

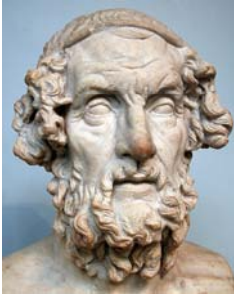
What the Greeks had

- A geographic curiosity often associated with commercial and military interests – and often extending beyond their empire.
- Seafaring skills and a need to improve them.
- A robust mythology closely intertwined with a polytheistic belief system that contained a god for just about everything.
- A belief that celestial objects were epitomes of gods, and therefore worthy of close scrutiny.
- A need for a geometry and associated tools to study the location and movement of celestial objects.

What the Greeks didn't have

- At the beginning, any kind of information source (other than word of mouth) that we now take for granted.
- Basic location and navigation skills (including the compass).
- An accurate system of measurement over long distances.
- Basic cartographic tools and techniques.
- An understanding of the shape and size of earth and of basic earth-sun relationships.
- A understanding of basic earth science including uplift erosion, deposition and meteorology.
- An appreciation of the adaptability of human beings to different climatic contexts.

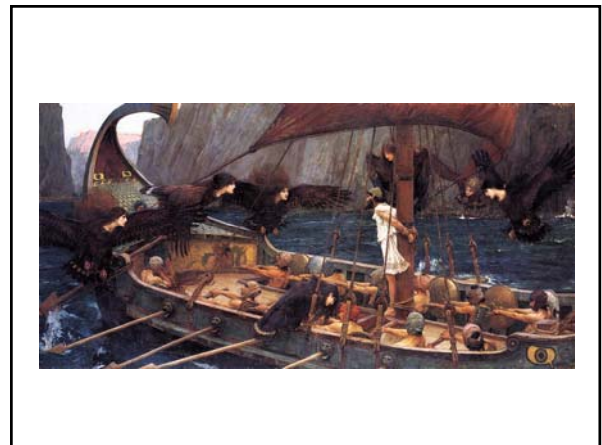
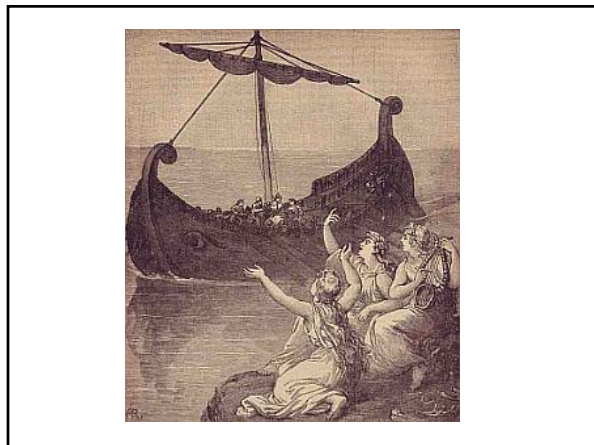
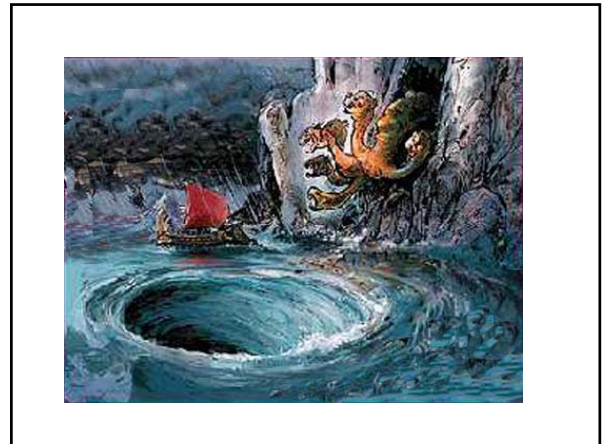
Homer
(dates unknown)
idealized portrait



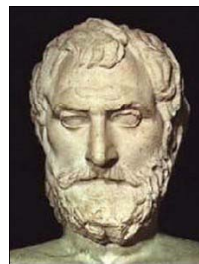
- Reportedly lived sometime between 1300 – 850 BC.
- Considered by some to be “The father of geography” because *The Odyssey*, one of his epic poems, provides the earliest geographical description of the fringe of the Greek world.

The Odyssey





Thales of Miletus (ca. 624 – ca. 546BC)



- Advocated explanation of the natural realm without reference to mythology.
- Candidate for "Father of Science"
- Major contributor to the budding field of geometry (calculated heights of pyramids).
- Using this knowledge, he is credited with being the first of the ancient Greeks to be concerned with the measurement and location of things on earth's surface (possibly for personal business reasons).

Teleological explanation vs. Mechanical explanation

Teleological explanation

- From the Greek *teleos*, meaning “purpose” or “end”.
- Things happen for a reason or purpose that suggests Divine will.
- As related to geography, God’s will is revealed in nature as well as in scripture.
- The world we inhabit was created by God and exhibits an order, complexity and purpose as designed by the Creator.
- A careful inventorying of the world’s attributes, as by geographical exploration and analysis, may help us understand God’s will even as it proves God’s existence.

Mechanical explanation

- Phenomena and observations are the results of purely natural (non-divine) causes.
- As related to geography, Earth’s attributes are the products of natural processes that may be explained by physics, mathematics, biology and other realms of human knowledge whose contents rely on careful observation, verification and testing.
- Established explanations must be able to withstand “the test of time.” Thus, they may be replaced if subsequent observation and analysis provide new explanations that are superior to old ones.

Miletus



Location of Miletus



Miletus



Anaximander (ca. 610 – ca. 546 BC)

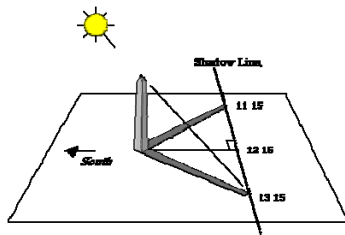


- Disciple of Thales
- Claimed that nature is ruled by laws, just like human society.
- Introduced the gnomon to Greece.
- Produced one of the earliest known maps of the world.

The gnomon

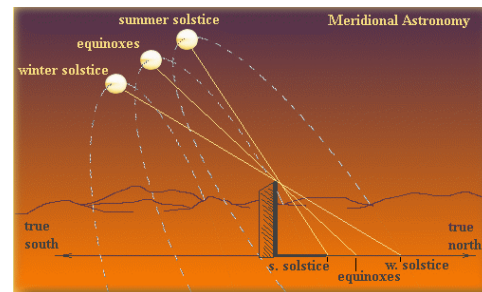


Shadows cast by a gnomon



General Example : at Local Noon, - here 1215 - the Sun gives the shortest possible shadow.

Use of the gnomon to determine solstices and equinoxes



The Tower of the Winds

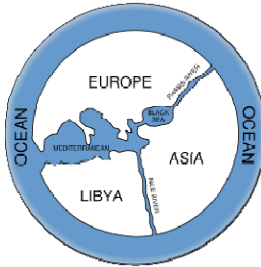


- Octagonal structure in Athens possibly dating from the second century B.C.
- About 12 meters tall and 8 meters in diameter.
- Its rooftop sundial(s) and interior water clock served as municipal timepieces.
- Also served as a wind-vane.
- The eight sides venerate the eight wind gods of antiquity: Boreas (N); Kaikias (NE); Euros (E); Apeliotes (SE); Notus (S); Livas (SW); Zephyrus (WS); and Skiron (NW).

The water clock is an ancient device (16th cent. BC?) which measures the passage of time by the regulated flow of water into or out of a vessel.

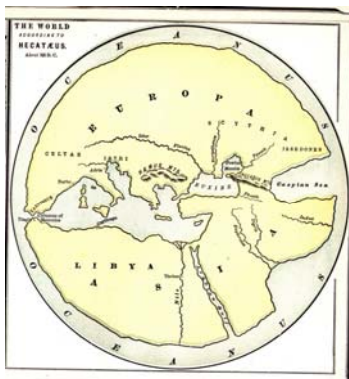


An Interpretation of Anaximander's world map



Hecataeus (ca. 550 – ca. 475 BC)

- No known artistic portrayal; name may refer to more than one person.
- Advocated taking stock of what is around us and putting the accumulated knowledge of the world together in some usable form.
- First known Greek to collect and classify information brought to Miletus not only from the known Greek world, but also from unknown (to the Greeks) lands beyond.
- A principal founder of the idiographic/descriptive tradition in geography.
- Used *Europa*, *Asia*, and *Libya* as regional divisions for his world geography.



Interpretation of the World Map of Hecataeus



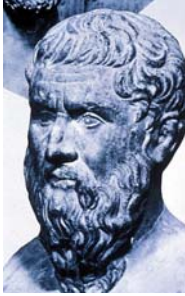
***Europe* comes from *Europa*, who in Greek mythology was a Phoenician woman of some importance who was abducted and raped by Zeus in the form of a white bull, and by him became the mother of Minos, Rhadamanthus and Sarpedon.**

The Rape of Europa by Titian (1562)



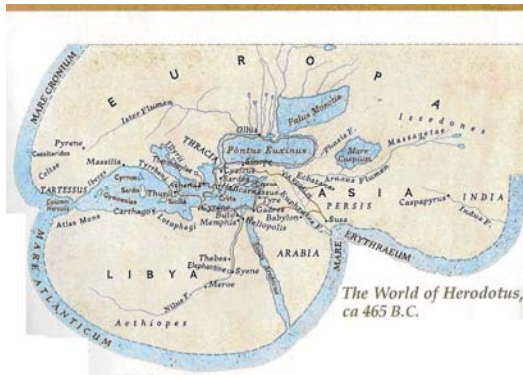
Herodotus

(484 – ca. 425BC)



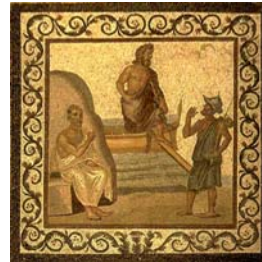
- Greek traveler and scholar who stressed the interrelationship between history and geography
- Correctly interpreted the Nile delta as being formed by silt deposits.
- Intrigued by the propensity of the Nile to flood during summer (the local low rain season).
- Sought explanations that reflected the notion of an earth that was arranged symmetrically.

The world of Herodotus



Hippocrates

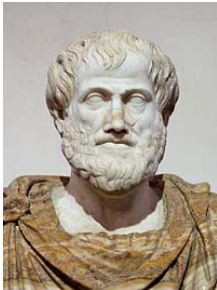
c. 460 BC – c. 370 BC



- Ancient Greek physician considered to be the founder of Western medicine.
- Produced the first medical geography.
- First to propose a link between environmental conditions and human health and behavior.
- Because of that, he might be considered the first proponent of a geographical law.

Aristotle

(384 – 322 BC)

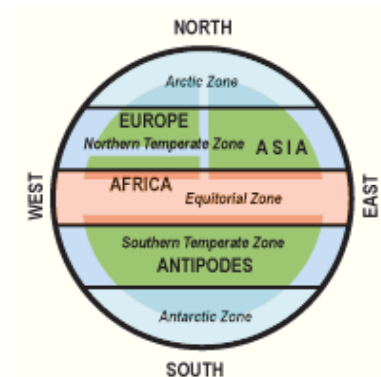
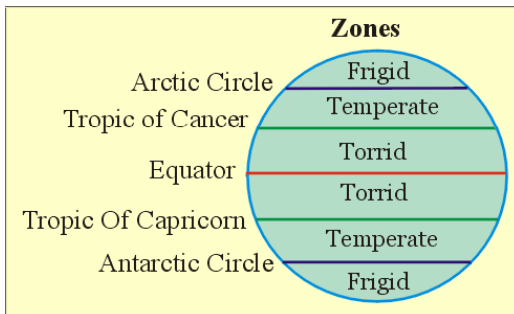


- Conceptualized the world as consisting of 5 climatic zones:
- A torrid zone, between the Tropics of Cancer and Capricorn, that was uninhabitable due to its heat.
- Habitable northern and southern temperate zones, between the Tropics and the Arctic and Antarctic circles.
- Uninhabitable frigid zones located poleward of the Circles.

The world according to Aristotle

- Earth is the result of divine creation.
- As befits its origin, Earth exhibits symmetry (sphericity) and balance.
- Thus, the land masses of the northern hemisphere (*Arktos*) must be balanced by a southern continent (*Anti-Arktos*).
- [For more than a thousand years, world maps would show a yet-to-be-discovered southern continent.]
- [In Roman times, *Arktos* and *Anti-Arktos* were replaced by *Borealis* and *Australis*, the northern and southern winds. Thus, the search for the southern continent would become a search for *Terra Australis Incognita* – *The Unknown Southern Continent*.

Aristotle's Climatic Zones



Eratosthenes
(ca. 276 – ca. 195 BC)

"The Father of Geography"



- Invented the word "geography"
- Chief librarian at Alexandria
- Invented a system of latitude and longitude.
- Calculated Earth's circumference with remarkable accuracy.
- First to prove that the Earth is round.
- Calculated Earth's tilt on its axis.
- Produced an advanced map of the world.



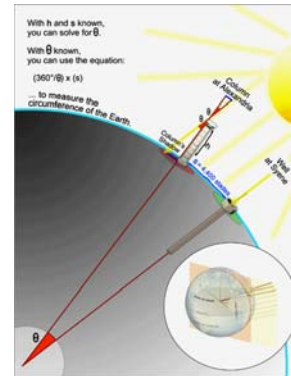
Aswan/Syene



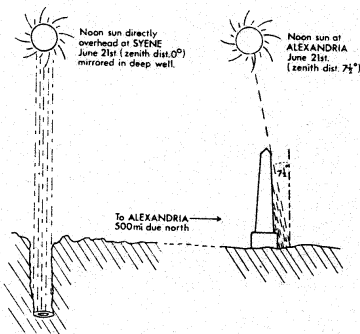
Aswan/Syene



(Supposedly)
The Well of Eratosthenes at Syene



How
Eratosthenes
calculated
the
Earth's
circumference



Eratosthenes' map of the world
(19th Century reconstruction)

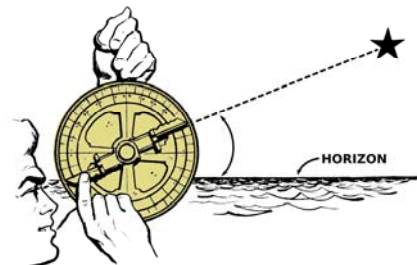


Hipparchus
c. 190 BC – c. 120 BC



- Considered the greatest astronomer of antiquity
- Probably succeeded Eratosthenes as chief librarian in Alexandria
- Considered by some to be the inventor of the astrolabe.
- Credited with popularizing the Assyrian sexagesimal mathematical system, which divides a circle into 360°. Became the basis for the measurement of latitude and longitude.

The use of an astrolabe
to calculate the angular elevation of a celestial object





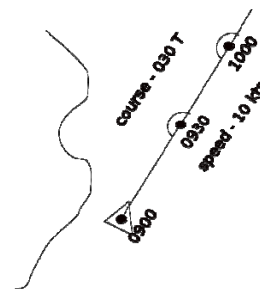
Posidonius

(135-50BC)



- Famous for two things that greatly influenced history and geography:
- A miscalculation about the size of the Earth that nevertheless was accepted for centuries; and
- A correct idea about the human inhabitability of the equatorial realm that was ignored for centuries.

Dead Reckoning is the process of estimating one's current position based on a previously determined (or estimated) position and advancing that position based on (a) estimated speed and (b) course.



Dead Reckoning

In this example, the current estimated position (triangle) is used to estimate future positions, based on calculations of direction and speed.

Posidonius miscalculates Earth's size

- Thought that Earth could not be nearly as large as Eratosthenes suggested. So he
- (1) Calculated the angular elevation of the star Canopus at Rhodes and Alexandria, which he believed were on the same meridian;
- (2) Measured the distance between the two observation points by means of the navigational technique known as *dead reckoning*; and
- (3) Based on the above, determined that Earth's circumference was about 18,000 miles – or about 7,000 miles less than what Eratosthenes said.

The world of Herodotus

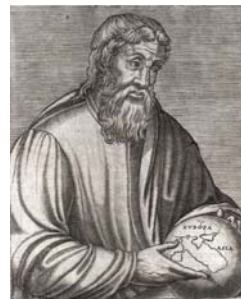


Marcus Terentius Varro (116-27 B.C.)



- Roman scholar whose treatise on geography proposed a 4-stage progression of cultural progress common to all peoples: primitive, pastoral, agricultural, and civilized.
- Went unchallenged until the 19th century, when the work of Alexander von Humboldt suggested otherwise.
- Until then, it greatly influenced how “civilized” societies viewed peoples in other categories.

Strabo (64 B.C. – A.D. 20) (16th century engraving)

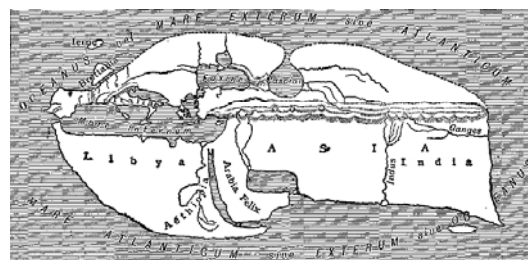


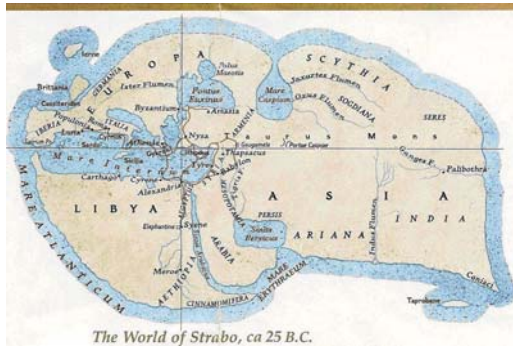
- Greek geographer of the Roman Empire
- Travelled broadly during reign of Augustus
- Later produced 17-volume *Geographica*, intended as a guidebook for Roman administrators and military commanders
- Preserves knowledge and ideas from classical Greece that was otherwise lost.
- His own work survives

Odds and Ends from Strabo's writings

- Defends Homer at great length but dismisses Herodotus as a “fable monger.”
- Accepts Aristotle's zones of habitability; asserts human life not possible south of Lat. 12°30' N
- Places northern limit of habitable earth 400 miles north of the Black Sea.
- Civilization not possible north of the Alps (people must spend all of their time keeping warm)
- Accepts Posidonius on Earth's circumference
- Correctly explains the floods of the Nile.

Strabo's map of the world





The World of Strabo, ca 25 B.C.

Rome and The Spice Trade



Strabo's map of Europe



Claudius Ptolemy (90-168 AD)



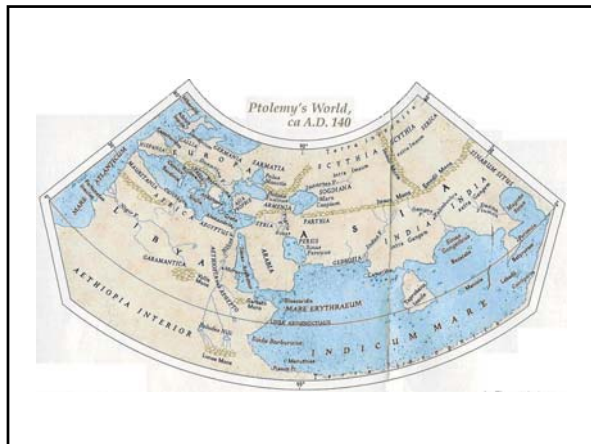
- Roman scholar/scientist famous for two great treatises written in Greek.
- The *Almagest*: a treatise on astronomy and celestial mechanics. Includes data on 48 constellations identified in classical times.
- *Geography*: A compilation of received knowledge of the world that spanned the classical period, to which he added his own judgments and interpretations. Includes a world map. "Discovered" around 1300; translated into Latin; influenced voyages of discovery.

Ptolemy's World Map (as re-drafted for a 15th Century manuscript)



Updated Ptolemy map drafted in 1482 (engraved by Johannes Schnitzer)

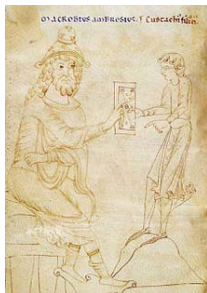




Concerning Ptolemy's world map . .

- Prime meridian runs through the Cape Verde Islands.
- Latitude is measured from the Equator, but the gradations are shown in day-lengths instead of degrees.
- Endorsed the calculations of Posidonius instead of Eratosthenes.
- Therefore, longitude is greatly exaggerated. The eastern extremity, the 180-degree line, runs through central China, which is actually about 120 E. Thus, the coast of China lies even farther to the east.
- The Atlantic Ocean is of unknown extent.
- Other map highlights: an enclosed Indian Ocean; a hint of an extensive southern continent; show Sri Lanka, Malaya, Indus, Ganges, Himalayas, Aral Sea and its tributaries . . .

Ambrosius Macrobius



- Roman grammarian and philosopher who flourished during the reigns of Honorius and Arcadius (395 – 423 AD).
- Of importance to geography for his manuscripts that depict the 5 classical climatic zones and a supposed southern continent separated from the northern ones by an equatorial ocean.

World map by Macrobius



Sketch of climatic zones by Macrobius



World map by Macrobius showing an equatorial ocean and undiscovered southern continent



World map by Macrobius



“Geography” and related vocabulary in the Classical and Post-classical periods

- Geography – mapping and description of the whole earth. [The global scale]
- Chorography – mapping and description of a more limited area. [The regional scale]
- Topography – the mapping or description of a small area or place. [The local scale]
- Chorology – The search for explanation concerning the distribution of phenomena over space, or of how two or more phenomena are spatially related. [Spatial analysis]

The principal geographical concerns of the Greeks and Romans

- Increased understanding of the location and characteristics of places.
- Determination of Earth's shape and size.
- Proper measurement of distance between locations.
- Depiction of the earth on maps.
- Understanding of the relationship between people and the environment, typically based on the belief that Earth and nature demonstrate an order and purpose designed by a deity; that environment influences people; and that people can only modify their environment to a limited extent.

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