GEOG 701: Assignments for September 21

Ahmed, Sadiyah: Caspar Peucer

Betancourt Mazur, Livia: Jean Bodin

Brown, Christina: James Ussher

Chim, Ivy: Robert Boyle

Cytryn, Margaret: Charles-Louis de Secondat, Baron de Montesquieu

Devlin, Jennifer: Varenius

Douglas, Robert: Georges-Louis Leclerc, Comte (Count) Buffon

Friedman, Erin: Georges-Louis Leclerc, Comte (Count) Buffon

Hymes, Marla: Anton Busching

James, Yolanda: Immanuel Kant

Jenkins, Kevin: James Hutton

Laroussi, Joanna: Johann Gottfried von Herder

Mead, Victoria: Captain James Cook

Murray, Wallace: Alexander von Humboldt

Olesh, David: Alexander von Humboldt

Sultana, Nighar: Wladimir Koppen

Visovsky, Stephen: Mary Somerville

Prepare a one-page response to the following:

Arguably, since 1790 no geographer has been more universally revered in his lifetime than Alexander von Humboldt (1769-1859). Why is this the case? In your opinion, was the praise deserved?

T-O map

- **A highly simplistic map of the world popular in Western Europe during the Middle Ages.**
- **The O refers to the map's circular shape.**
- **The T refers to the stylized placements of the Mediterranean Sea (vertical); the Aegean and Black seas (left bar); and the Nile and Red sea (right bar).**
- **Jerusalem is at the center, where the three segments (above) meet.**
- **Typically, T-O maps are "oriented" to show the East Asia at the top.**
- **Once said to epitomize the Dark Ages, T-O maps are now recognized as objects primarily meant to advance religious instruction instead of geographical knowledge.**

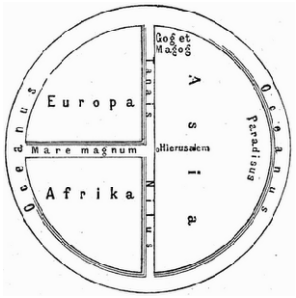
Earliest <u>printed</u> T-O map, 1472

Basic schema of the Medieval T-O Map

T – O map design adapted to modern hemispheric map

Early map with T-O design

(Note Jerusalem at center and paradise in Far East)



A T-O style Mappa Mundi from *La Fleur des Histoires*, 1459-1463.

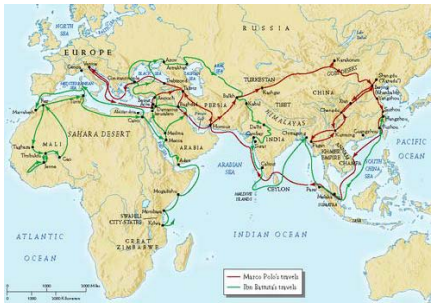
The Hereford *Mappa Mundi*

- **Dates from about 1290.**
- **30 inches in diameter.**
- **The largest medieval world map known to exist.**
- **On display at Hereford Cathedral, England**
- **On vellum in T-O style.**
- **Jerusalem at center.**
- **The map is <u>oriented</u> to show "Paradise" – the Garden of Eden – as a circular island at the top, corresponding with East Asia (thereafter, "The Orient").**

Ibn Battuta
(1304-1368/69)

- **Moroccan Berber whose pilgrimage to Mecca (1325) began a life of travel.**
- **Covered some 75,000 miles, mainly in Africa and Asia. Returned home in 1354.**
- **Crossed the equator torrid zone) as far as Mozambique.**
- **Kept no records. Late in life, dictated his travels (*Rihla*, "The Journey") from memory to Ibn Juzayy.**
- **While parts are questionable, it is probably the best description of the areas covered in the 14th century.**

The Travels of Marco Polo and Ibn Battuta



Muhammad al-Idrisi (1099-1165/66)

- **Muslim geographer and cartographer who lived in Sicily under the patronage of the Christian King Roger II.**
- **Used first-hand knowledge from his European travels and knowledge gleaned from Muslim and European merchants and explorers to create what was then the most accurate map of the world.**
- **His descriptive geography, written to accompany his world map (drafted in silver for King Roger II), reveals many inaccuracies in the Aristotelian division of the world into 5 climatic zones (two frigid, two temperate, and one torrid), and proposes a more sophisticated climatic system.**

World Map by Al Idrisi

Introductory map from Al-Idrisi's world atlas, 1154

Tabula Rogeriana by Al-Idrisi, 1154

(a compilation of 70 double-page maps from Idrisi's atlas compiled for King Roger II of Sicily)

Tabula Rogeriana

Inverted Fra Mauro world map, ca. 1450

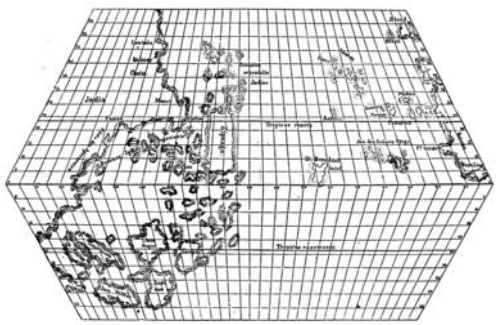
Fra Mauro was a 15th century Venetian monk who drafted a world map surprising for its accuracy. Possibly incorporating information derived from China and Africa, it suggests an all-water route between Europe and Asia. The map was produced under the patronage of King Alfonso V and acquired by Prince Henry.

[A lunar crater is named in the monk's honor.]

Paolo dal Pozzo Toscanelli (1397-1482)

- **Italian cosmographer whose 1474 map of the Atlantic Ocean influenced the westward voyage of Columbus by grossly underestimating the distance to India.**
- **Columbus would go to his grave (1506) believing he had reached "the Indies" as opposed to a previously unknown continent (i.e., to the Europeans).**

1474 Toscanelli Map of the Atlantic Ocean later acquired by Columbus

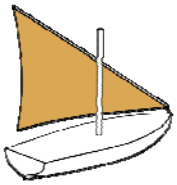


Modified 1474 Toscanelli map of the Atlantic Ocean showing North America

Caravel

- **A relatively small and highly maneuverable oceangoing vessel refined in the 15th Century by the Portuguese and used in many of their subsequent voyages of discovery.**
- **Noted for it's lateen sails.**
- **Carried a crew of about 20.**

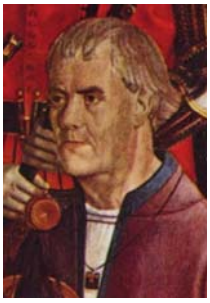
Lateen (sail)



- **A triangular sail hung from a long yard (supporting piece of wood) mounted at an angle on the mast.**
- **Makes for great maneuverability (especially to windward) and speed since the sail can be set at a variety of angles with respect the to mast.**
- **In use during Roman times, if not earlier.**

Prince Henry, the Navigator

(1394-1460)



- **A junior prince of the Kingdom of Portugal who was appointed governor of the Order of Christ (1420) and used its riches to promote exploration (cartography, navigation, ship design . . .).**
- **The success of his patronage was largely responsible for the ascent of tiny Portugal to the status of a major player in the future European political and economic domination of much of the world.**

Gil Eannes

(15th Century A.D.)

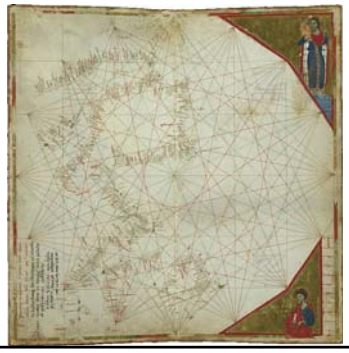
- **Portuguese explorer, navigator and ship's captain who sailed in the service of Prince Henry the Navigator.**
- **Made numerous voyages along the northwest coast of Africa.**
- **In 1434 he commanded the first the first known ship to sail south of Cape Bojador and return, proving the "torrid zone" was not fatal to humans, and**

Portolan chart

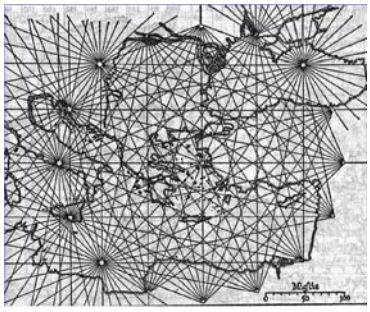
- **From the Italian *portolano* – "related to ports or harbors."**
- **Originated in Portugal, Spain and Italy in the 14th century.**
- **They indicate and label the outline of coasts in great detail.**
- **Meant to provide precise locations of harbors, whether for purposes of commerce or refuge, and to help mariners pinpoint their locations after traveliing across open waters.**
- **Crisscrossing lines represent the 32 points of the mariner's compass**
- **Suggest the growing importance of *piloting* as a complement to *navigation*.**

Portolan by Battista Agnese, 1544

Pietro Vesconte portolan, 1325
Atlantic Europe "upside down"



Pietro Vesconte portolan chart, 1311



World map by Poracchi
(date unknown)

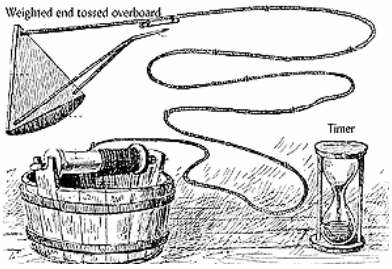
World map by Abraham Ortelius, 1570

World map by Plancius, c. 1590

"So geographers, in Africa maps,
With savage pictures fill their gaps,
And o'er uninhabitable downs
Place elephants for want of towns."

-- Jonathon Swift (1667-1745)

The Chip Log (ca. 1500-1600)

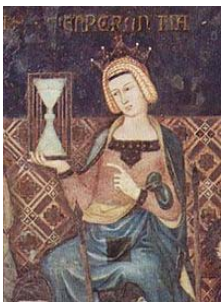


The Chip Log

- **A major improvement to dead-reckoning**
- **Basically an early speedometer.**
- **A light line is knotted at regular intervals and attached to a log, which was tossed overboard at the stern.**
- **The pilot counted the knots that were let out over a specific period of time, as measured my a minute glass or similar timer.**
- **From this the speed of the vessel could be determined.**
- **To this day, a ship's speed is stated in "knots."**

Hourglass

(in Lorenzetti's *Allegory of Good Government*, 1338)



- **A timekeeping device that replaced the water clock by virtue of superior accuracy.**
- **Origin unknown.**
- **Probably invented in Western Europe, perhaps as early as the 8th century A.D.**
- **In widespread use by the 14th century.**

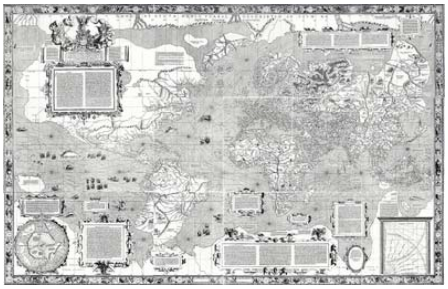
Gerardus Mercator (1512-1594)

- born Gerard Kremer
- Flemish cartographer
- Principally remembered for the map projection that bears his name, and which greatly aided oceanic navigation by allowing mariners' to plot a course to a desired destination that followed a single compass bearing.
- The map's success led to its unintended general use, despite distortion of land masses.
- Published the first book of maps, which happened to depict Atlas (a Titan who supported the heavens) on the cover.

Mercator/Hondius Atlas cover, 1634

Mercator Atlas cover

Mercator Projection, 1569

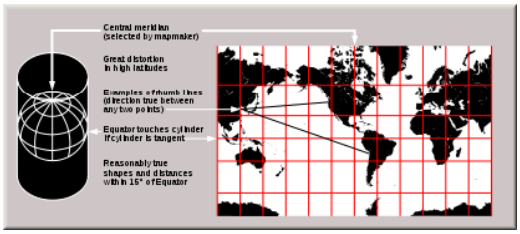


The Mercator Projection

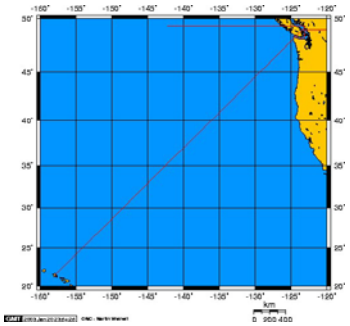
- A cylindrical map projection devised in 1569 by Gerardus Mercator, a Flemish/Belgian cartographer.
- Became the standard map projection for nautical purposes because of its ability to plot lines of constant course, called *loxodromes* or *rhumb lines.*
- To achieve this desired attribute – constant bearing in all directions from a point – the size of areas is increasingly distorted (i.e., enlarged) with distance from the equator, resulting in substantial misrepresentation of the relative sizes of land masses and water bodies.
- Nevertheless, because of the map's great utility for navigation, it became the most popular "general information" map of the world – something which Mercator never intended.

Mercator Projection

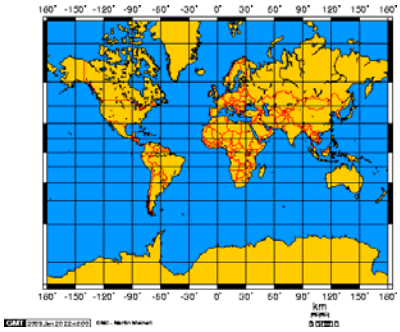
The Mercator Projection



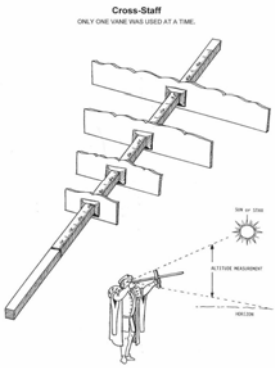
A plotted course from Vancouver to Oahu on a Mercator Projection



Mercator Projection

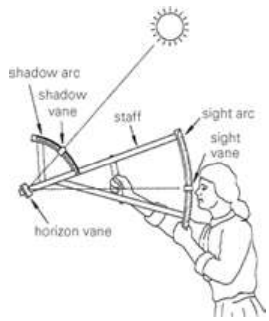


Cross-Staff



An early 16th Century device used to calculate the angular elevation of a celestial object. Made the astrolabe obsolete.

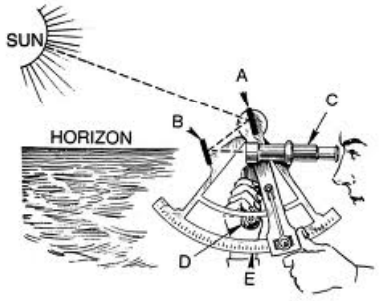
The Davis Quadrant (backstaff) Early 17th Century (replaced the cross-staff)



Sextant

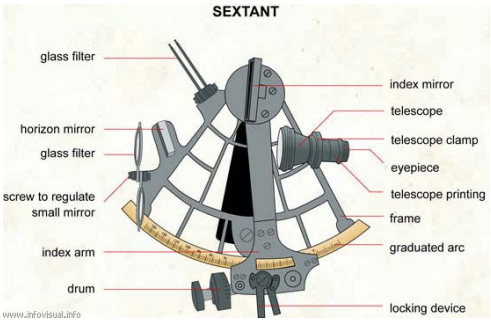
- An instrument used to measure the angle between any two visible things, particularly the horizon and a celestial object.
- Allowed for far superior readings than those obtained by a Davis Quadrant, which it replaced sometime around 1730.
- Facilitated accurate measurement of latitude.
- Used optical principles invented by Sir Isaac Newton.

Using a Sextant



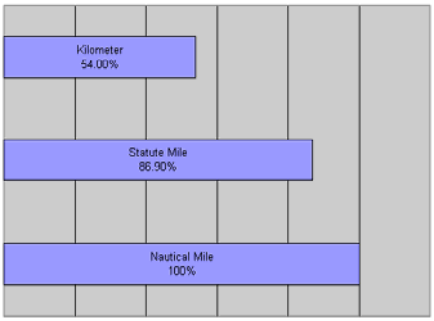
Using a Sextant

SEXTANT



Sextants

A comparison of standard distances



The English word "mile" is derived from the Latin "milia passum", or thousand paces (each pace consisting of two steps). This "Roman mile" (about 5,000 ft.) reached Britain with the Roman invasion. After the Empire fell, the Roman mile gradually ceased to be used, though in Britain "mile" persisted in the evolving English language to signify a substantial unit of linear distance.

The <u>Statute Mile</u> (5,280 feet) is so-named because it was formally defined by an English Act of Parliament in 1592. That is, the distance was set by law (or statute).

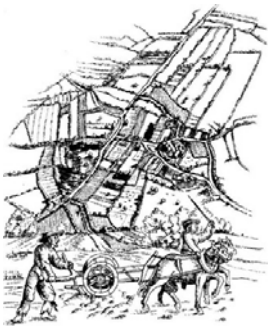
The length of the statute mile is derived from medieval English agriculture

- **The basic unit of farming was a long, narrow piece of land called a strip.**
- **The strip was a "furrow long," or furlong – originally the distance a team of oxen could pull a plow before having to stop and rest.**
- **The farmer used a long stick ("rod ") to guide the oxen.**
- **In time the rod was standardized to 16.5 feet – 5 yards.**
- **Sometime later the furlong was standardized to 40 rods (220 yards).**
- **Later still a distance of 8 furlongs (1,760 yards, or 5,280 feet) became the basis for a longer unit of measurement which eventually was codified as the statute mile.**

Interpretive plan of an English medieval manor

Medieval Plowing

Note herder carrying a rod



Medieval English agricultural strips in an old print.

Medieval Strips in the Contemporary English Landscape (bottom of photo)

Despite centuries of change in field patterns (due to inheritance, consolidation and other factors) some centuries-old strips continue to characterize the surface of Great Britain.

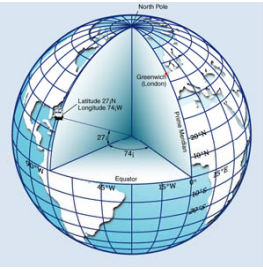
Old strip boundaries near Blakewell, England

Nautical Mile

- **A unit of length originally conceptualized as equal to one minute of arc of latitude along any meridian.**
- **The concept may have been originally proposed by Gabriel Mouton as the based for metric length.**
- **Standardized in 1929 (by the First International Extraordinary Hydrographic Conference, Monaco) as 1,852 meters, or 6,076 feet.**
- **Before that, different countries recognized different lengths.**
- **Widely used in navigation because of its conformity to the universally used system of latitude and longitude.**

The Metric System

- **From the Greek *metron* – measure.**
- **A base-10 (decimal) system of measurement.**
- **Concept first proposed in 1586 by Simon Stevin, a Flemish mathematician.**
- **In 1670, Gabriel Mouton, a French clergyman, proposed that metric measurement of length be based on the Earth's circumference.**
- **In 1790 the National Assembly of France requested the French Academy of Sciences to produce a comprehensive system of measurement.**
- **The results were adopted by the French government in 1795 and became official (general use) in the country in 1799.**
- **Subsequently, the system has been refined and adopted by most of the world's countries.**



The meter was originally conceptualized as being the equivalent of one ten-millionth of the distance between the Equator and the North Pole along a line of longitude.

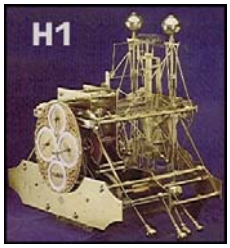
On October 22,1707 four large ships in a British naval fleet were wrecked on the Isles of Scilly with a loss of 1,400 men because the navigator had miscalculated the longitude.

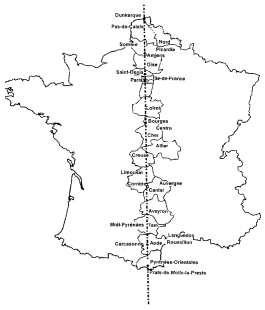
Cornwall, England
and the Isles of Scilly, far lower left

John Harrison (1693-1776)

- **Self-educated English clockmaker who won the Longitude Prize**
- **Recognized that the solution required the accurate telling of time at sea.**
- **Produced a series of marine chronometers with required accuracy.**
- **Had difficulty claiming the prize because he was not a recognized scientist.**

Two of Harrison's clocks





Location reference map for the world's first scientifically measured prime meridian

Royal Paris Observatory

Jardin du Luxembourg, Paris

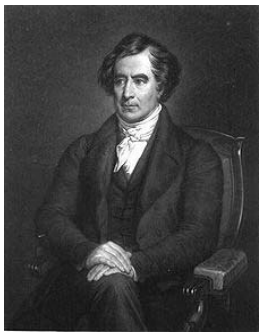
Jardin du Luxembourg

Jardin du Luxembourg

Monuments on the original Paris Meridian (the world's first prime meridian – 1667) Jardin du Luxembourg, Paris

Map of the Paris Meridian shown on the floor of the Meridian Room (a.k.a. Cassini Room), Royal Paris Observatory

The original Paris Meridian on the grounds of the Royal Paris Observatory



François Arago (1786-1853)

French mathematician, physicist, astronomer and politician who recalculated the location and orientation of the Paris Median, which still runs through the Royal Paris Observatory, but at a slightly different angle than before.

One of the 135 "Arago medallions" that mark the Paris Meridian on the streets and sidewalks of Paris

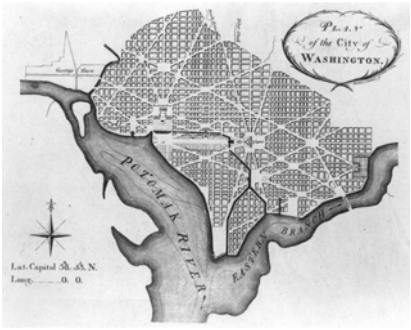
American tourist meets Arago Medallion in the Jardin du Luxembourg, immediately north of the Royal Paris Observatory

Royal Greenwich Observatory

- **Commissioned in 1675, built the following year.**
- **Four prime meridians have run through the building.**
- **The present one was established in 1851 by Sir George Airy.**
- **The complex is now a museum that houses, among other things, John Harrison's original clocks.**
- **Each year thousands of people are photographed at the Observatory straddling the Prime Meridian.**

The Greenwich Meridian
on the grounds of the
Royal Greenwich Observatory

Old map of Washington, DC
(Note the longitude – 0, 0)



International Meridian Conference
held in Washington, D.C., October 1884

- **Convened by President Chester A. Arthur to promote global recognition of a common system of longitude based on a single Prime Meridian.**
- **Promulgated by the growing need for a common grid reference system, particularly as the basis for delineating global time zones.**
- **Conference was attended by 41 delegates from 25 countries.**
- **Outcome: The Greenwich Meridian was chosen as the global standard, and thus the British system of longitude.**