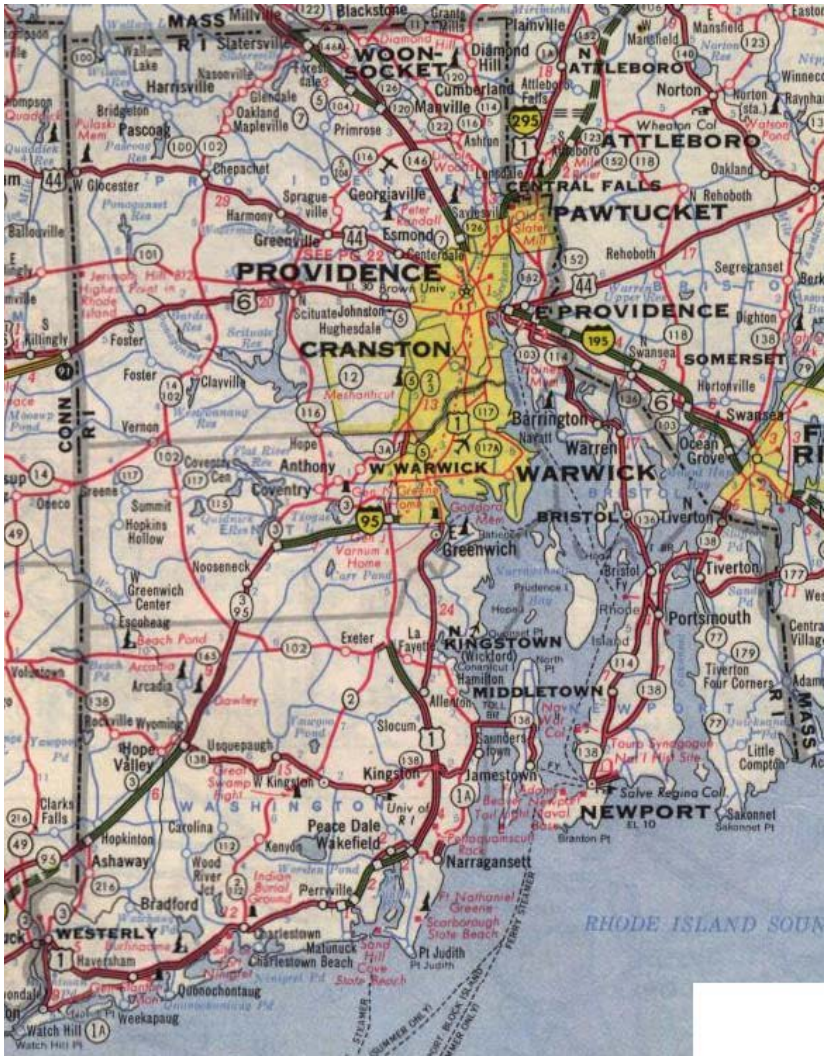
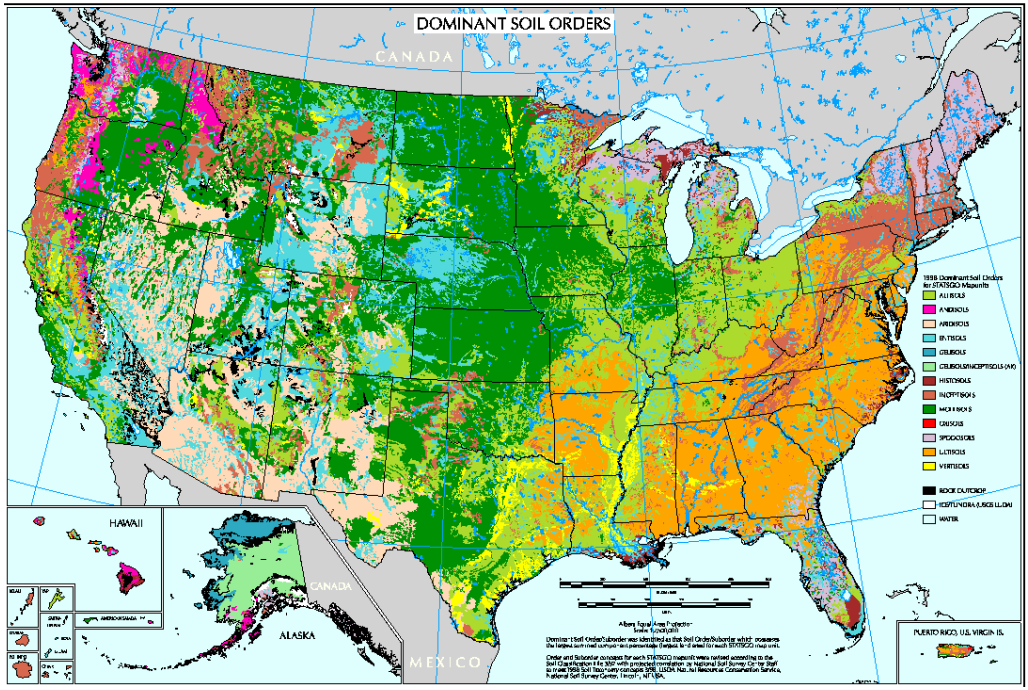
Geog 126: Maps in Science and Society

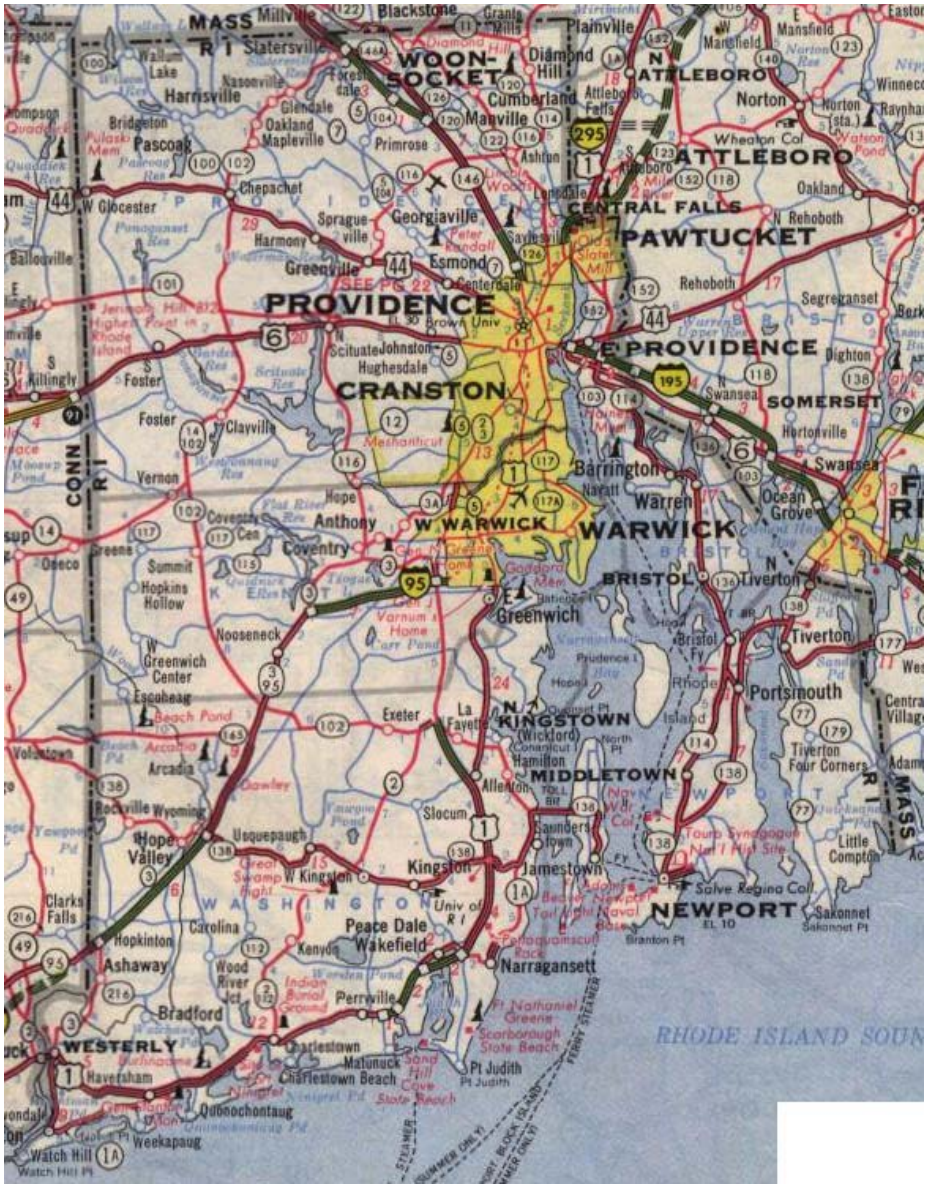
Early Thematic Cartography

General-reference maps versus thematic maps





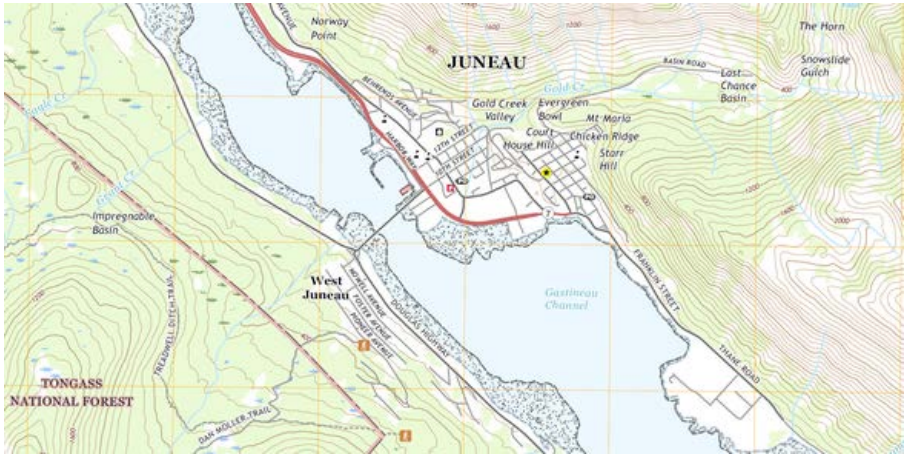
General-reference maps



- Emphasize location of spatial phenomena
- Principal goal is navigation and cartometry
- Go back to cartography's origins
- Examples include:
  - Road maps
  - Google Maps
  - Openstreetmap.org
  - USGS Topo maps

USGS Topographic Maps: Content

- Topography
- Hydrology
- Land cover/use
- Roads and transportation
- Human settlements
- Place and feature names
- Geodetic base and control
- Cadastral information and land divisions
- Boundaries
- Imagery

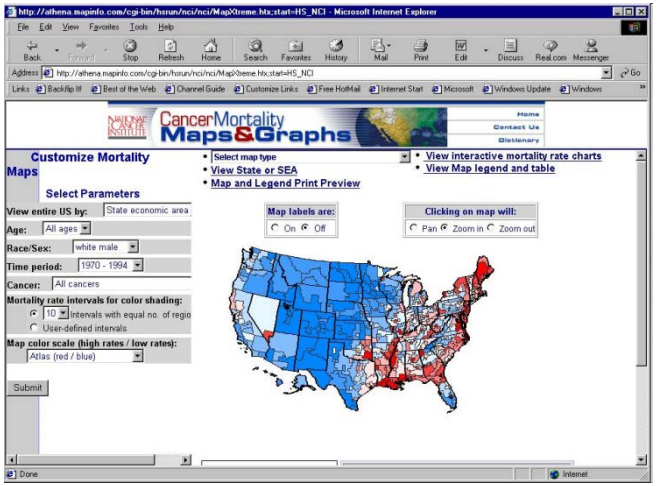


The thematic map

- Also called the “statistical map,” “single-topic map,” or the “special-purpose” map
- Less literal than a general-reference map
- Two groups of thematic maps: qualitative and quantitative
- Goal is primarily information transfer
- More recent than general purpose

Attributes

- Attributes in geography are spatially dependent variables
- Geographic attributes are specific statistics tied to geographic locations
- Locations can be points, lines, polygons
- Examples include:
  - Population density
  - Tax rates
  - Health data (lung cancer rate)
  - Air pressure, temperature

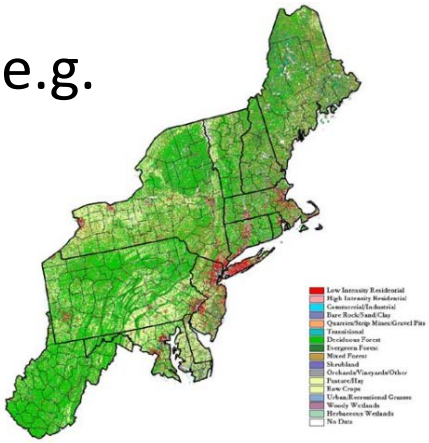


- Thematic maps depict geographic attributes

The 2 kinds of thematic maps

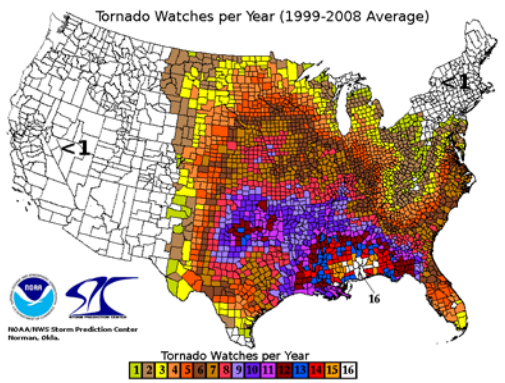
- Qualitative thematic maps
  - Show the spatial distribution or location of *a set of classes*
    - ***Land use***
    - ***Soil types***
    - ***Languages***
    - ***Geology***
  - These maps are concerned with groups, names, types (nominal data)
  - Many systematic national mapping efforts, e.g.

    National Land Cover database

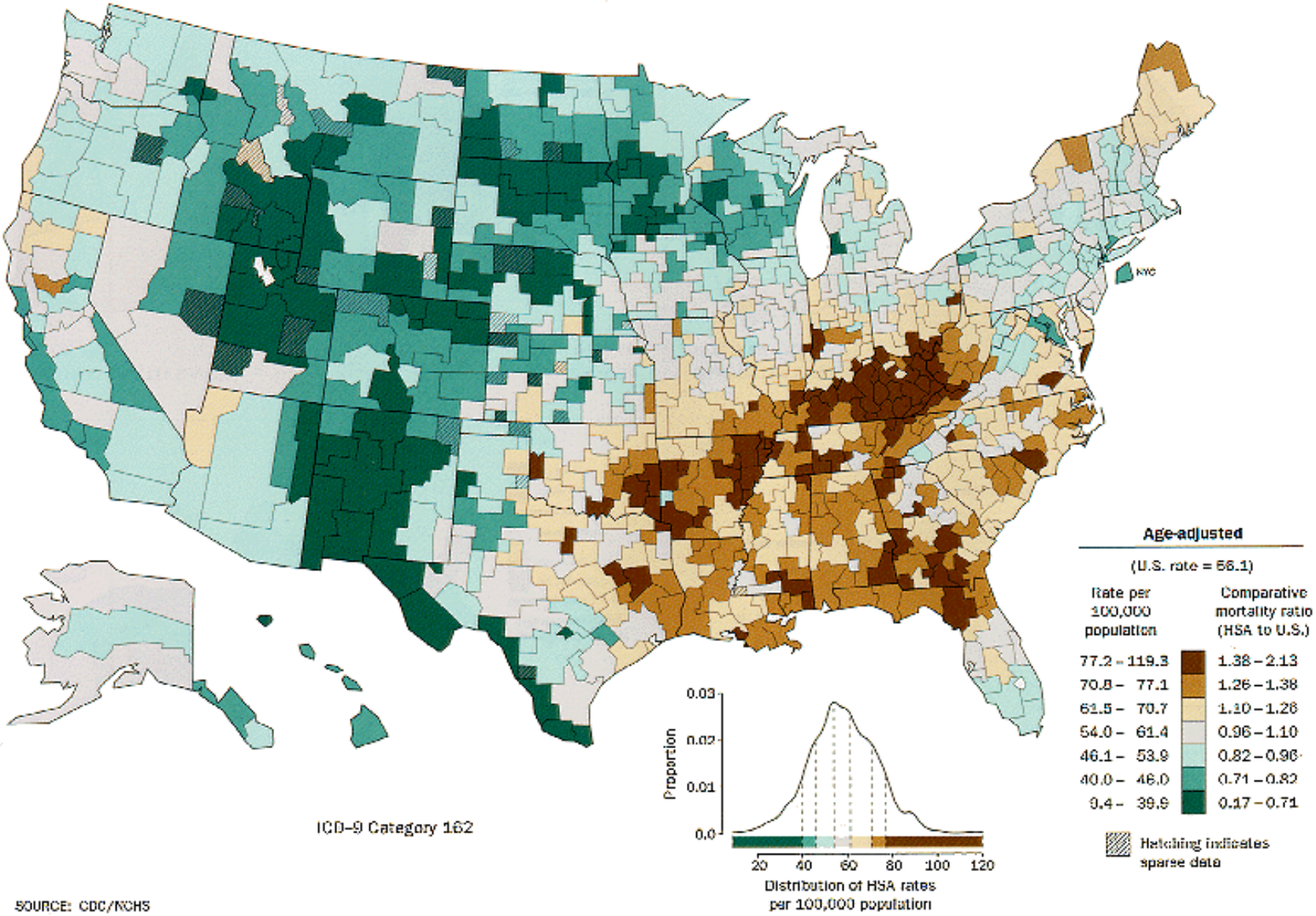


The 2 kinds of thematic maps

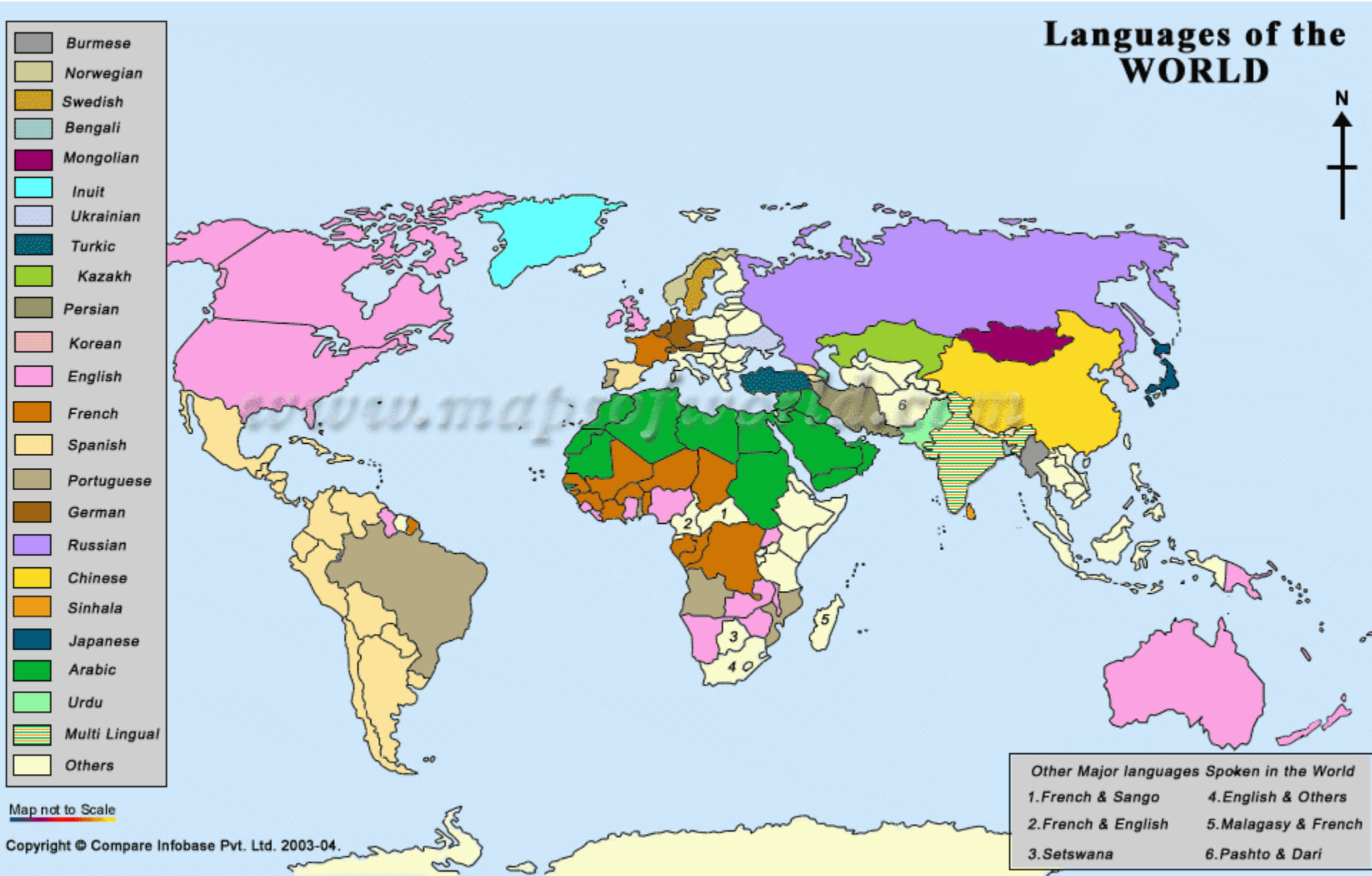
- Quantitative thematic maps
  - Spatial aspects of ***numerical*** data
    - Corn yield
    - Per Capita Income
    - Number of Tornadoes
    - Population Density
  - These maps are concerned with **amounts**, or **quantities**



Lung cancer in white males, by Brewer
Qualitative or Quantitative?

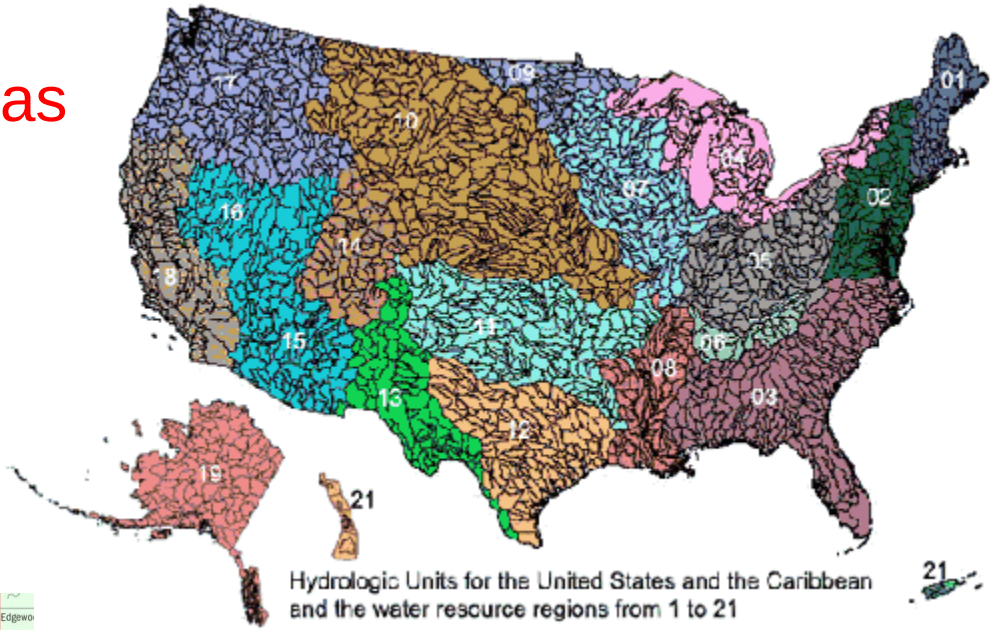


Qualitative or Quantitative?

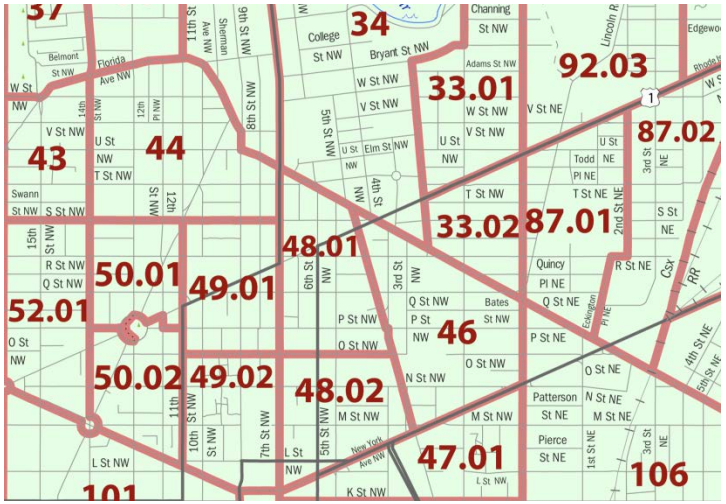


Geographical Units

Real points, lines, areas
Fiat Boundaries

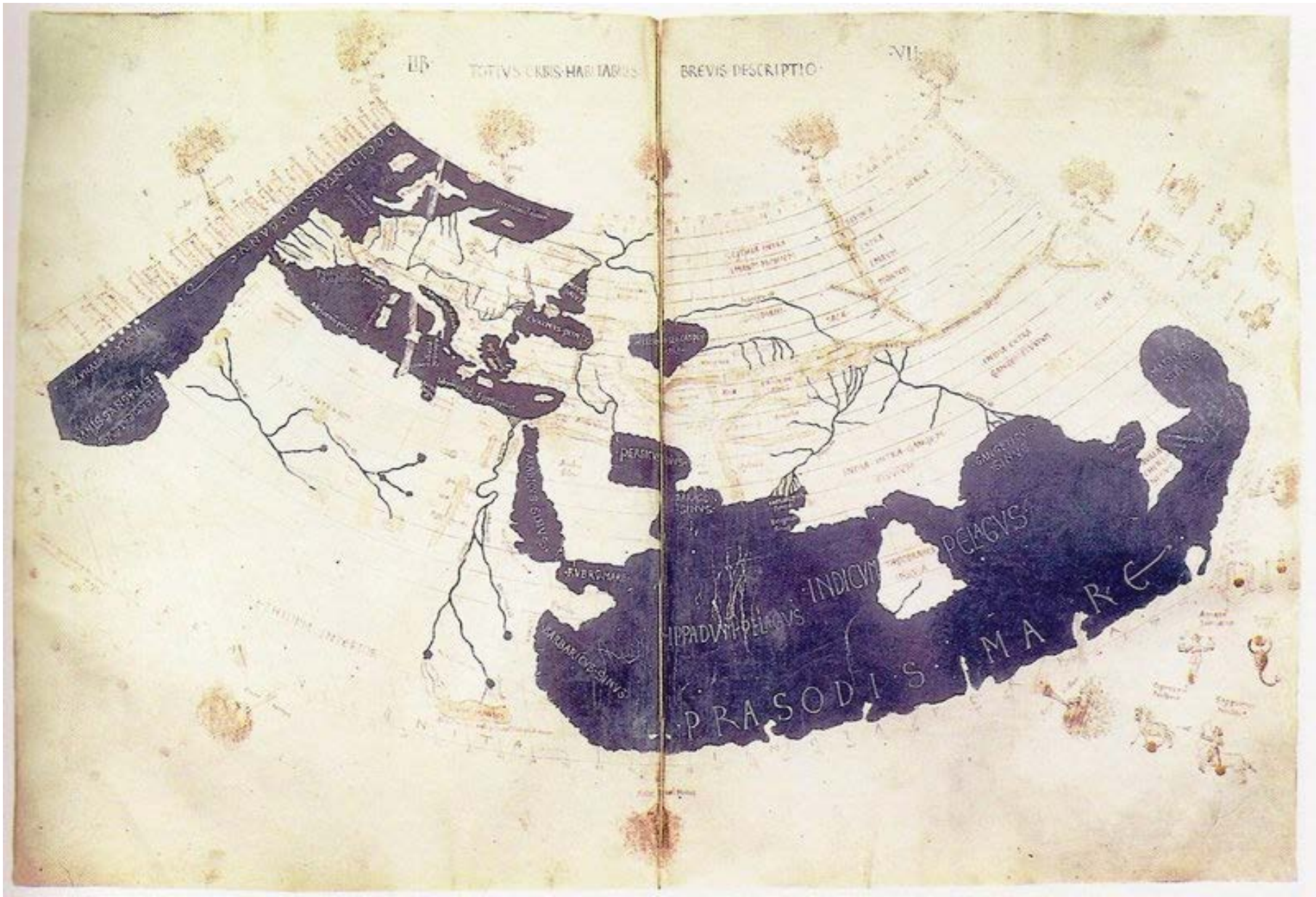


Hydrologic Units for the United States and the Caribbean and the water resource regions from 1 to 21



Some important historical general-reference maps

Ptolemy's map of the world (circa 150)

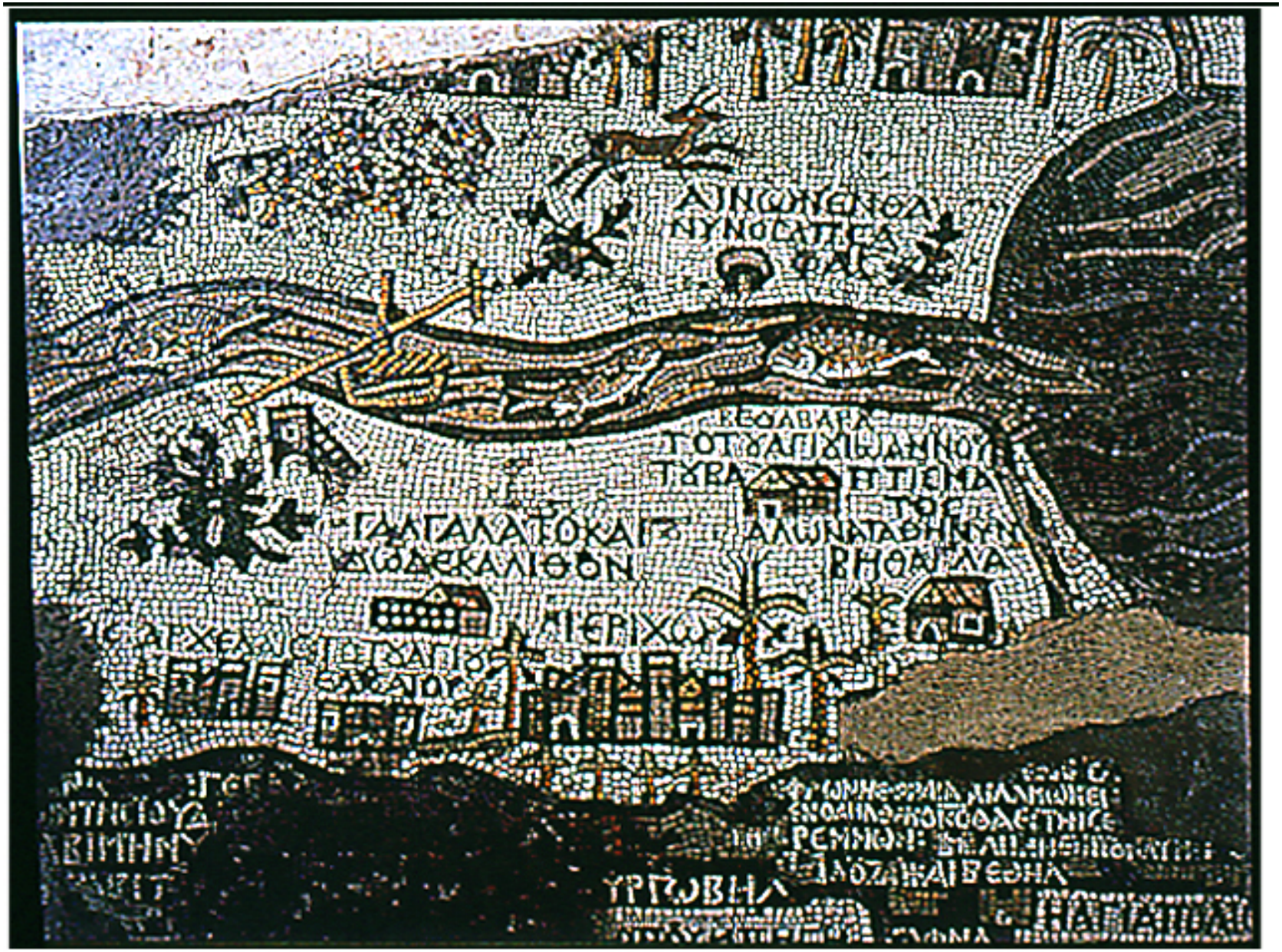



AFRICA
INDICVS OCEANVS

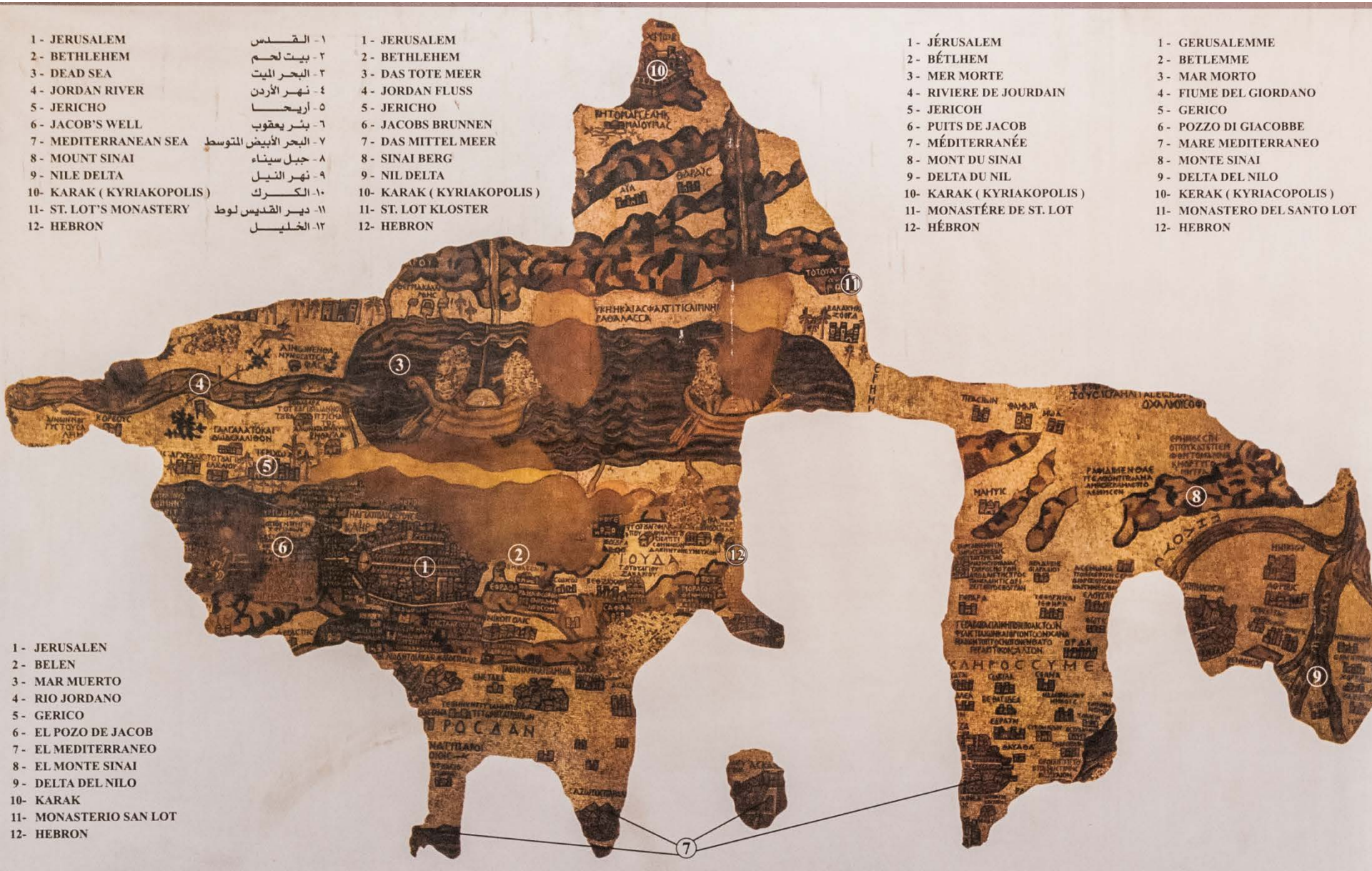
The Madaba Mosaic

- Circa 590 AD
- Madaba is the 5th largest city in Jordan
- The mosaic is an index map of the biblical region (earliest map of Jerusalem)
- Consists of 2 million pieces of colored stone
- Re-discovered in 1896
- Floor decoration for a Greek Orthodox church
- Features and placenames in Greek

The Madaba Mosaic



Photomosaic

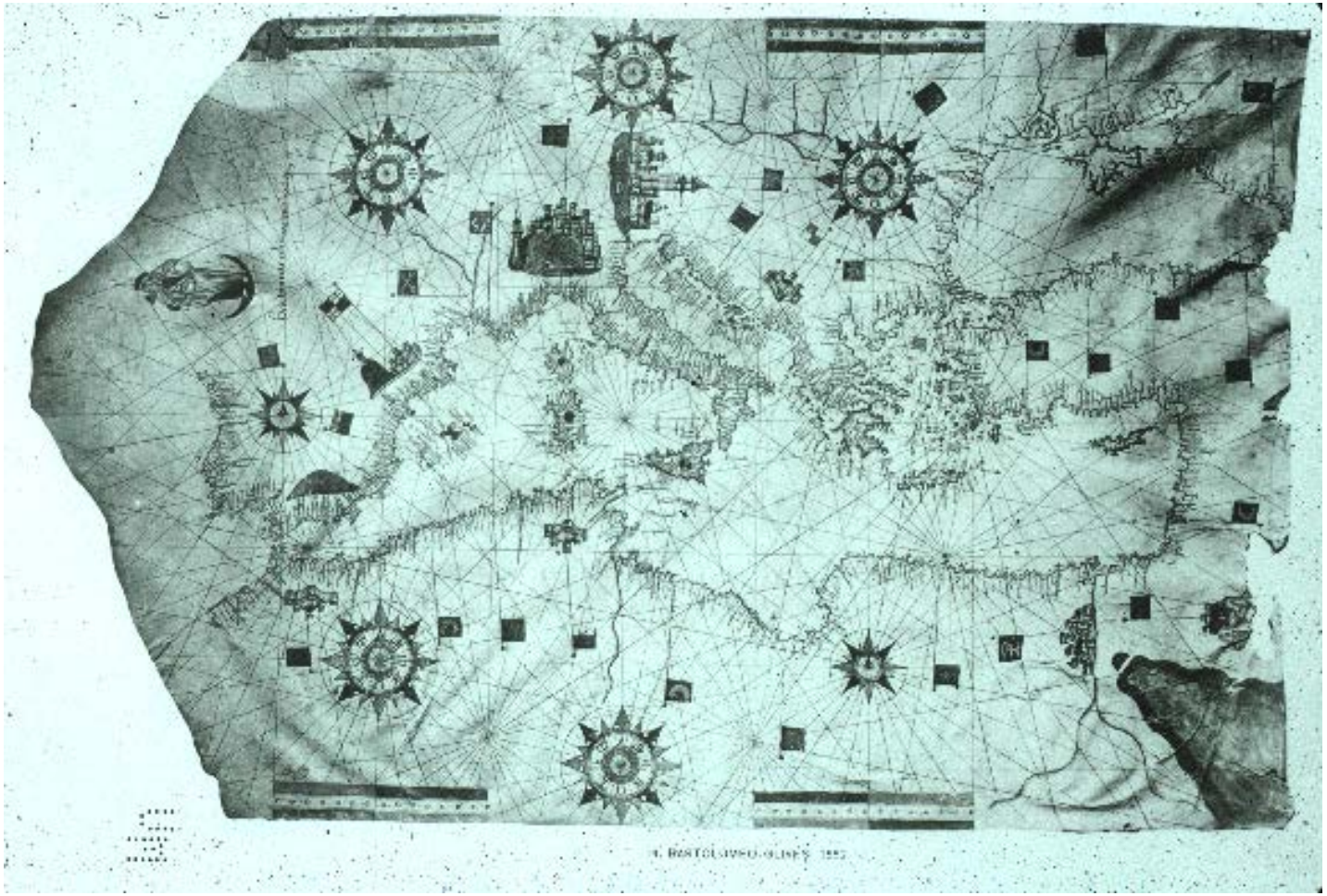


Jerusalem on the Madaba Map

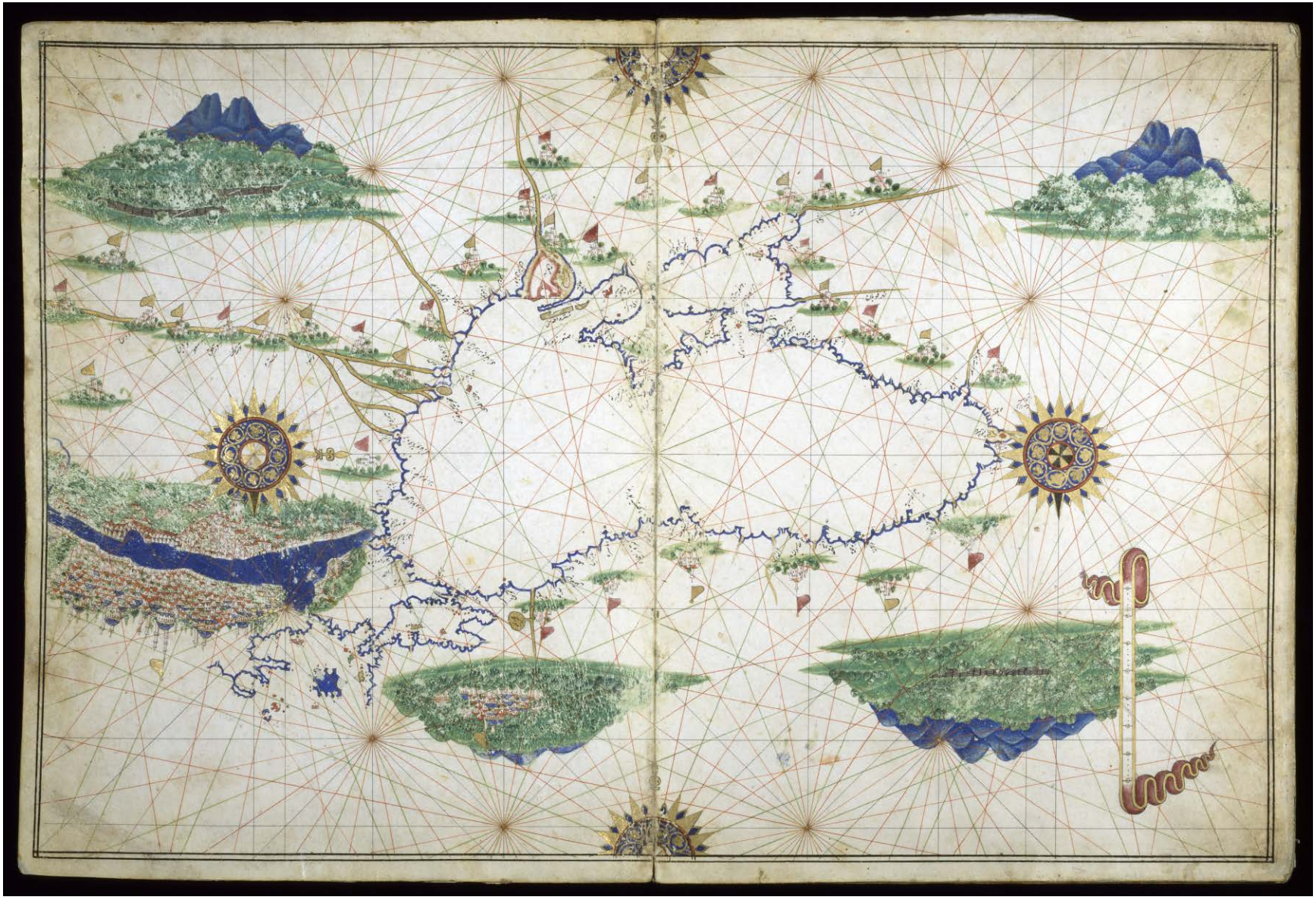
Portolans

- 14th Century European navigation charts
- Meant to be used by mariners
- Good shoreline depictions
- Reflect the extent of European travels at that time (not global, no America)
- Show compass roses centered on key ports, cities etc.

Portolan navigation charts

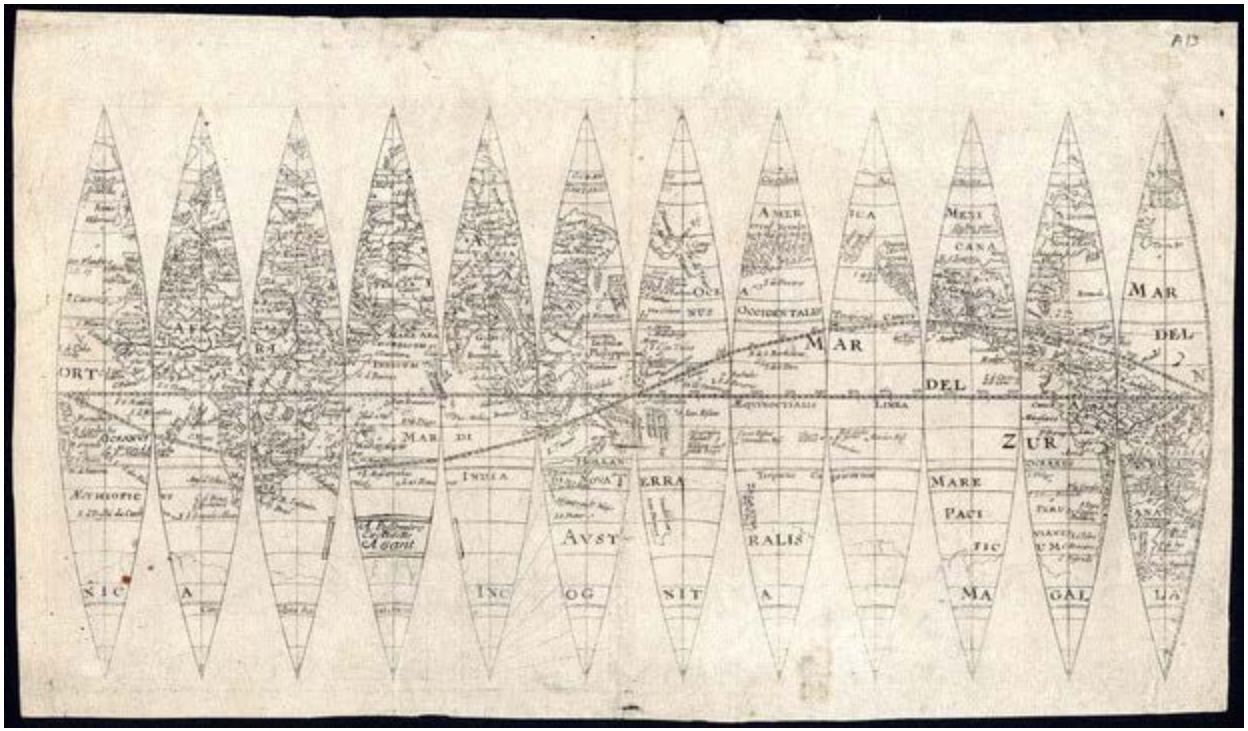


16th-century Turkish portolan map of the Black Sea



Globes as Reference Maps

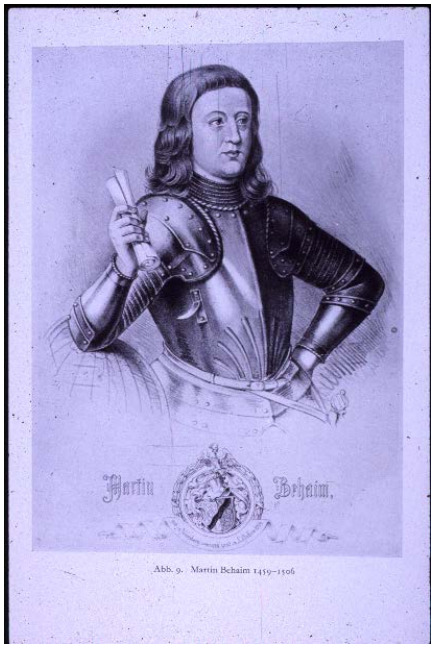
- True globes
- Gores



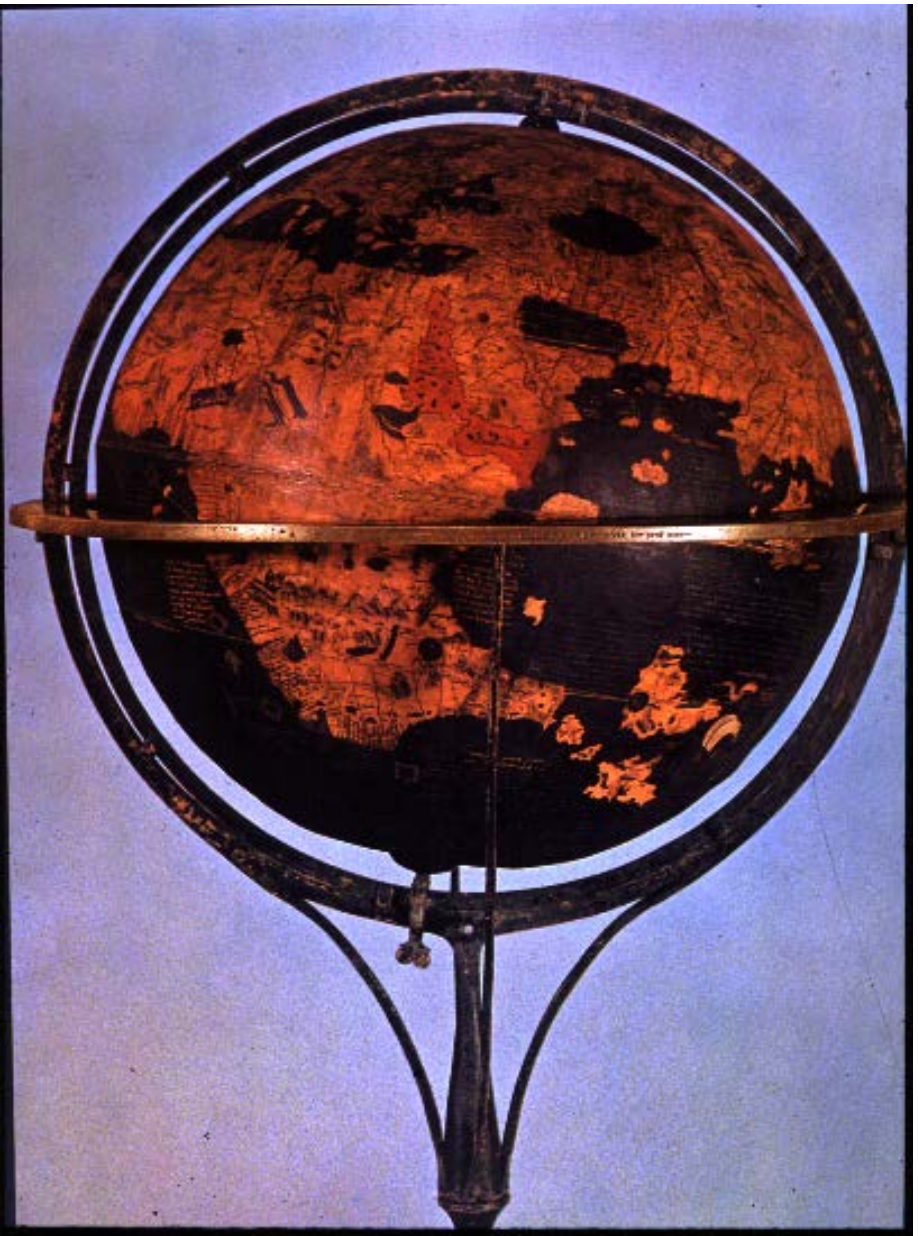
Adrian Possemirs, 1680

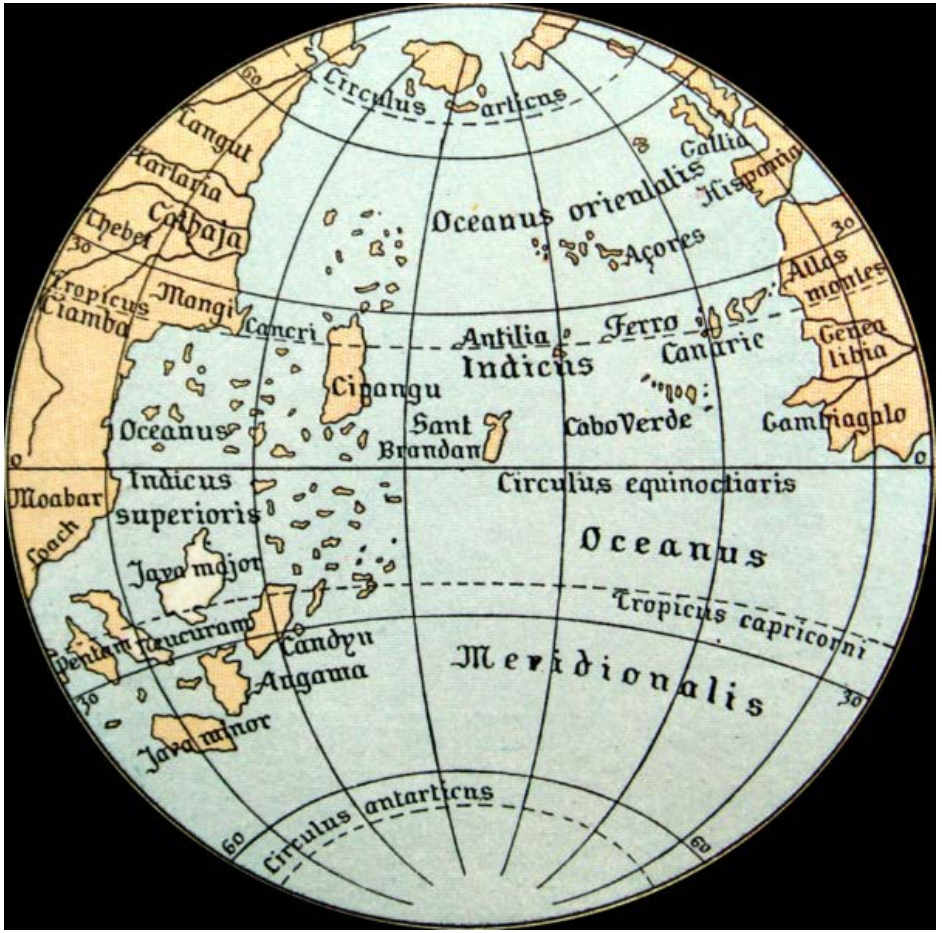
Martin Behaim

- Created an important early globe
- 1492 (significant year…)
- The globe is still preserved in Nuremberg, Germany



Martin Behaim's 1492 Globe





Post-Columbus

- Ortelius' Atlas "Theater of the World"
- 1570s, Flemish Geographer

Ortlelius: The “Atlas” 1570

Some early thematic maps

www.math.yorku.ca/SCS/Gallery/milestone/sec5.html

Thematic Cartography

- Earliest examples from 1700's
- Edmond Halley
  - English Scientist
  - Charts on Trade Winds, published 1686…
  - Isogonic charts, earliest use of contours

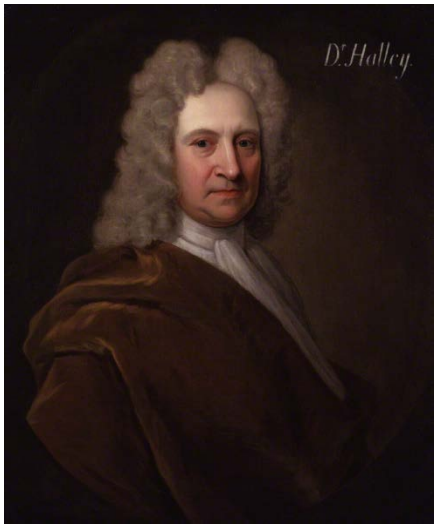
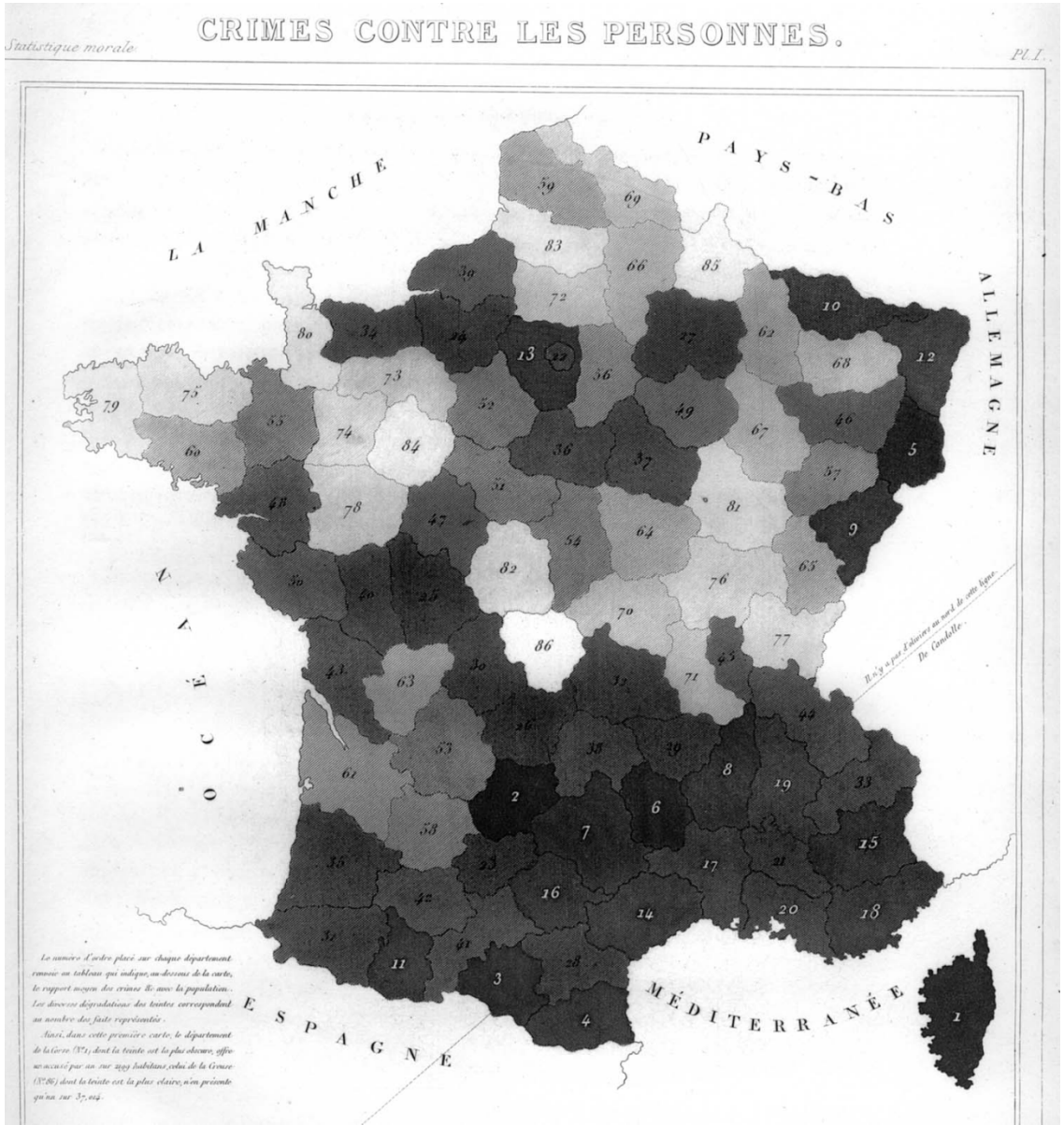


Fig. 5. "A New and Correct Chart shewing the Variations of the Compass in the Western and Southern Oceans," ca. 1701 by Edmond Halley. From a copy in the Library of the Royal Geographical Society, London, reproduced by permission of the Society.

Edmond Halley, 1701

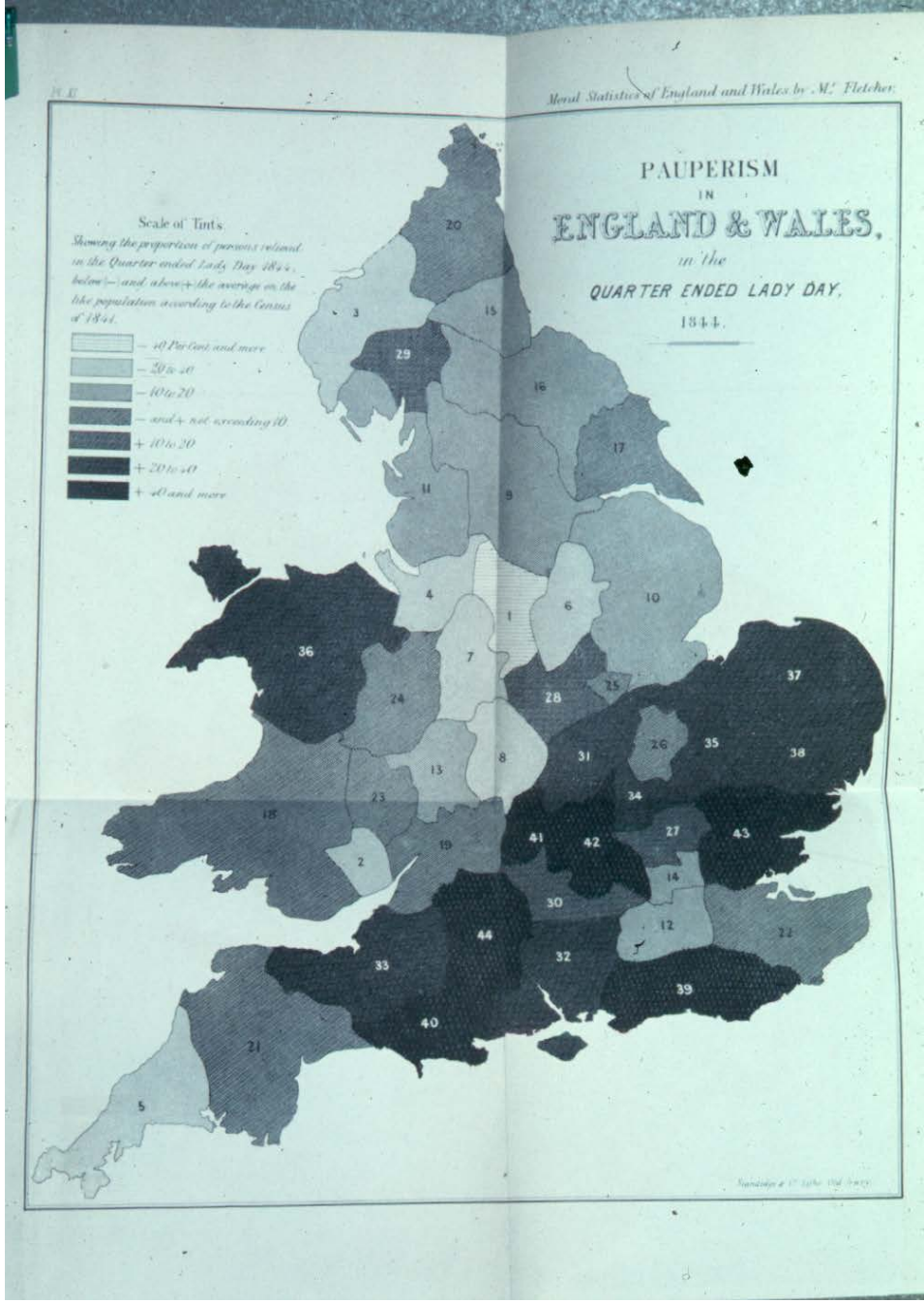
- An "isogonic" map
- Isogonic or "Halleyan" lines connect points of equal magnetic declination
- Invisible attribute!

Guerry's map of crimes against persons in France (1833)

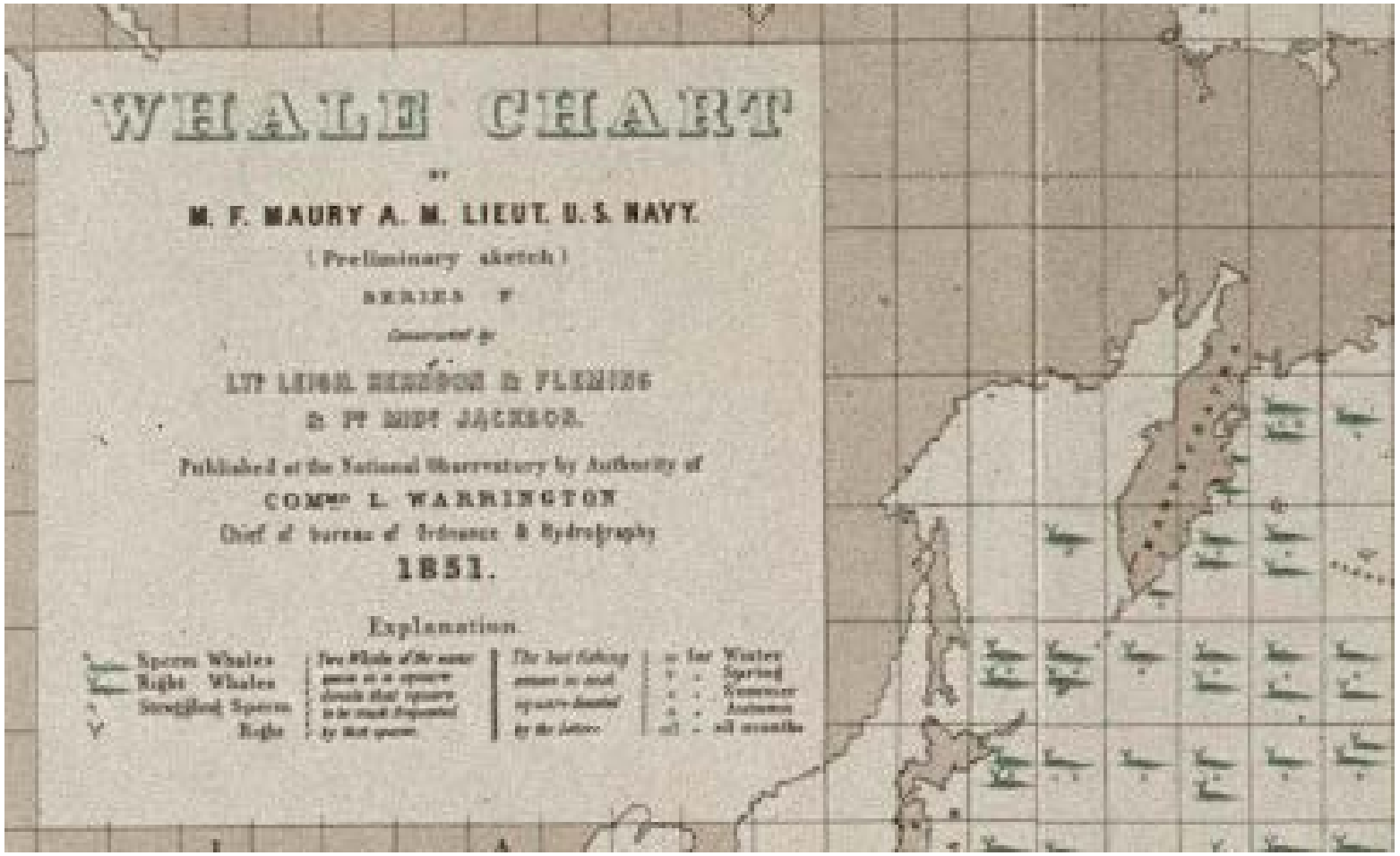


Joseph Fletcher 1844

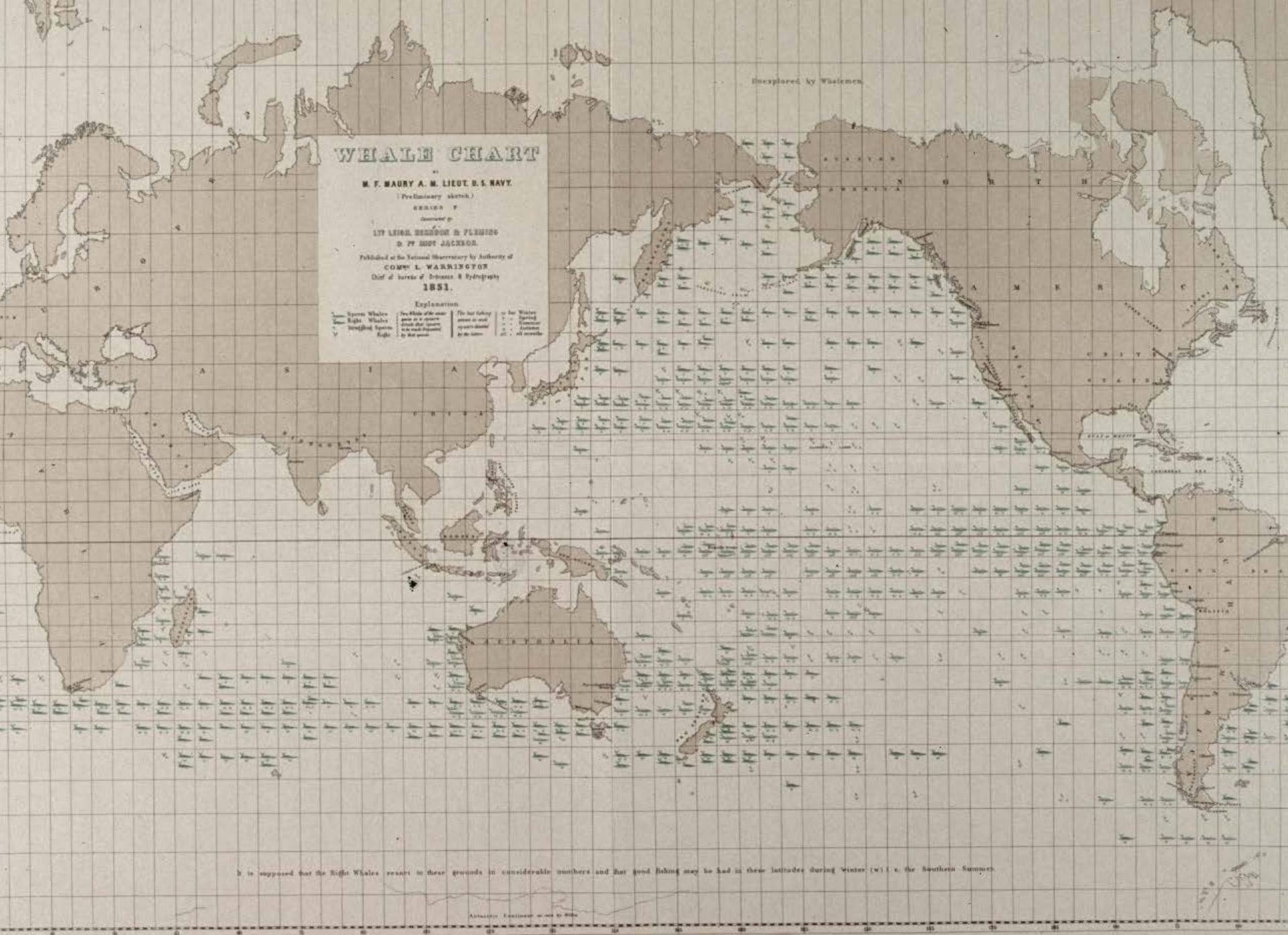
- First “choropleth” map
- “Pauperism” in England & Wales



Maury's 1851 map of whale sightings



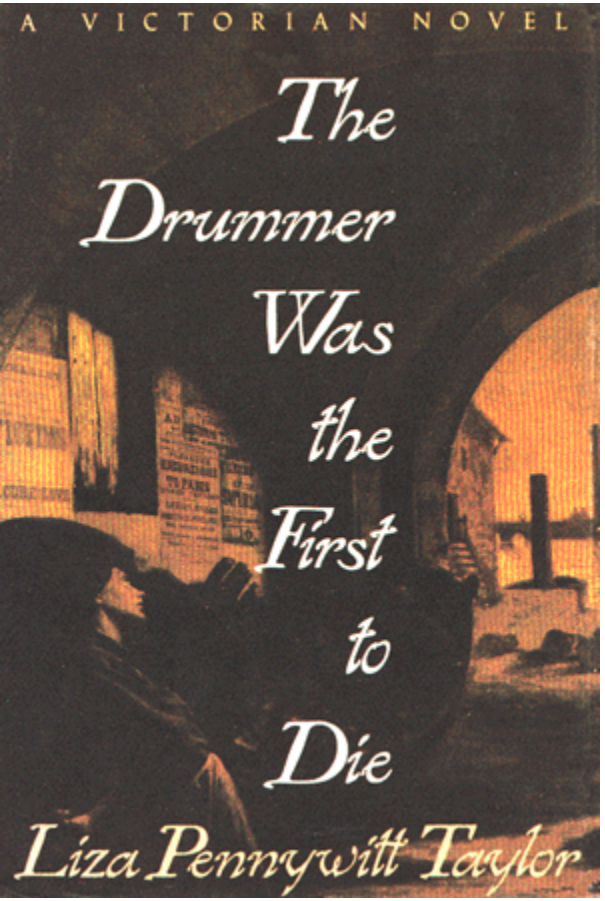
- US Navy
- Use of pictographic symbols

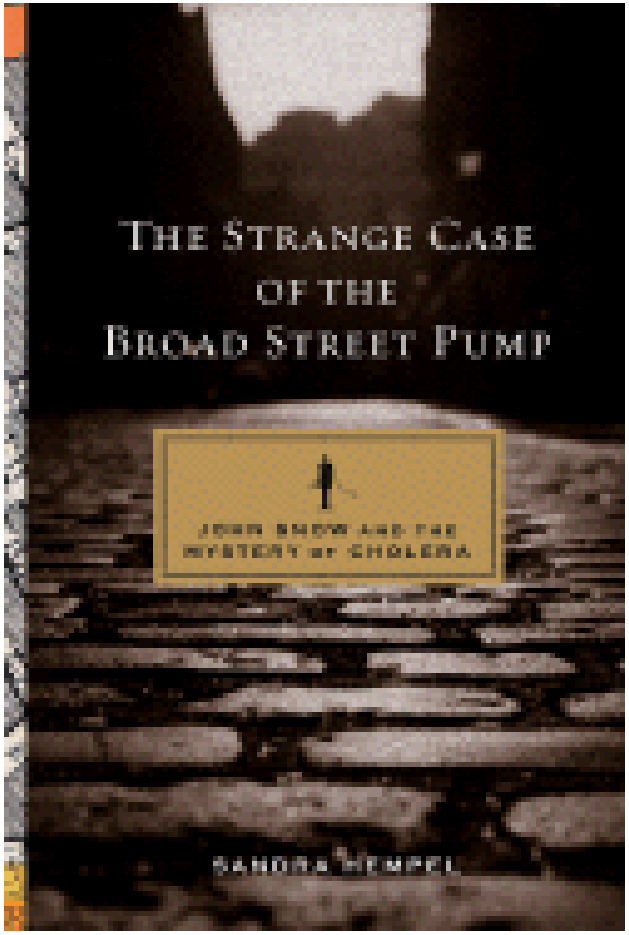


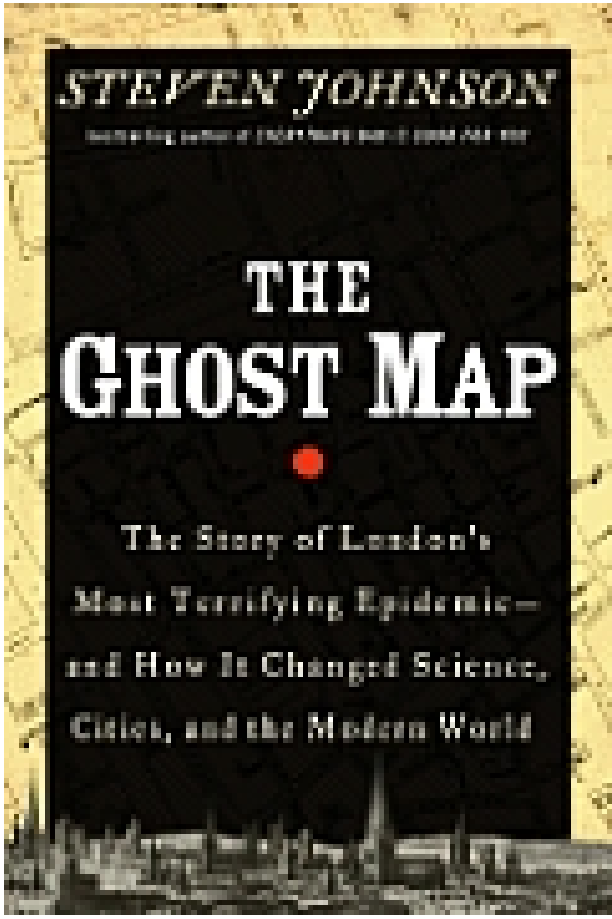
John Snow's 1854 map of Cholera

- Shows the frequency and spatial distribution of cholera cases in a London neighborhood
- Revealed the source was a contaminated water pump

The Snow Map

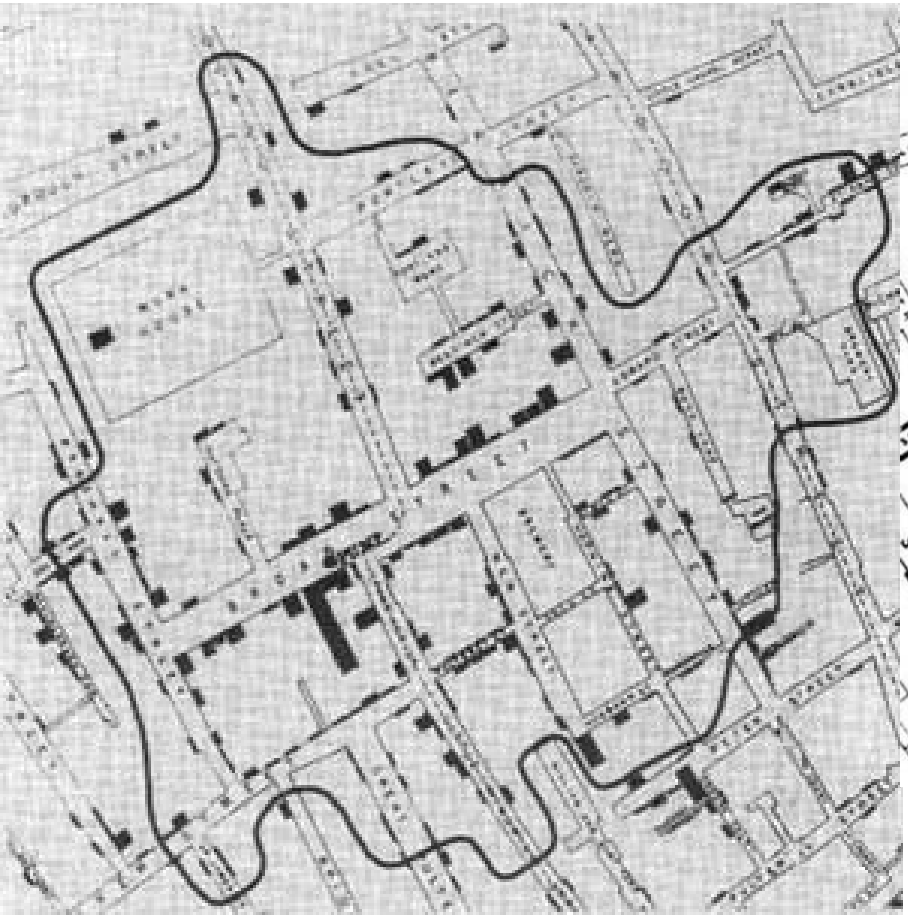

A VICTORIAN NOVEL
The Drummer Was the First to Die
Liza Pennywitt Taylor

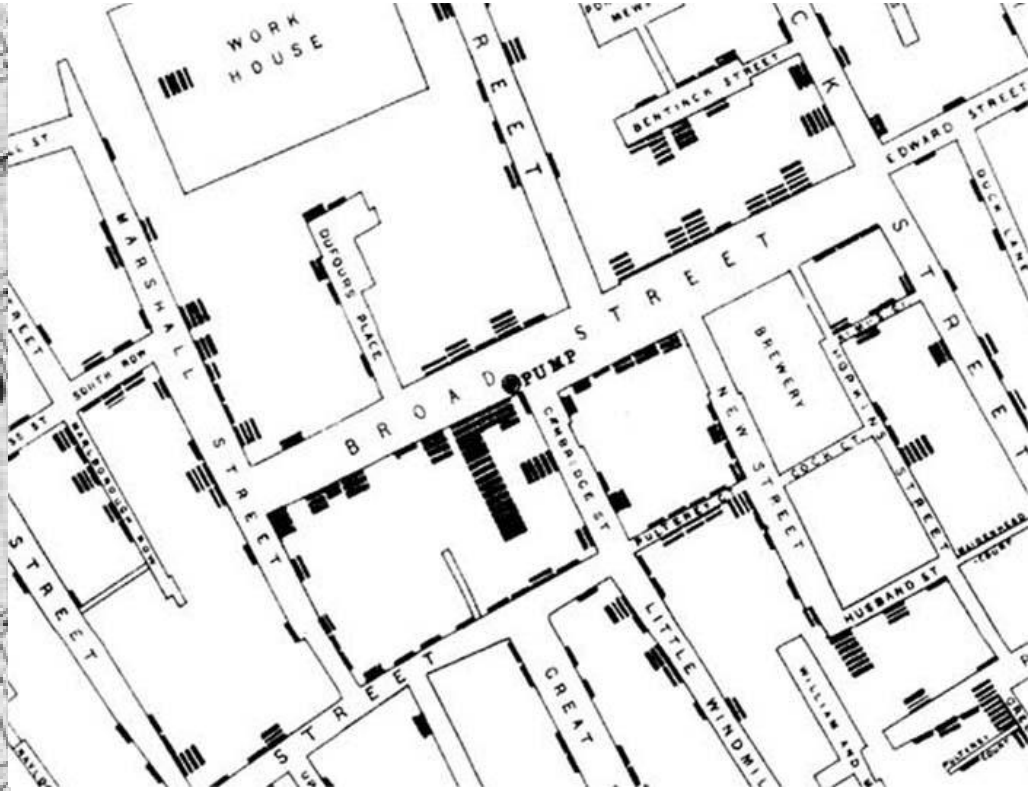

THE STRANGE CASE OF THE BROAD STREET PUMP
JOHN SNOW AND THE MYSTERY OF CHOLERA
SANDRA HEMPEL


STEVEN JOHNSON
THE GHOST MAP
The Story of London's Most Terrifying Epidemic—and How It Changed Science, Cities, and the Modern World

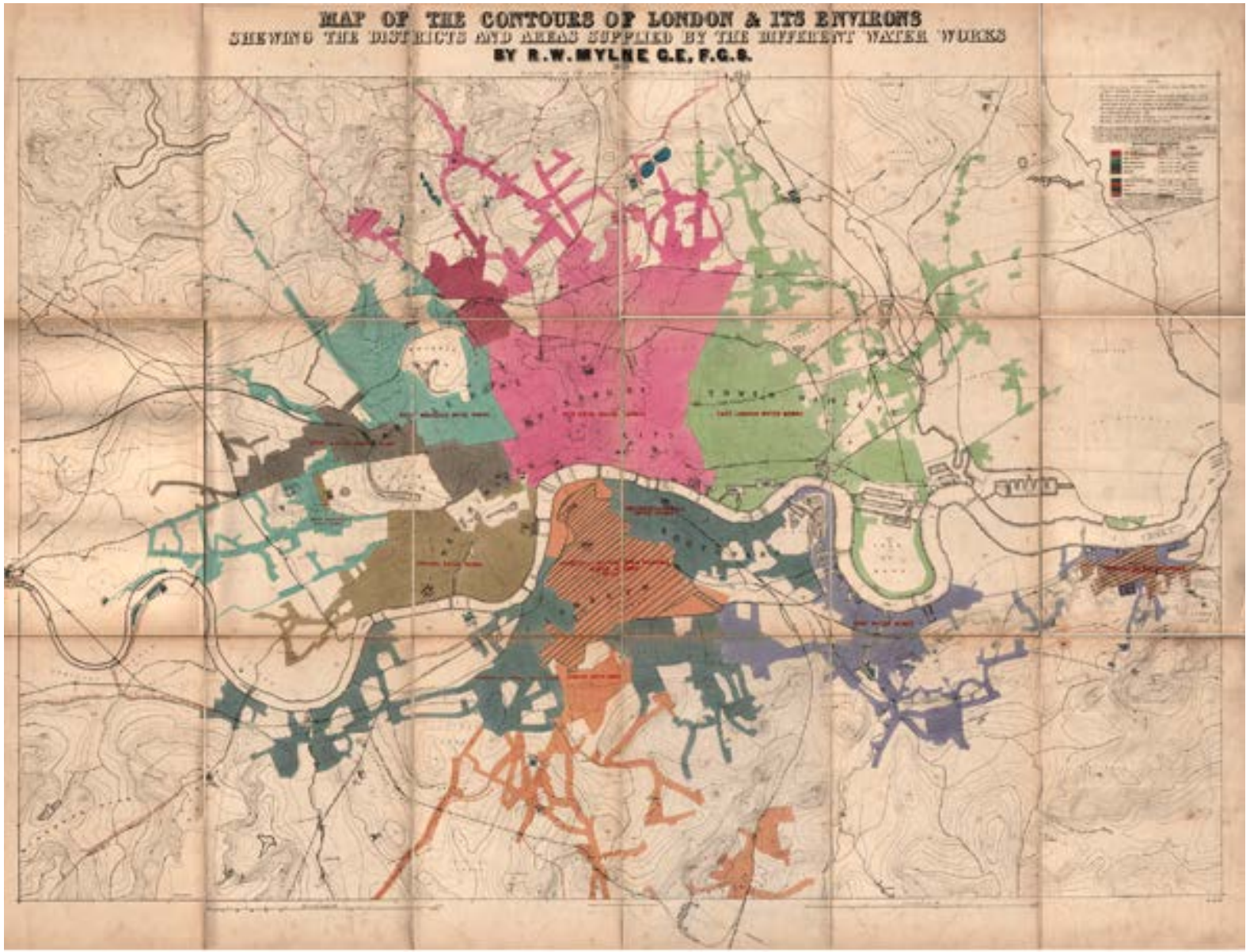
The Broad Street Pump

The Cholera Epidemic of 1854

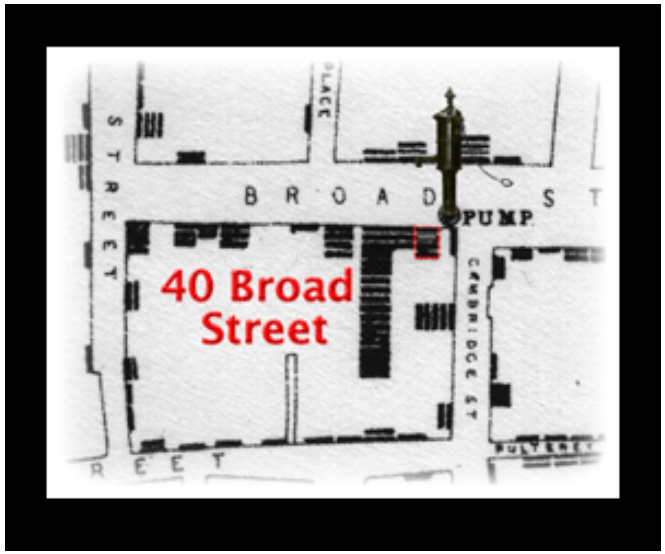


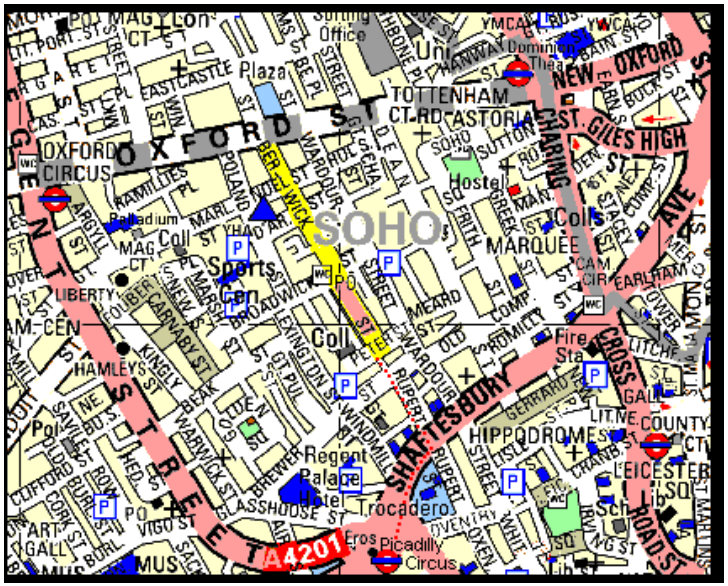


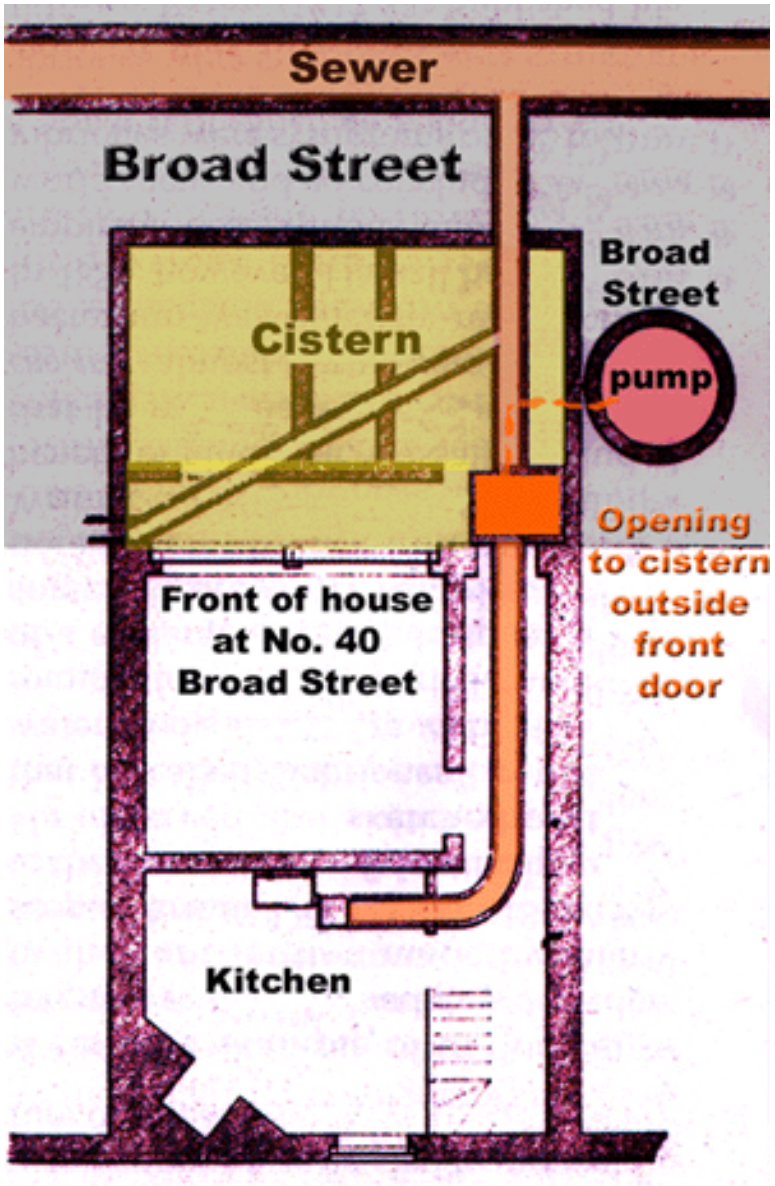
London Waterworks 1856



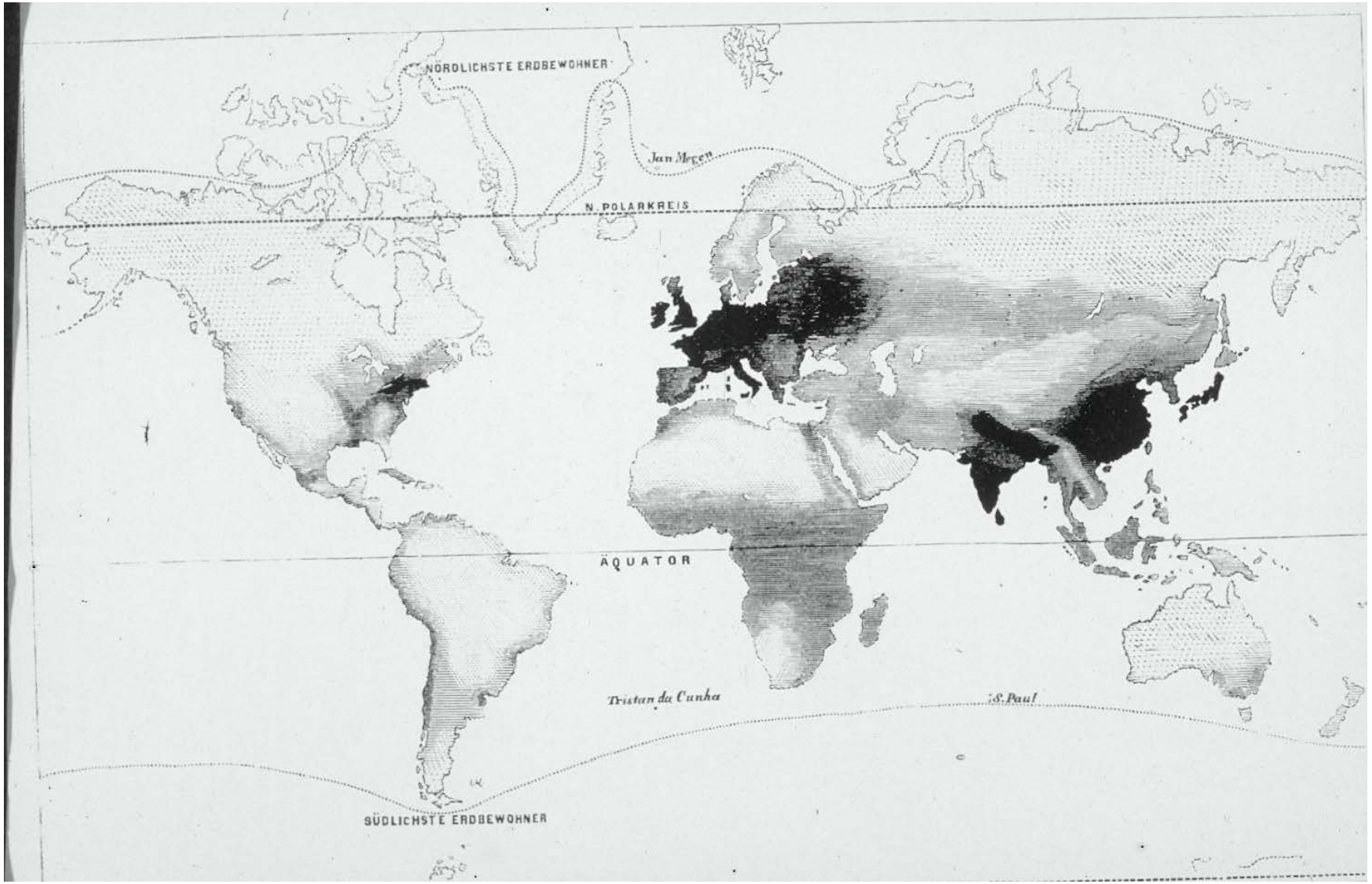
The Index Case



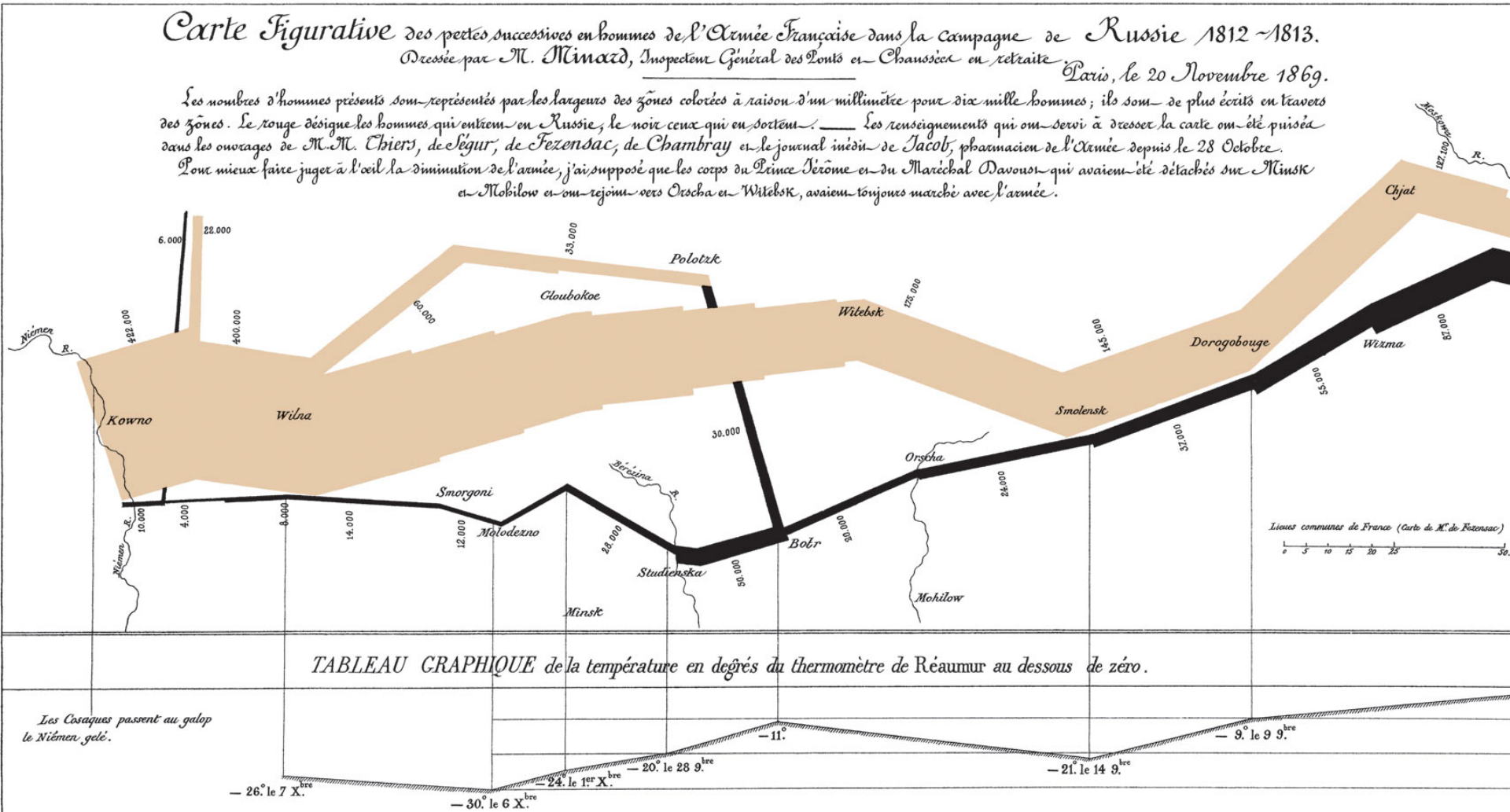




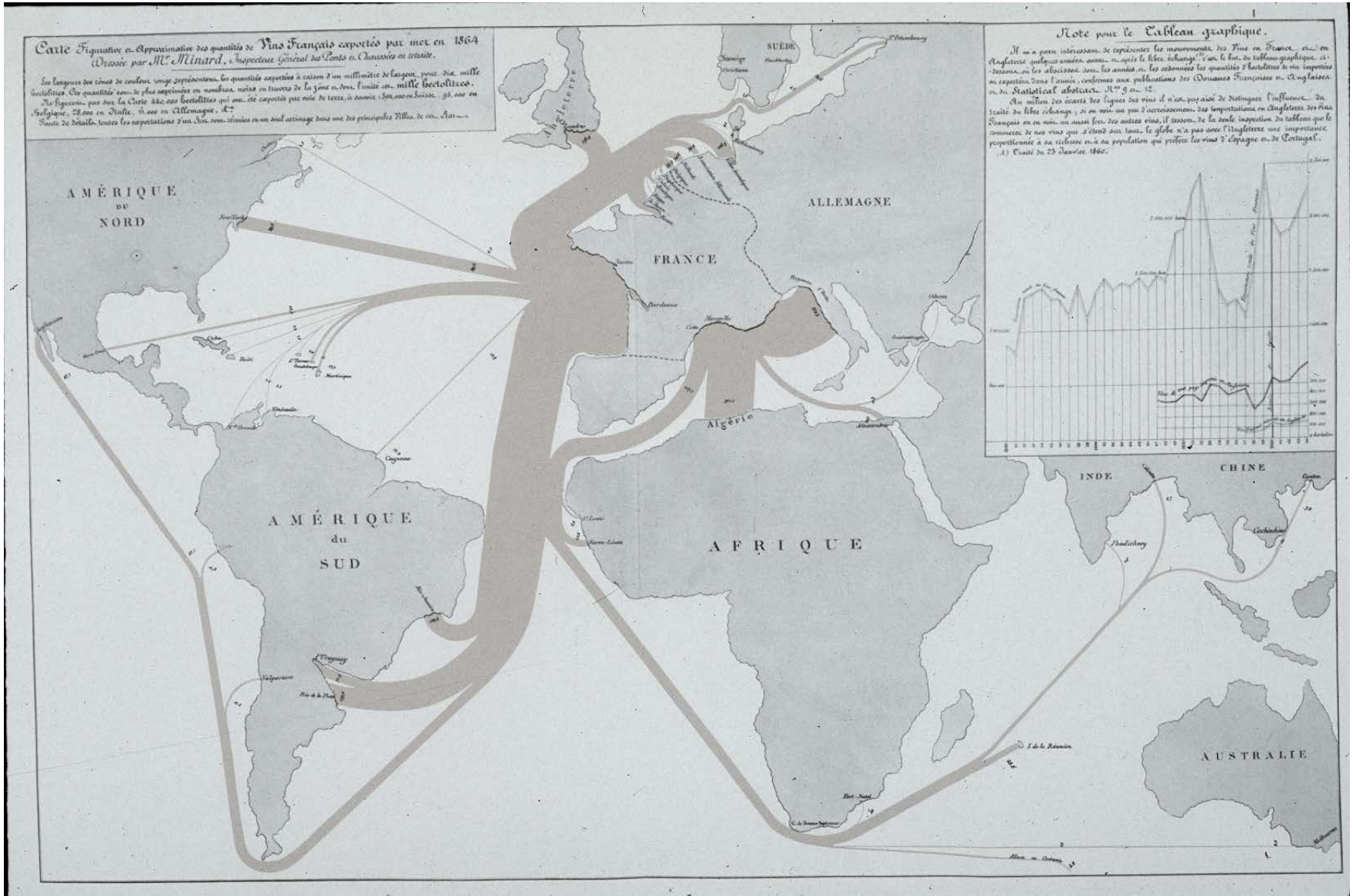
Petermann's 1859 map of world population density



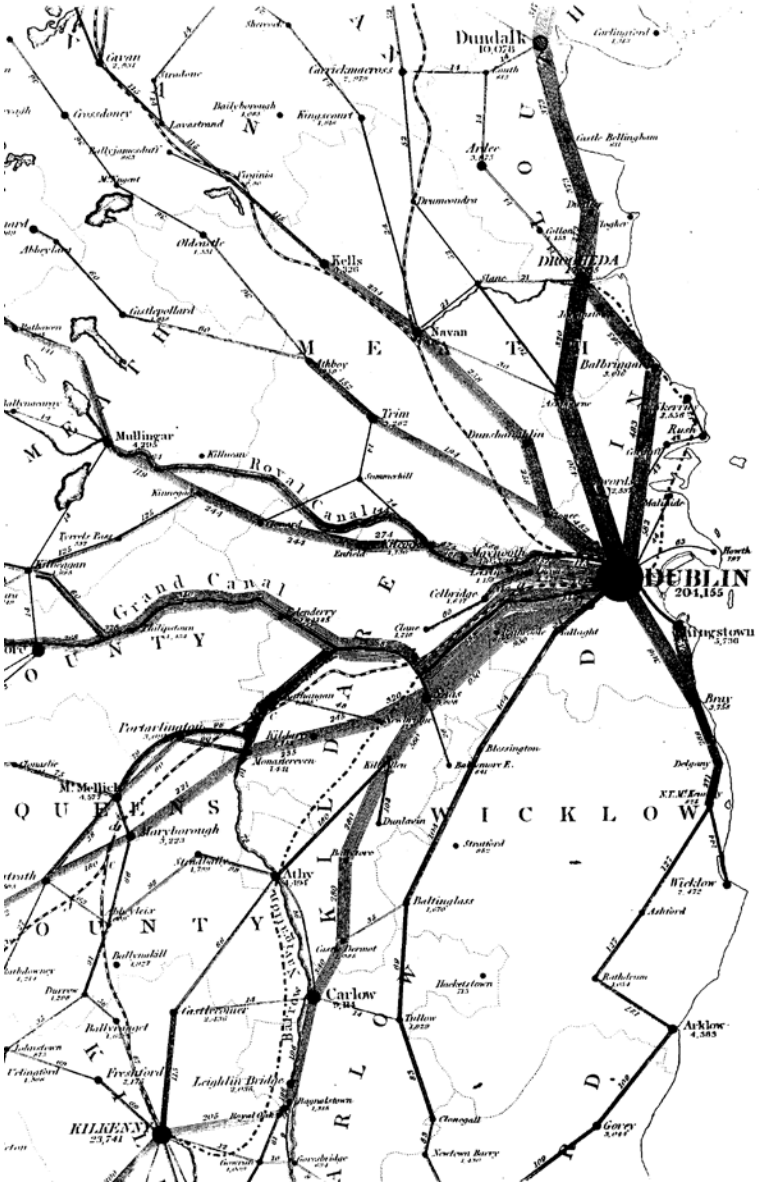
Minard's 1861 map of Napoleon's march to Moscow



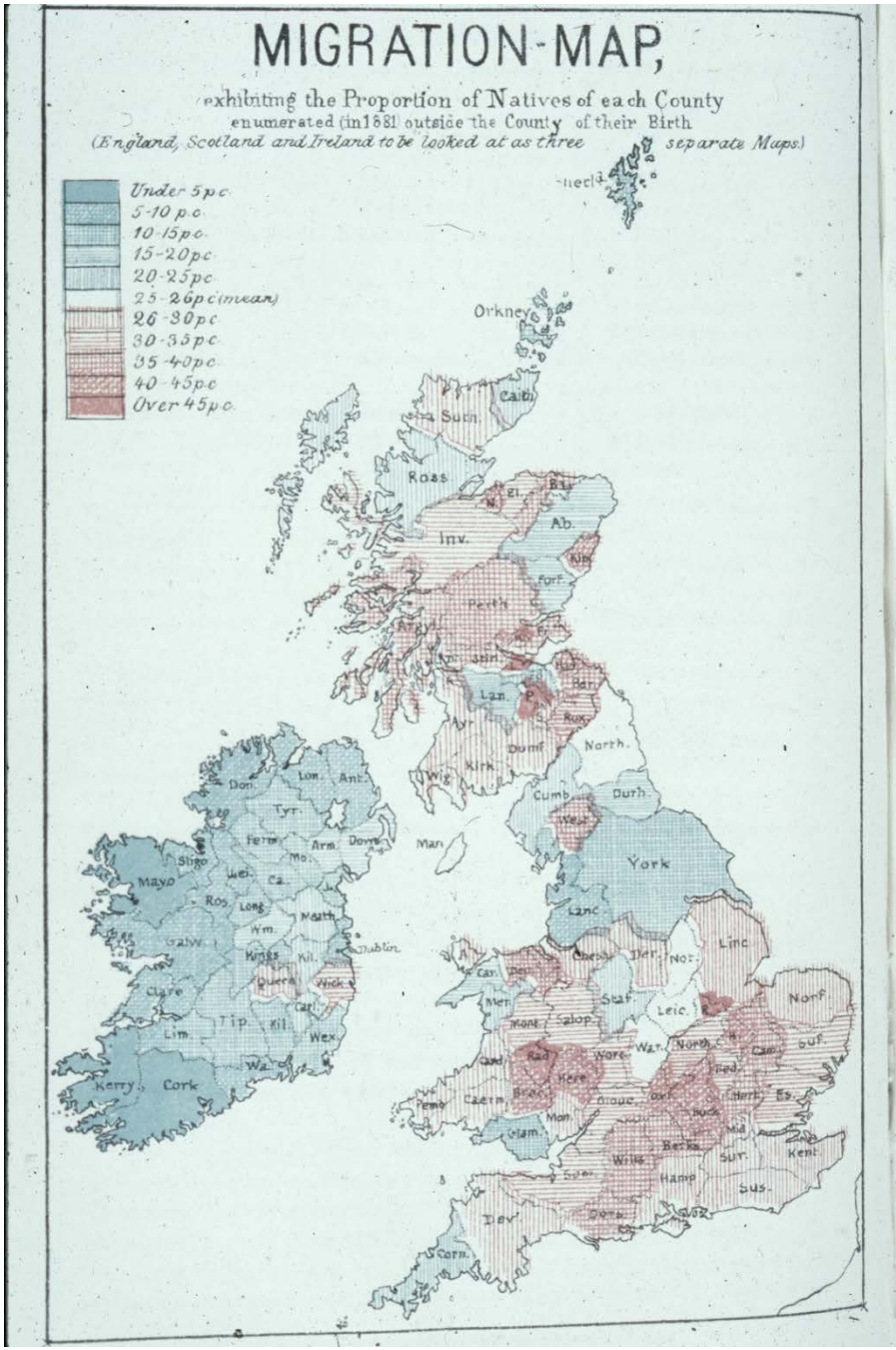
Thematic map of wine exports from France, 1861 by C.J. Minard



Harness 1888 Flow of Passengers on Irish Railroads



Ethnography

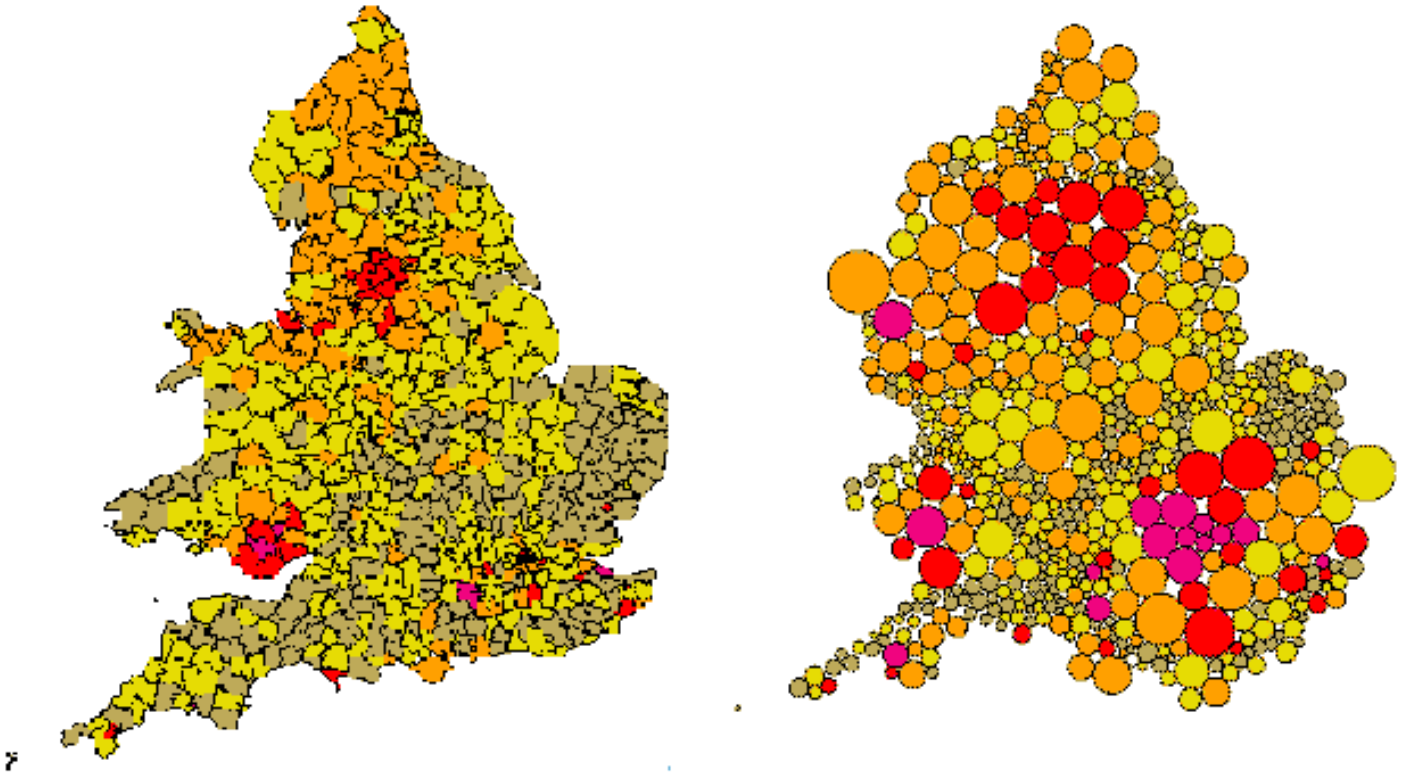


Ethnographische Karte von Nordamerika.

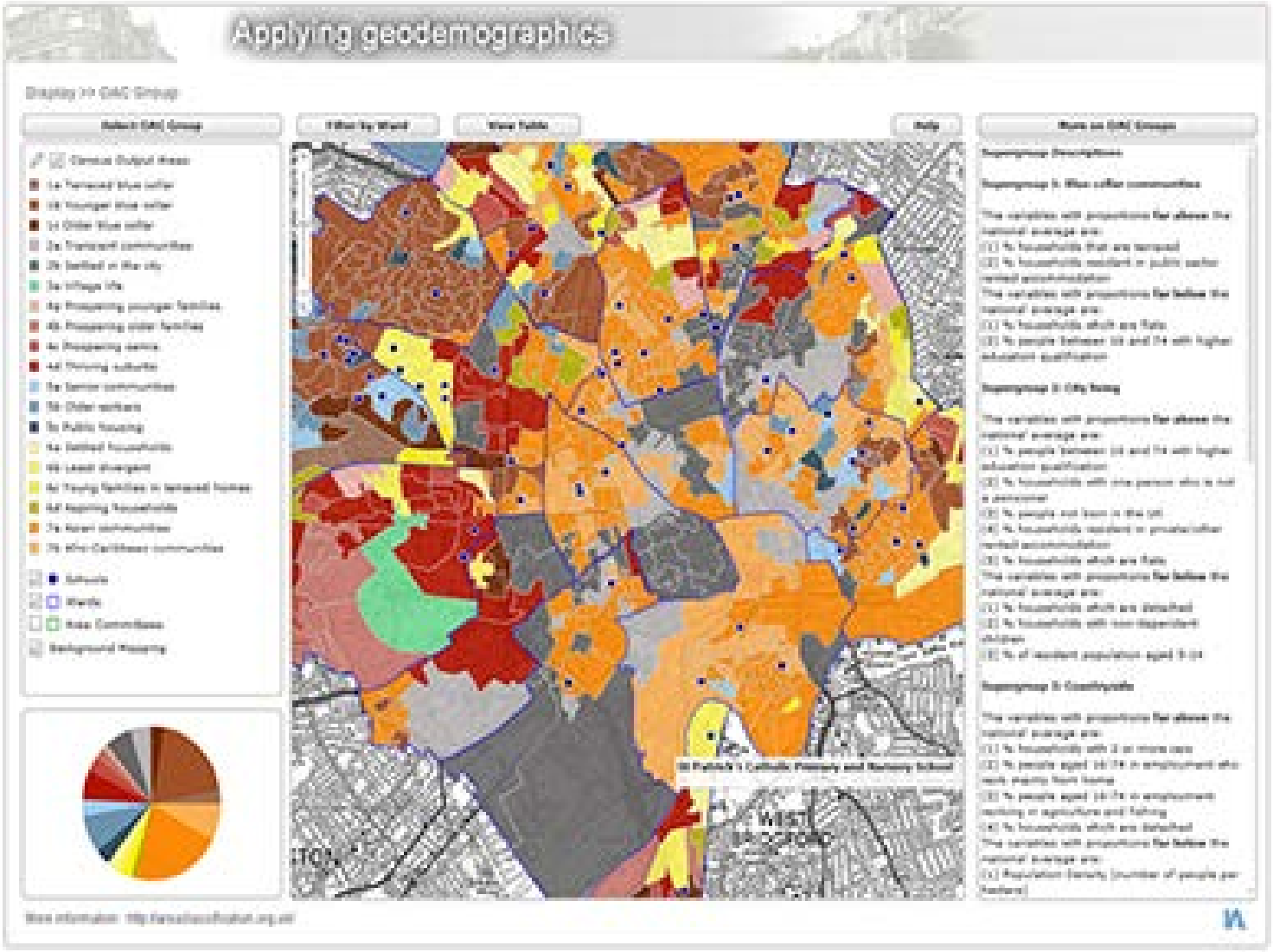

Geologische Karte
von
DEUTSCHLAND
und den nächst angrenzenden Ländern
1850.

Cartograms

COMPARISON OF A TRADITIONAL MAP AND CARTOGRAM REPRESENTATIONS OF THE PERCENTAGE OF THE MALE POPULATION OF WORKING AGE IN 1891



Geodemographics



History of Academic Cartography

- Cartography at US universities is relatively new
- One seminal figure…

Arthur Robinson

- Hired in 1945 at the University of Wisconsin (Ph.D. Ohio State)
  - Established a cartography program at UW
  - Published “The Look of Maps”
  - Started first American journal in cart, “The American Cartographer”
  - His graduate students went on to spread the word

Arthur Robinson

- What's his most famous achievement?

Arthur Robinson

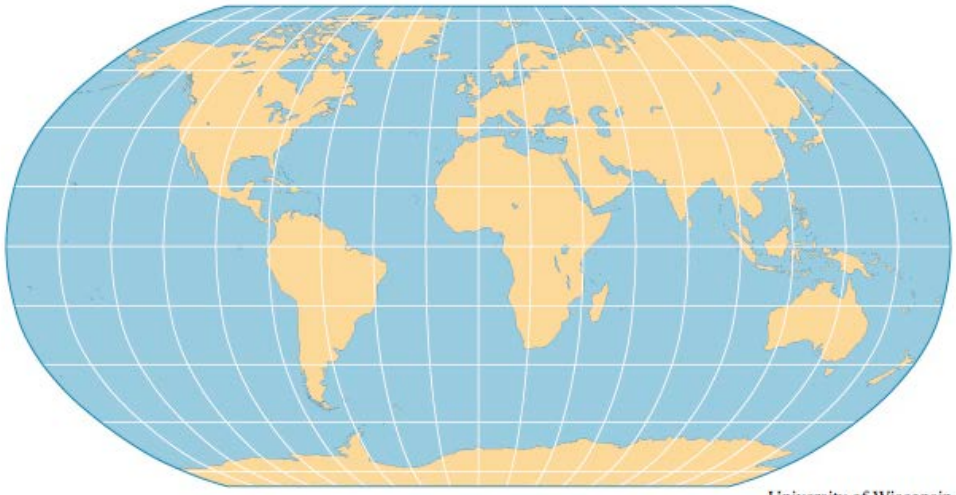
- What's his most famous achievement?

Arthur Robinson

- The Mercator Problem

Arthur Robinson

- The Robinson Projection



Thematic cartography

- Relatively recent
- Can be quantitative or qualitative attribute
- Most methods invented for particular problems
- What about statistical graphics and visual analytics?