

Spatial analysis

- Geography by its nature is a spatial science. Geographers therefore study space in order to locate the distribution of people and objects.
- Geographers ask two main questions, “where” and “why.” Spatial analysis is concerned with analyzing regularities achieved through interaction. Regularities result in a distinctive distribution of a feature.
- Distribution has three properties:
 - Density
 - Concentration
 - Pattern

Relevance

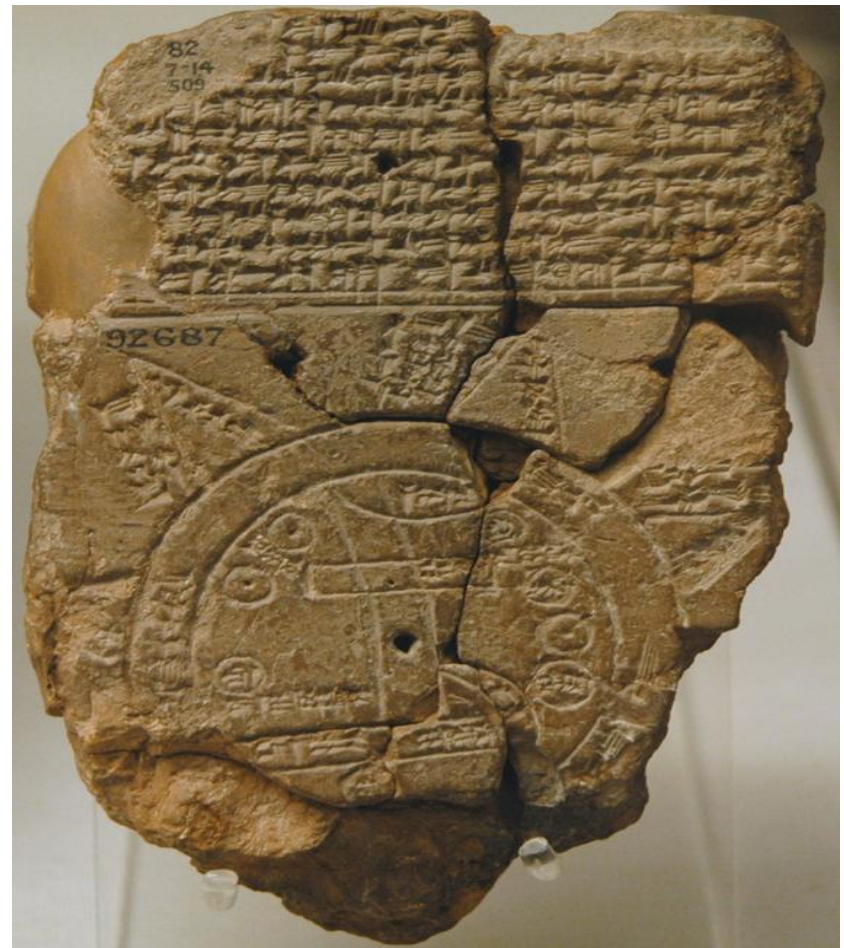
- Geographers observe that people are being pulled in opposite directions by two different factors: globalization and local diversity.
- Tensions between these simultaneous geographic trends underlie many of the world's problems that geographers study.
 - Political conflicts
 - Economic uncertainty
 - Pollution of the environment

Maps

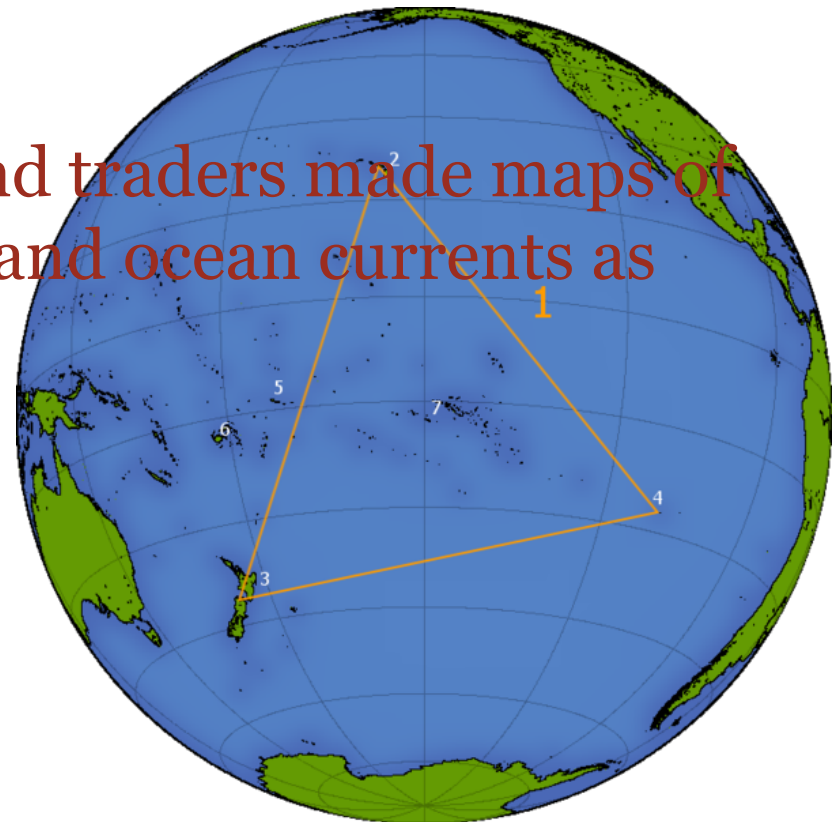
- The most important tool for geographers is a map.
 - Two-dimensional or flat-scale model of Earth's surface, or a portion of it.
 - Cartography: the science of mapmaking.
- Serve two purposes
 - Tool for storing reference material.
 - Tool for communicating geographic information.
- Often the best means for showing the distribution of human activities or physical features, as well as thinking about reasons underlying a distribution.

Early Mapmaking

- Earliest surviving maps were drawn by Babylonians on clay tablets about 600 B.C.E.

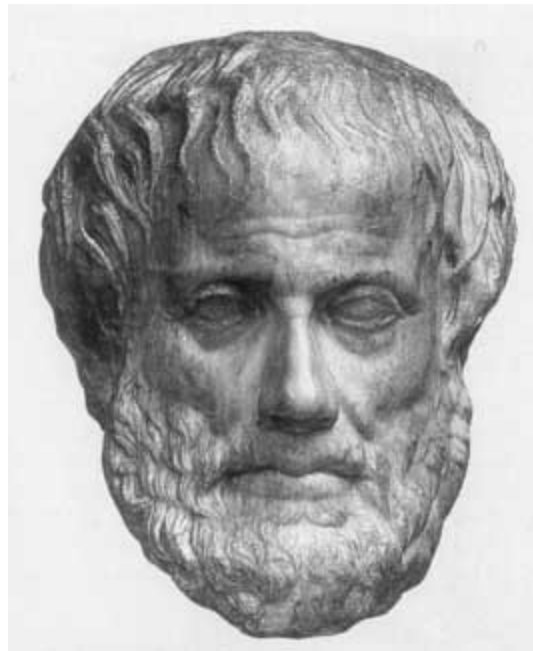


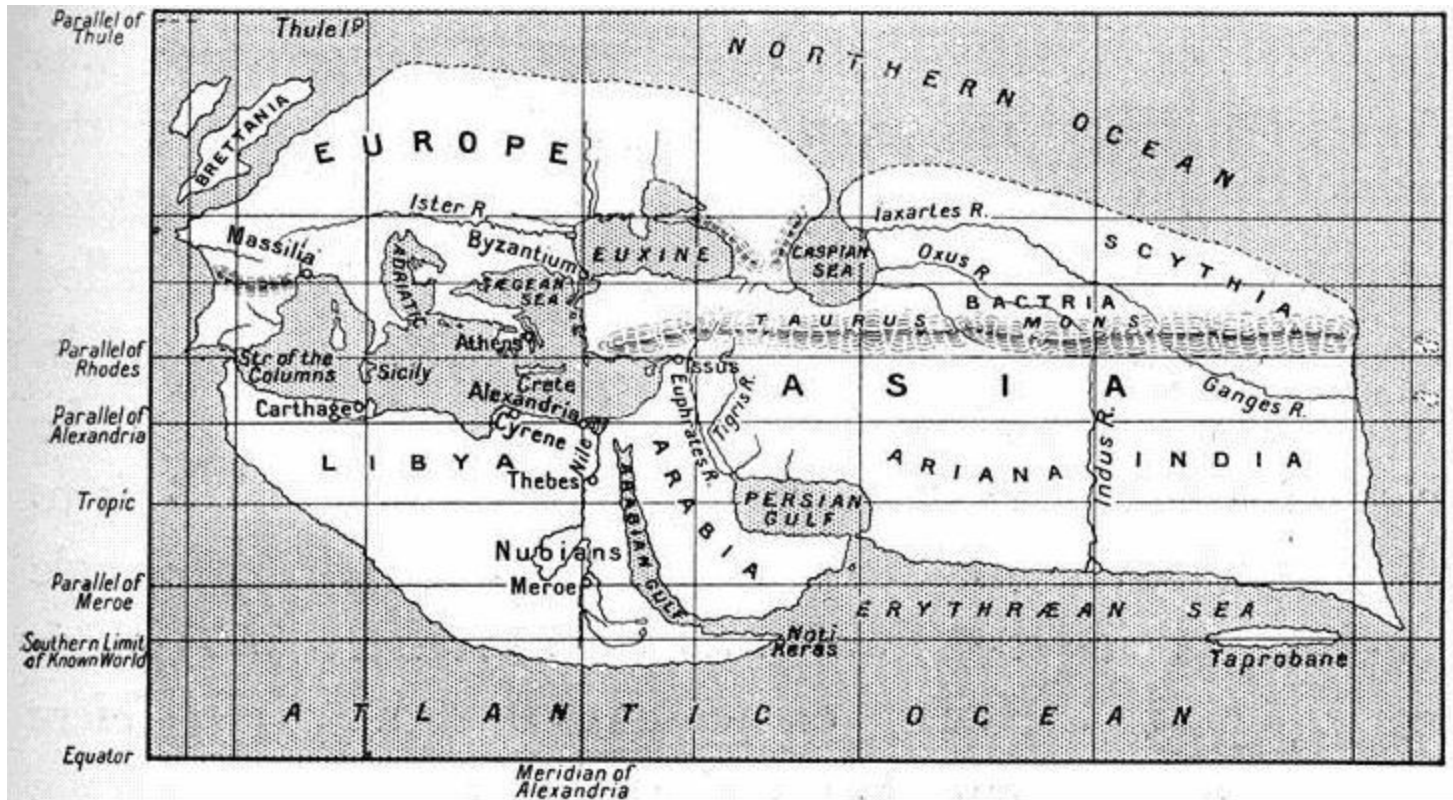
- Mapmaking is undoubtedly older.
 - Polynesians navigated for thousands of years with three dimensional maps.
 - Mediterranean sailors and traders made maps of rock formation, islands, and ocean currents as early as 800 B.C.E.



Early Cartographers

- Aristotle(382-322 B.C.E.): The first to demonstrate the earth was spherical.
 - Observed curved shadow of the earth on the moon during an eclipse and the fact that the visible groups of stars change as one travels north or south.





- Eratosthenes(276-194 B.C.E.): The first person on record to use the word “geography,” calculated the circumference of the earth, and correctly divided the world into five climatic regions.

- Ptolemy(100-170 C.E.): Wrote the 8-volume *Guide to Geography*, taking advantage of info collected by merchants and soldiers who traveled throughout the Roman Empire.



Non-European

- After Ptolemy, little progress was made in Europe for 100s of years.
- Phei Hsiu (Fei Xiu), “father of Chinese cartography,” produced an elaborate map of China in 267 C.E.
- Muslim geographer al-Idrisi prepared a map in 1154 C.E.
- Ibn Battuta (1305-1368) wrote *Rihlah (Travels)* based on 30 years of journeys

Exploration and Discovery

- Cartography enjoyed a revival during the European Age of Exploration
- By the 17th century, maps accurately displayed the outline of most continents and the position of the oceans.



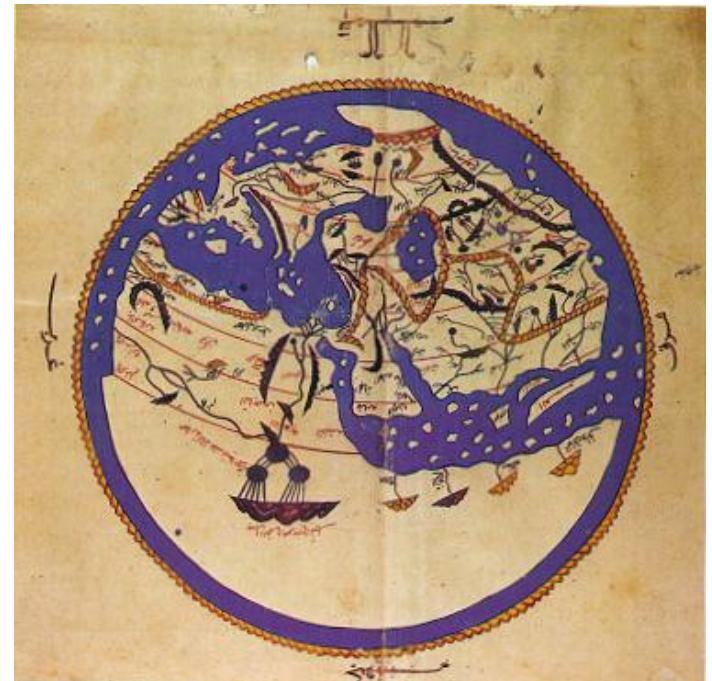
Old Islamic Maps

- Muslims used early maps to fulfill the duties of formal prayers and the pilgrimage.
- Muslims need to find the direction and routes leading to al Ka'aba from virtually any spot on the globe.



Left: map of the world in 1154 by Idrissi

Right: map of the world made by the Muslim geographer Jihani in the 10th century of the common era.



Map Scale

- The scale of a map is the relation of a feature's size on a map and its actual size on Earth's surface.
 - Fraction ($1/24,000$)
 - Ratio (1:24,000)
 - Written statement (1 inch equals 1 mile)
 - Graphic bar scale



Graphic Scale

- A graphic scale usually consists of a bar line marked to show distances on Earth's surface.
- The bar line is used by measuring a distance on the map, then reading that distance along the bar line.
- The appropriate scale for a map depends on the information being portrayed.

Washington State

(1:10 million scale)



All satellite imagery provided by GlobeXpress.com

1:10,000,000

0 50 100 MILES

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Western Washington (1:1 million scale)



1:1,000,000

0 5 10 MILES

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Seattle Region (1:100,000 scale)



1:100,000

0 0.5 1 MILE

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Downtown Seattle, Washington (1:10,000 scale)



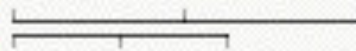
1:10,000

0 .05 .1 MILE

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Verbal Scale
1 in. = 1,485 mi
1 cm = 940 km



Representative fraction

$$\frac{1}{94,000,000}$$

Small scale



Verbal Scale
1 in. = 585 mi
1 cm = 370 km



$$\frac{1}{37,000,000}$$



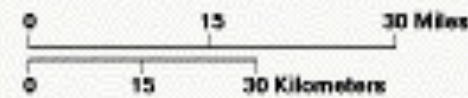
Verbal Scale
1 in. = 250 mi
1 cm = 160 km



$$\frac{1}{16,000,000}$$



Verbal Scale
1 in. = 20 mi
1 cm = 13 km



$$\frac{1}{1,300,000}$$

Large scale



Map Scale Practice

- Match the following scales to which map is hanging up in the room.

- 1 : 41,849,600

- 1 : 28,500,000

- 1 : 7,100,000

- 1 : 14,636,000

- 1 : 31,860,000

- 1 : 5,877,000

1. Atlantic Ocean Floor

2. Caspian Region

3. Globe

4. Africa

5. Middle East

6. World

Scale Differences: *Maps of Florida*

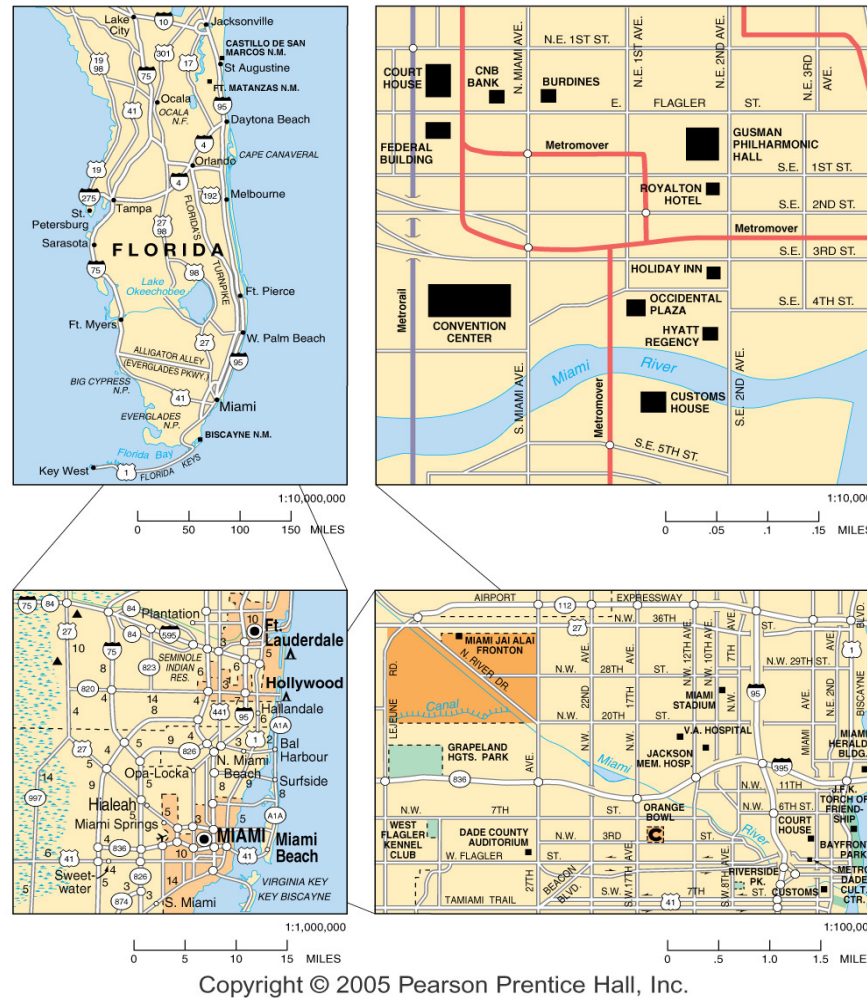
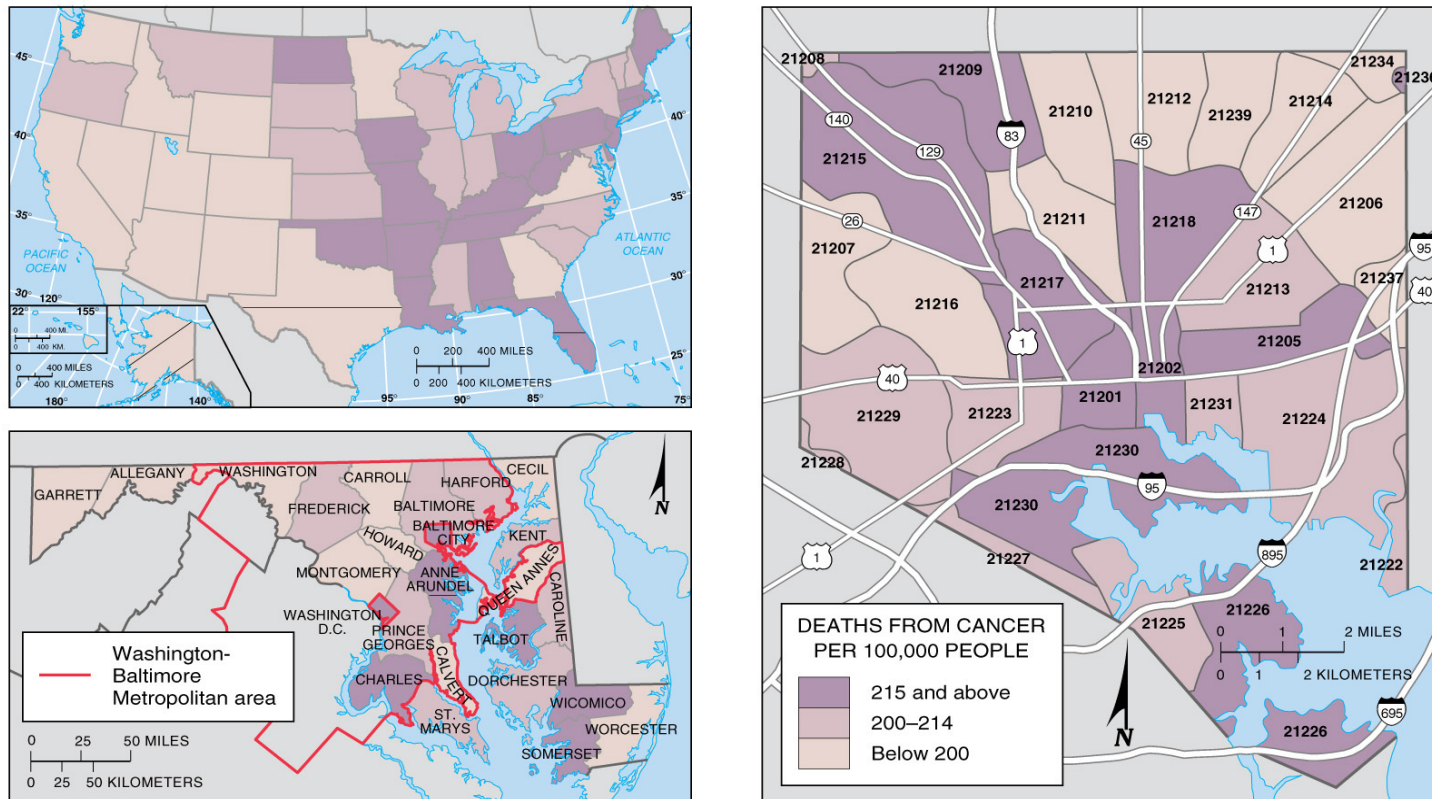


Fig. 1-3: The effects of scale in maps of Florida. (Scales from 1:10 million to 1:10,000)

Spatial Association at Various Scales



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Fig. 1-13: Death rates from cancer in the U.S., Maryland, and Baltimore show different patterns that can identify associations with different factors.

Projection

- The method of transferring location on Earth's surface to a flat map is called projection.
- Earth's spherical shape poses a challenge for cartographers because drawing Earth on a flat surface unavoidably produces distortion.