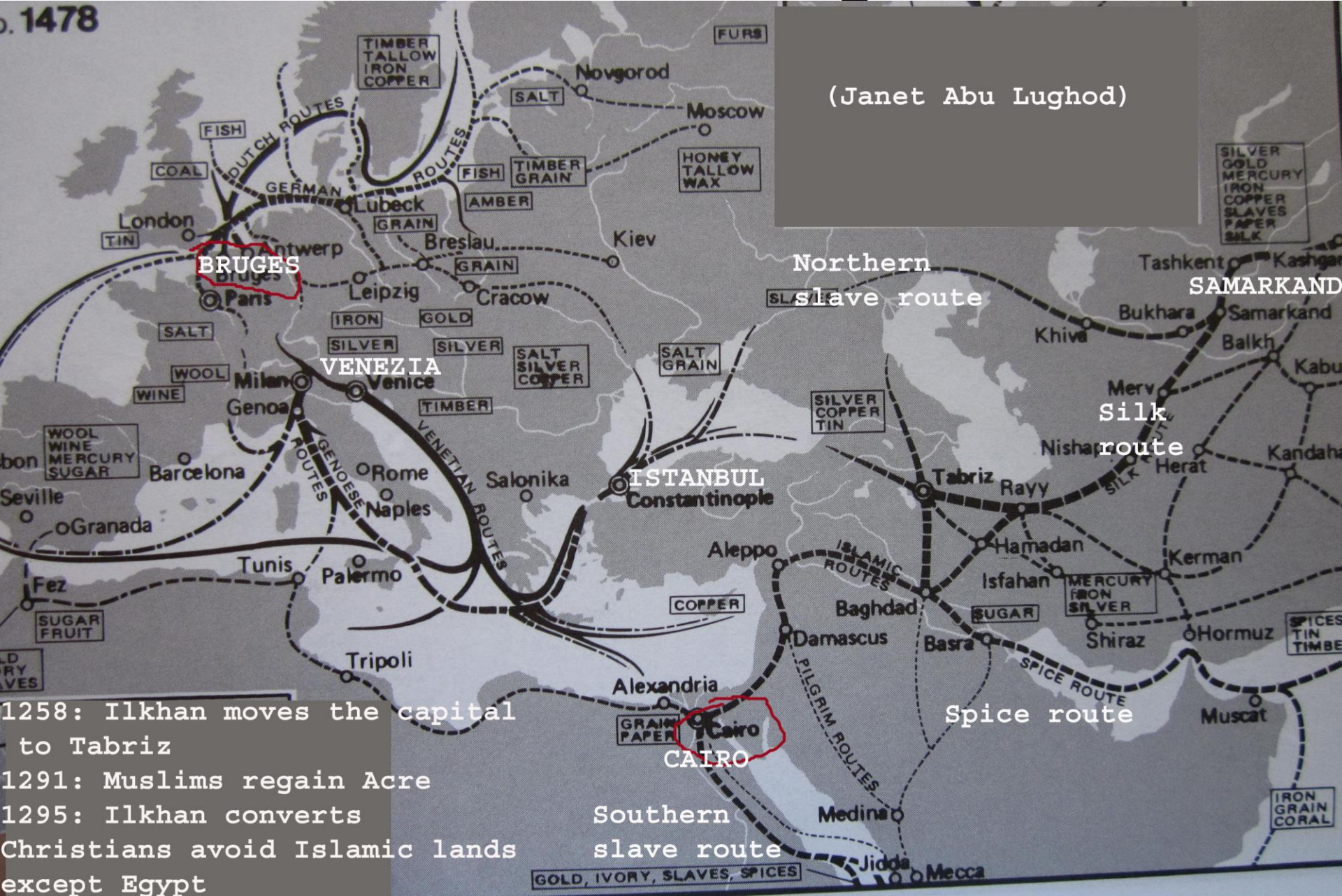
What the Middle Ages knew

- World Economy
 - From northwestern Europe to China
 - Fostered by Crusades, that introduce (and create demand for) Middle Eastern goods to Europe (silk, spices, etc)
 - The demand remains even after the Crusaders are expelled from the Middle East
 - No single hegemonic power
 - Multilingual: Latin, Arabic, Greek, Mandarin
 - Incompatible currencies: silver in Europe, gold in the Middle East (Byzantium, Egypt), copper (and paper money) in China
 - Security provided by the Mongols (religiously neutral)

What the Middle Ages knew

- World Economy
 - Capitalism develops in all regions: credit and banking develops first in the Middle East, paper money in China (backed by the central government), partnerships in the Middle East
 - Effect on Europe: Europe has nothing to sell to the Arabs and Chinese except for wool and silver, so it industrializes its textile industry and its mining industry
 - Italians learn banking and accounting from the Muslims
 - 1386: The Mongols lose China and start a chain reaction along the overland route that used to connect Italy to China

What the Middle Ages knew



What the Middle Ages knew

- World Economy
 - Effects of the Black Death
 - Disruption of the ancient trade routes (eg Silk Road)
 - Emergence of England (less affected than continental Europe)

What the Middle Ages knew

- An alternative history of the Rise of the West
 - The Crusades create demand for Eastern goods
 - Europe can only offer woolen textiles in exchange
 - This causes the first wave of industrialization
 - Wool comes mainly from northern Europe
 - Italian cities open the Atlantic route to the Flanders to avoid France
 - This inaugurates the age of long-distance shipping

What the Middle Ages knew

- The Rise of European productivity
 - Cultural revolution (import of Arab knowledge and technology via the Crusades, import of Asian knowledge and technology via the Pax Mongolica and the Arabs: Indian mathematics, Chinese paper, Chinese gunpowder, Chinese printing, Chinese mechanical clocks, Chinese magnetic compass, Arab lateen sail, Arab windmill...)

What the Middle Ages knew

- The Rise of European productivity
 - Agricultural revolution (three-field crop rotation)
 - Technological revolution (accelerated by the Plague which causes labor scarcity)
 - Transport revolution (sailing technology)
 - Financial revolution (Templars, Italian city-states)
 - Trade revolution (Pax Mongolica)

What the Middle Ages knew

- The Rise of European productivity
 - Endemic warfare is the paramount motivation
 - The Chinese use gunpower to make fireworks
 - The Muslims use clockworks to make toys

What the Middle Ages knew

- The Mongol Factor
 - The Mongols crushed Russia, China and the Islamic world but not Europe: Russia, China and the Islamic world will never catch up again with the pace of European progress

What the Middle Ages knew

- Papacy
 - Gregorio VII (1073) to Bonifacio VIII (1294)
attempt to create a European world state
 - Theocratic federalism fails against national
monarchies and republican city-states

What the Middle Ages knew

- Papacy
 - Intolerance for “heretics”
 - 0-1100: Ecclesiastical prohibition of torture
 - 1184: First papal decree against heretics
 - 1199: Innocent III decrees that heretics are traitors to God (and therefore punishable the same way traitors to the state can be punished)
 - 1233: Gregory IX institutes the Inquisition
 - 1252: Innocent IV decrees that heretics are thieves and murderers of souls, and therefore can be tortured like ordinary criminals

What the Middle Ages knew

- Papacy
 - Crisis of the Church
 - With the decline of the German emperor (1250), the Church loses its symbolic role as the leader of anti-imperial resistance in Italy
 - Popular support for the Pope declines as the Church became a bureaucratic institution in the hands of noble families
 - Loss of popular support during the Avignon captivity (1305-77) and the schism (1378-1415 – France, Spain and Scotland vs England, Holland and Germany)
 - Decimation of the clergy by the Black Death (1348)

What the Middle Ages knew

- Papacy
 - Rise of anticlericalism
 - Dante: the Papacy is the cause of Italy's divisions
 - Jean de Meung's "Romance of the Rose" (satire of the Church)
 - William Langland's "Piers Plowman" (scathing indictment of the Church's amorality)
 - Geoffrey Chaucer's "Canterbury Tales" (satire)
 - John Wycliffe's repudiation of the Pope's authority (14th c)
 - Jan Hus' revolt in Bohemia (1419)

What the Middle Ages knew

- Papacy
 - The Papal monarchy
 - 1420: A city in ruin after the Western schism
 - 1447: Nicholas V turns the Pope into an absolute monarch
 - Rebuilds Rome (Leon Battista Alberti)
 - The jubilee of 1450 turns Rome into the richest government if Italy
 - A humanist who assembles Greek and Latin classics to build the largest library in the Christian world
 - Innocent VIII (1484): Moral and political chaos

What the Middle Ages knew

- Papacy
 - The Papal monarchy
 - Alexander VI (1492) finances Church by selling cardinal appointments, seizing dead cardinal's fortunes, restoring Church's state via a powerful army (led by his son Cesare Borgia)
 - 1750: The Church still owns about 50% of southern Italy

What the Middle Ages knew

- Death
 - Ars moriendi/The Art of Dying (1415, by a Dominican friar in Germany)
 - Everybody has a role in assisting the deceased, both the family members (prayers to Jesus, Mary and saints; plus ceremonies) and the priests
 - The deathbed is the setting for a battle with Satan for the soul of the deceased
 - Importance of indulgencies to help the deceased in purgatory

What the Middle Ages knew

- Death
 - Note that until Pasteur, death was more common among children than among old people
 - Which was a problem for the Church: if everything happens because of God's will, why does he kill children?
 - Death became a disease of old age only in the 20th century
 - Until Pasteur, death was also very painful: the process of dying was often long and excruciatingly painful, with little more than alcohol to kill the pain

What the Middle Ages knew

- Ordinary Life
 - “Le Ménagier De Paris/ The Goodman of Paris”, A Treatise on Moral and Domestic Economy by a Citizen of Paris (c. 1393)
 - Wife's chores
 - Gardening
 - Cooking

What the Middle Ages knew

- Architecture
 - Leon Battista Alberti: "De Arte Aedificatoria"
 - Antonio Filarete (Florence): "Libro Architettonico" (1464)
 - Francesco di Giorgio Martini (Siena): "Trattato dell'Architectura" (1482)

What the Middle Ages knew

- Furniture
 - Chair, Palazzo Strozzi (1489)
 - Bed, Christine de Pizan's "The Queen's Manuscript" (1411)
 - Loom, French translation of Boccaccio's "De mulieribus claris" 1401, "Des femmes nobles et renommées"
 - Desk, Ludolf of Saxony's "Vita Christi" (1374) - Vol. 3, folio 47v



What the Middle Ages knew

- Decline of Byzantium
 - Enemies: Slavs, Turks and Italians
 - Weakened by the Crusades
 - Weakened by imperial successions

What the Middle Ages knew

- Decline of the Italian city-states
 - The rich Italian city-states fail to scale up
 - 1453: Fall of Constantinople to the Ottomans
 - 1492: Discovery of America
 - 1494-1530: Italian wars (France, Aragon and the German emperor invade and split Italy)
 - 1527: German mercenaries sack Rome
 - Italy becomes a battleground in the dynastic wars

What the Middle Ages knew

- Decline of the Italian city-states
 - Venezia
 - Wars with Milano (1425-54)
 - Decline of Eastern trade due to the Ottoman conquests
 - Wars with the Ottomans (1463-79)
 - League of Cambrai (1508)
 - Venezia loses naval supremacy

What the Middle Ages knew

- Decline of the Italian city-states
 - Firenze
 - Italian wars end with annexation of Firenze by the German empire (1530)
 - Milano
 - Italian wars end with annexation of Milano by France (1499)

What the Middle Ages knew

- Decline of the Italian city-states
 - However, the political decline coincides with a cultural boom
 - Humanism
 - Francesco Petrarca rediscovers Cicero's letters (1345)
 - Poggio Bracciolini, former secretary of many popes, rediscovers Lucretius' "De Rerum Natura" (1417), Quintilian's treatise on law, Vitruvius' treatise on architecture
 - Platonic school of Firenze (15th c)
 - Greek scholars flock to Firenze after 1453 (when the Ottomans capture Byzantium) sponsored by banker Lorenzo Medici

What the Middle Ages knew

- Humanism/ patronage of the arts
 - Firenze: banker Lorenzo Medici
 - Roma: pope Nicccolo' V, pope Pio II

What the Middle Ages knew

- Prodromes of the Reformation
 - John Wycliffe (Oxford, 1381)
 - The value of a sacrament depends on the worthiness of the priest administering it
 - Salvation depends on predestination rather than on individual merit
 - Attack against the doctrinal, political and financial bases of the Church
 - Jan Hus (Prague, 1415)
 - Attack against the Church's liturgy

What the Middle Ages knew

- The city state
 - Zeniths of civilization frequently rest upon the city state
 - Sumeria
 - Greece
 - Rinascimento in Italy

What the Middle Ages knew

- Southern Germany
 - Silver mines in Saxony and Tyrol (1450s)
 - Emergence of bankers (Fugger, weavers of Augsburg, become the most influential bankers of the 16th century)
 - Exports of clocks and cannons

What the Middle Ages knew

- Germanic expansion
 - Germans expand east into Slavic lands
 - Saxony's Wendish (Slavic) Crusade (1147)
 - Albert Ascanian establishes the margraviate of Brandenburg (1157) and invites Dutch and German colonists
 - The Baltic Crusade led by Hartwig II, archbishop of Bremen (1186-1236)
 - Teutonic Knights' conquest of Eastern Prussia (1231-34)
 - Founding of Berlin (1237) and new Brandenburg (1248)

What the Middle Ages knew

- Germanic expansion
 - Germans expand east into Slavic lands
 - German immigrants bring superior technology (e.g. the heavy plow) into Slavic lands
 - New German cities already export grain within a generation
 - 1415: Frederick I of the House of Hohenzollern becomes margrave of Brandenburg and moves the capital to Berlin

What the Middle Ages knew

- Germanic expansion
 - Hanseatic League
 - 1159: Heinrich of the Welf house, Duke of Saxony and Bavaria, builds new Lübeck
 - Northern German merchants specializing in Baltic trade (timber, wax, amber, resins, furs, rye, wheat) form “hansa” (guilds)
 - 1267: The term “hanse” is used in a document
 - 1241: Lübeck and Hamburg ally
 - 1260: Köln joins Lübeck and Hamburg
 - Trade with Flanders and England: cloth
 - 1356: The first Hanseatic Diet is held

What the Middle Ages knew

- Germanic expansion
 - Hanseatic League



16th Century Lübeck

What the Middle Ages knew

- Germanic expansion
 - Hanseatic League



The Steelyard – the Hanseatic League's London base



A 14th Century
Hanseatic League

What the Middle Ages knew

1447: The Pope becomes an absolute monarch

1453: Fall of Byzantium to the Muslims in Eastern Europe

1456: The printing press

1462: The first czar in Russia

1492: Spain expels the Muslims from Western Europe

1492: Discovery of America

Piero Scaruffi
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