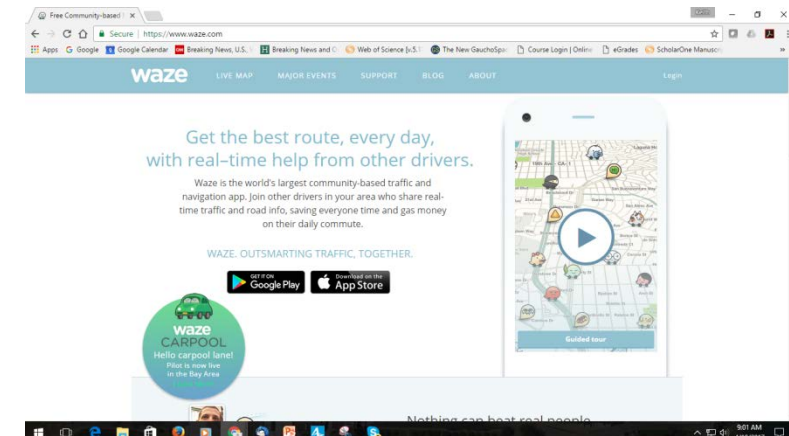
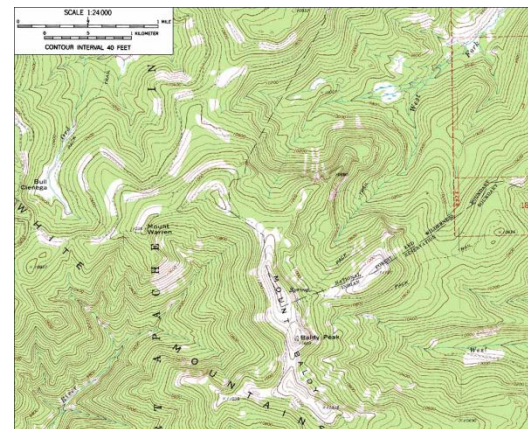
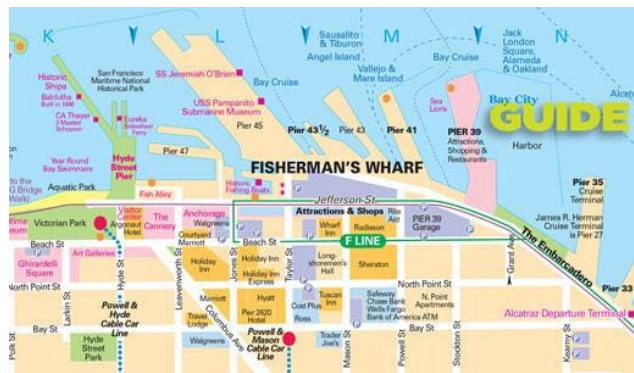


Geog183: Cartographic Design and Geovisualization Spring Quarter 2020

Lecture 3: Thematic cartography, geovisualization and visual analytics

General Purpose or “Reference” Cartography

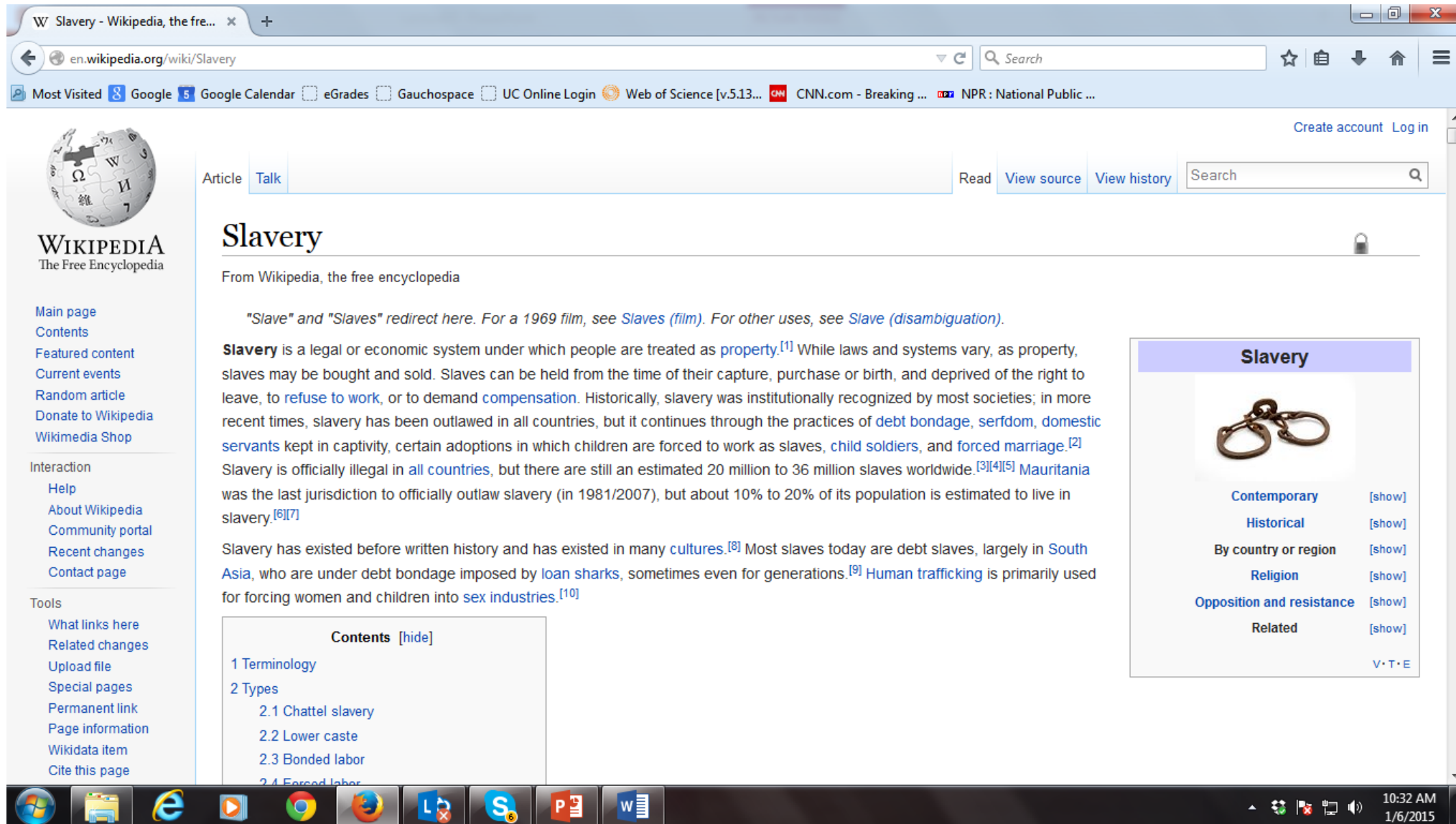
- Maps showing generic themes primarily of use for navigation
- Atlases, topographic maps, city and county guides
- Often standardized symbolization and scales
- E.g. US Topographic maps at 1:24,000
- In computer/web era, switch to data gathering using GPS
- Current versions include Google maps, Waze, Bing maps, NIM, etc.



Thematic cartography

- Slocum “used to emphasize spatial pattern of one or more spatial attribute”
- Spatial attribute can imply numbers, and forms the “theme”
- Dates from the mid-1800s
- Origins in historical explanations and raising awareness of social conditions (Moral statistics)
- Parallels development of information and statistical graphics
- Examples: population density, family income, daily temperature maximum

What does the map add: Example of slavery



The image shows a screenshot of a web browser displaying the Wikipedia article for "Slavery". The browser's address bar shows the URL "en.wikipedia.org/wiki/Slavery". The page features the Wikipedia logo on the left, a navigation menu, and the main article text. The article text discusses the legal and economic system of slavery, its historical prevalence, and its current status in various countries. A table of contents is visible below the main text, listing sections such as "Terminology", "Types", and "Chattel slavery". On the right side, there is a sidebar with a title "Slavery" and a list of links for "Contemporary", "Historical", "By country or region", "Religion", "Opposition and resistance", and "Related". A small image of metal shackles is also present in the sidebar. The Windows taskbar at the bottom shows the time as 10:32 AM on 1/6/2015.

W Slavery - Wikipedia, the fre... x +

en.wikipedia.org/wiki/Slavery

Most Visited Google Google Calendar eGrades Gauchospace UC Online Login Web of Science [v.5.13... CNN CNN.com - Breaking ... NPR : National Public ...

Create account Log in

Article Talk

Read View source View history Search

Slavery

From Wikipedia, the free encyclopedia

"Slave" and "Slaves" redirect here. For a 1969 film, see [Slaves \(film\)](#). For other uses, see [Slave \(disambiguation\)](#).


Slavery is a legal or economic system under which people are treated as [property](#).^[1] While laws and systems vary, as property, slaves may be bought and sold. Slaves can be held from the time of their capture, purchase or birth, and deprived of the right to leave, to [refuse to work](#), or to demand [compensation](#). Historically, slavery was institutionally recognized by most societies; in more recent times, slavery has been outlawed in all countries, but it continues through the practices of [debt bondage](#), [serfdom](#), [domestic servants](#) kept in captivity, certain adoptions in which children are forced to work as slaves, [child soldiers](#), and [forced marriage](#).^[2] Slavery is officially illegal in [all countries](#), but there are still an estimated 20 million to 36 million slaves worldwide.^{[3][4][5]} [Mauritania](#) was the last jurisdiction to officially outlaw slavery (in 1981/2007), but about 10% to 20% of its population is estimated to live in slavery.^{[6][7]}

Slavery has existed before written history and has existed in many [cultures](#).^[8] Most slaves today are debt slaves, largely in [South Asia](#), who are under debt bondage imposed by [loan sharks](#), sometimes even for generations.^[9] [Human trafficking](#) is primarily used for forcing women and children into [sex industries](#).^[10]

Contents [hide]

- Terminology
- Types
 - Chattel slavery
 - Lower caste
 - Bonded labor
 - Forced labor

Slavery

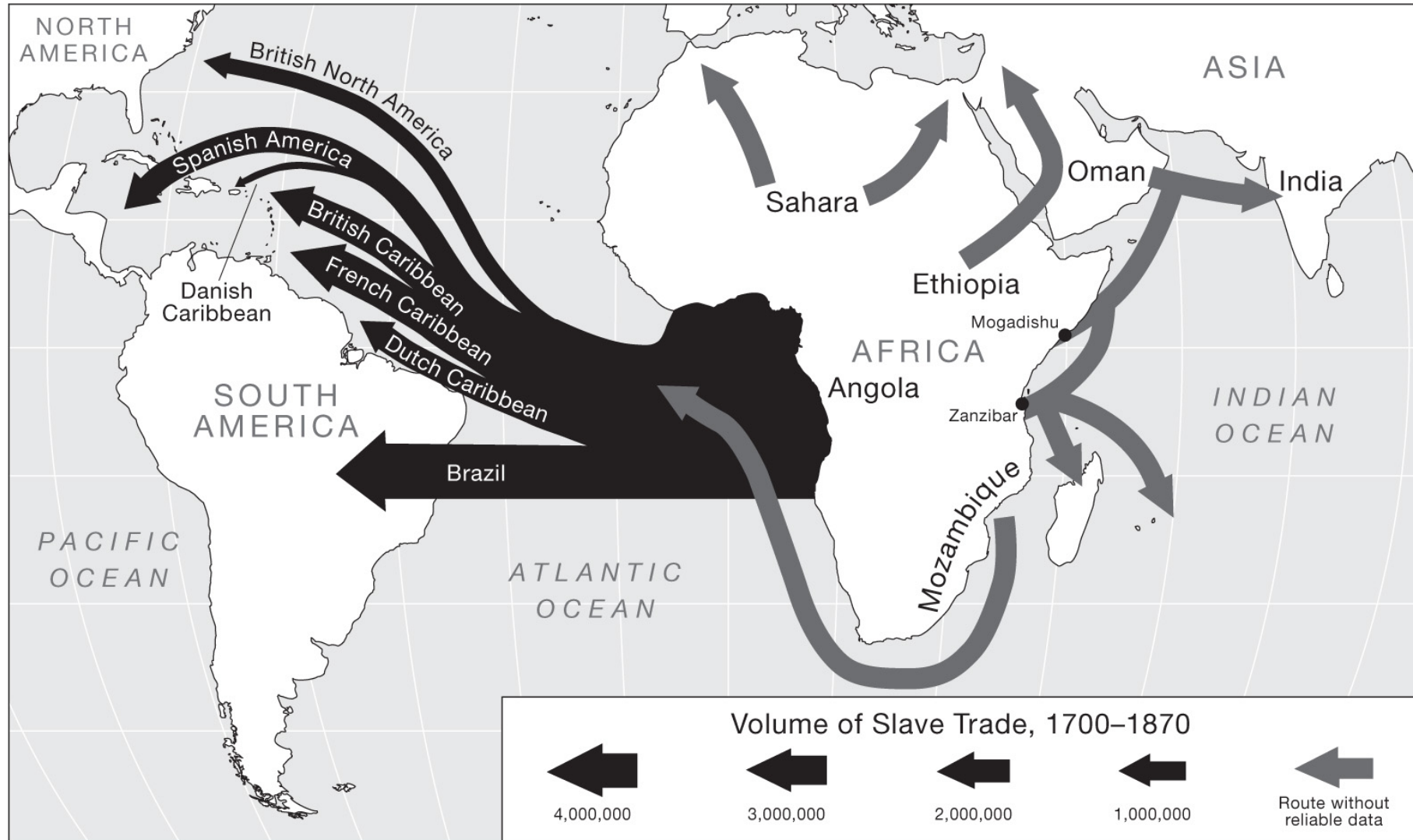


- [Contemporary](#) [show]
- [Historical](#) [show]
- [By country or region](#) [show]
- [Religion](#) [show]
- [Opposition and resistance](#) [show]
- [Related](#) [show]

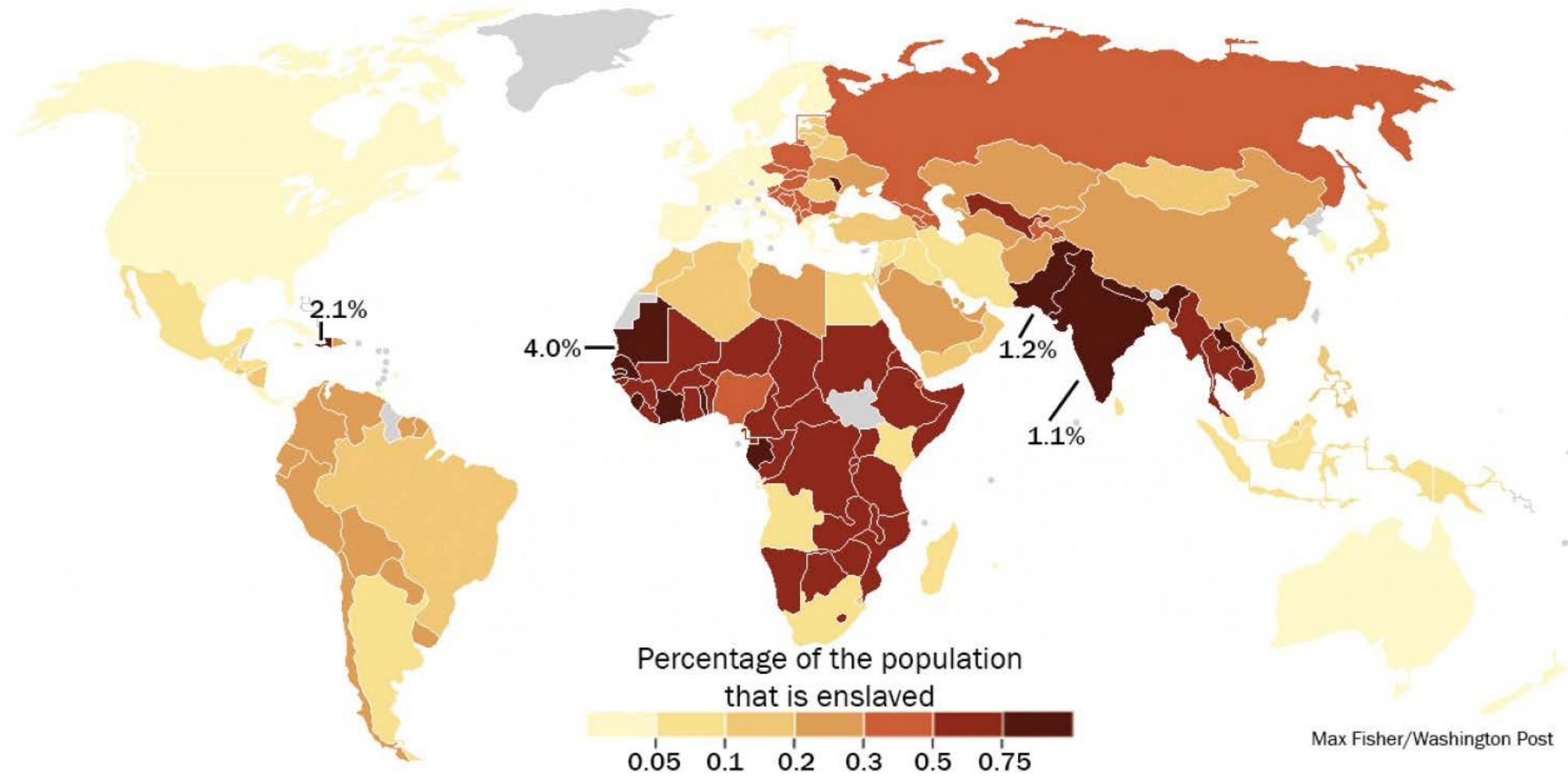
V · T · E

10:32 AM
1/6/2015

Flow map



This map shows where the world's 30 million slaves live. There are 60,000 in the U.S.
By Max Fisher Washington Post October 17, 2013

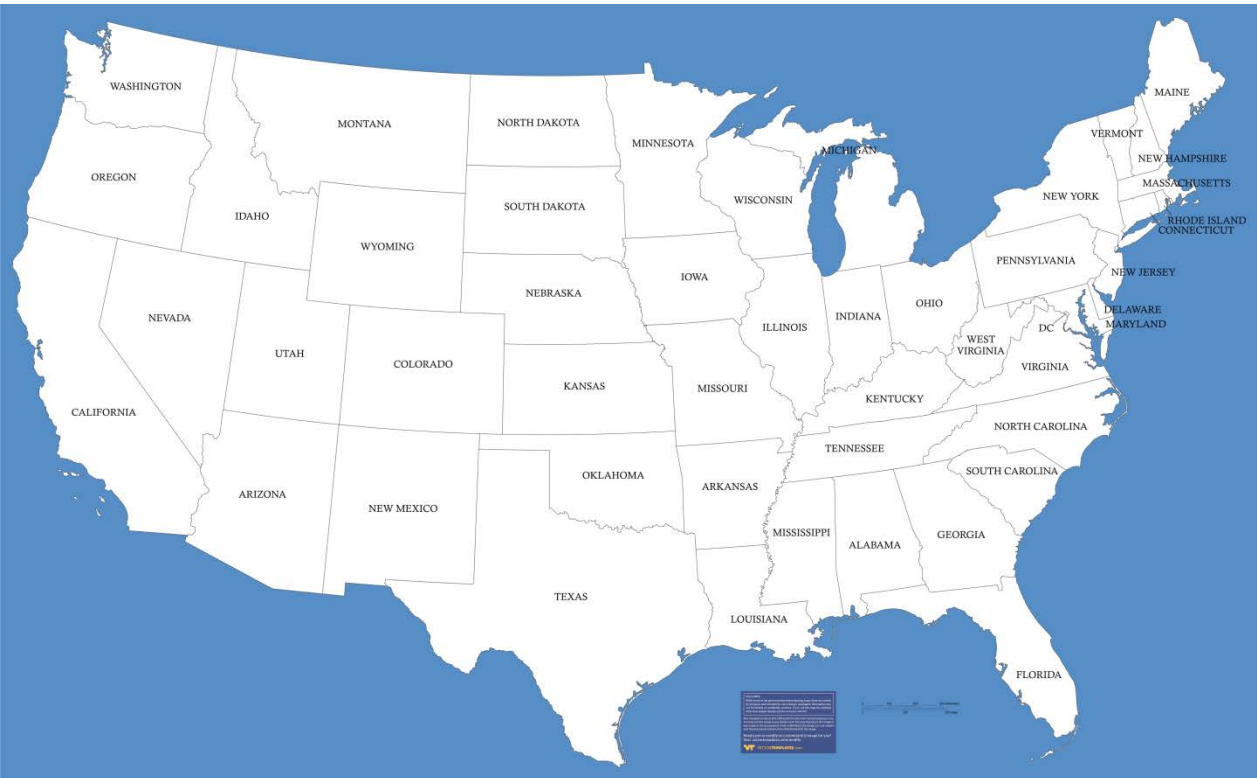


Information

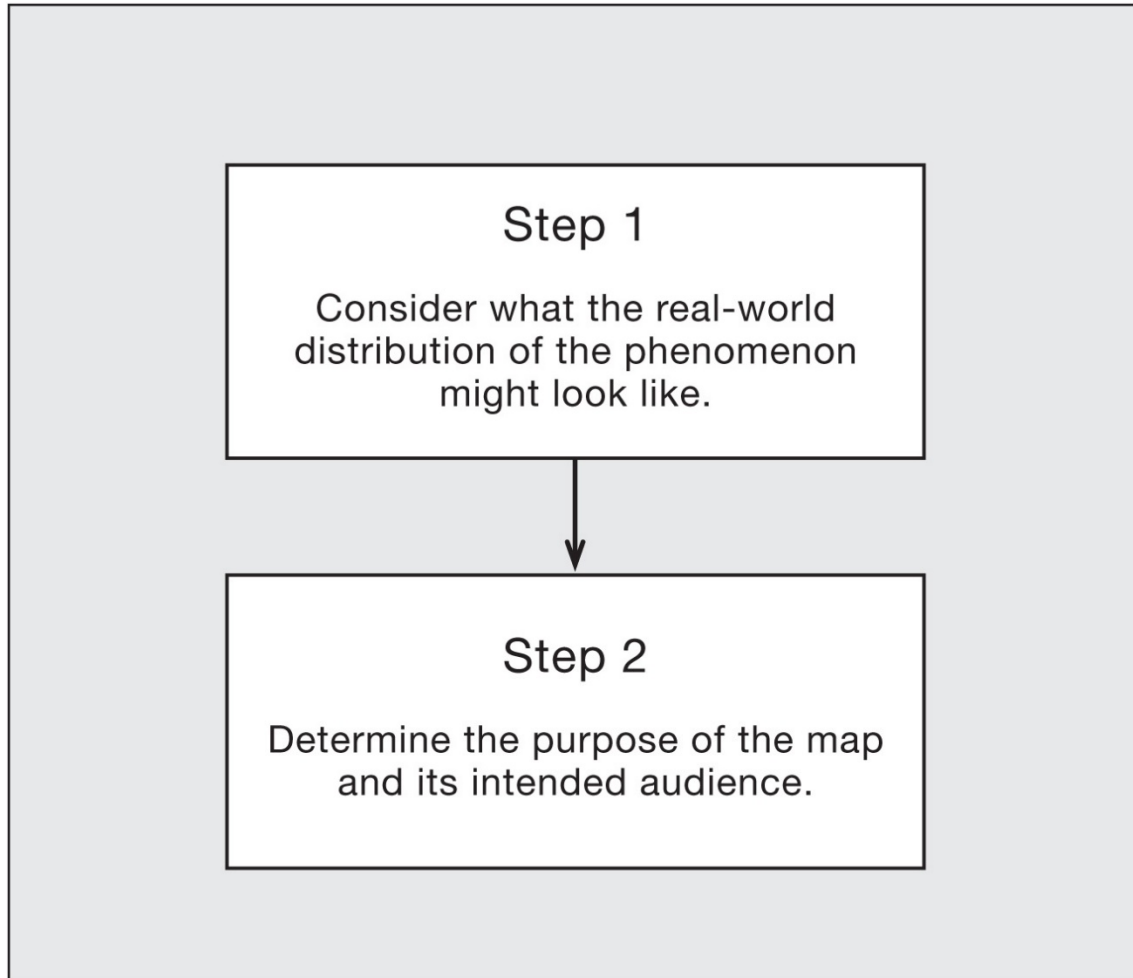
- Slocum: data acquisition vs. memory
- MacEachren: specific & general
- Robertson: value at a point, local distributions (gradients/features), global (trend/structure)
- Bertin: elementary, intermediate and superior levels
- Some attempts to quantify map information using information theory or “entropy” (Shannon)
- Information structure can determine map type and symbols to be used

Quantity of Information?

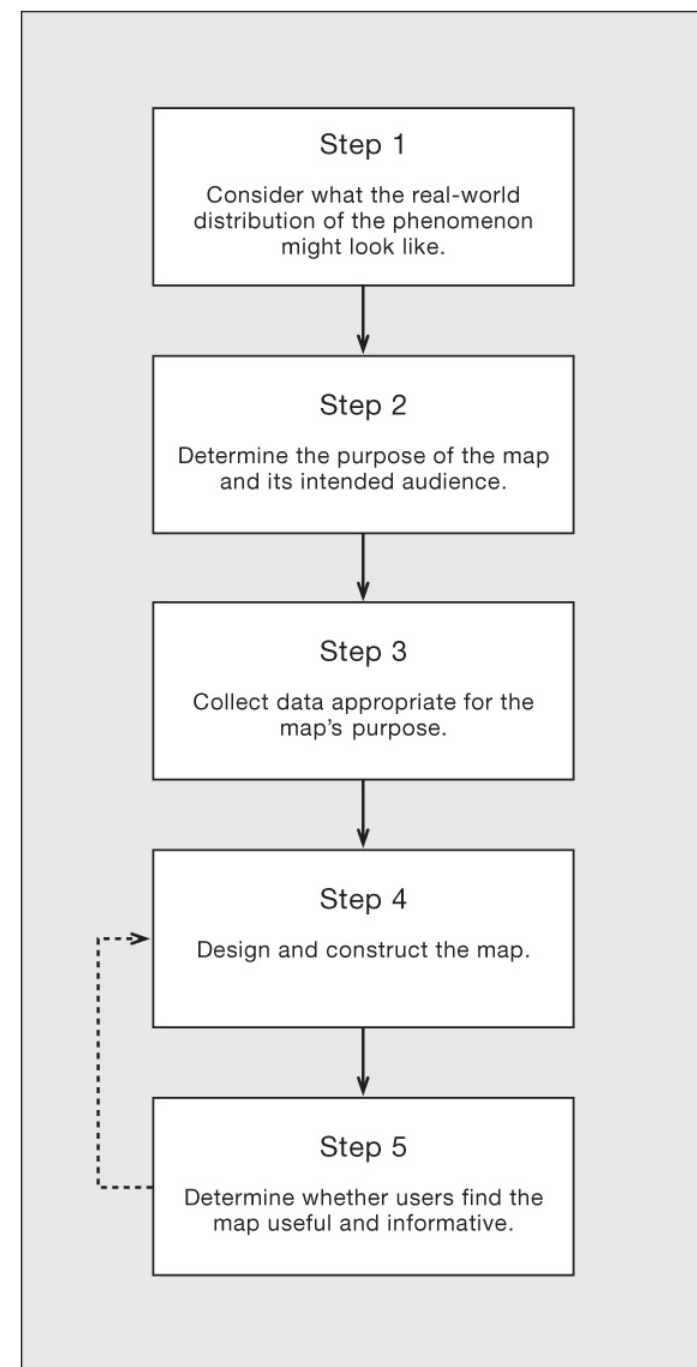
themes, colors, features, symbols, density?



The Mapping Process



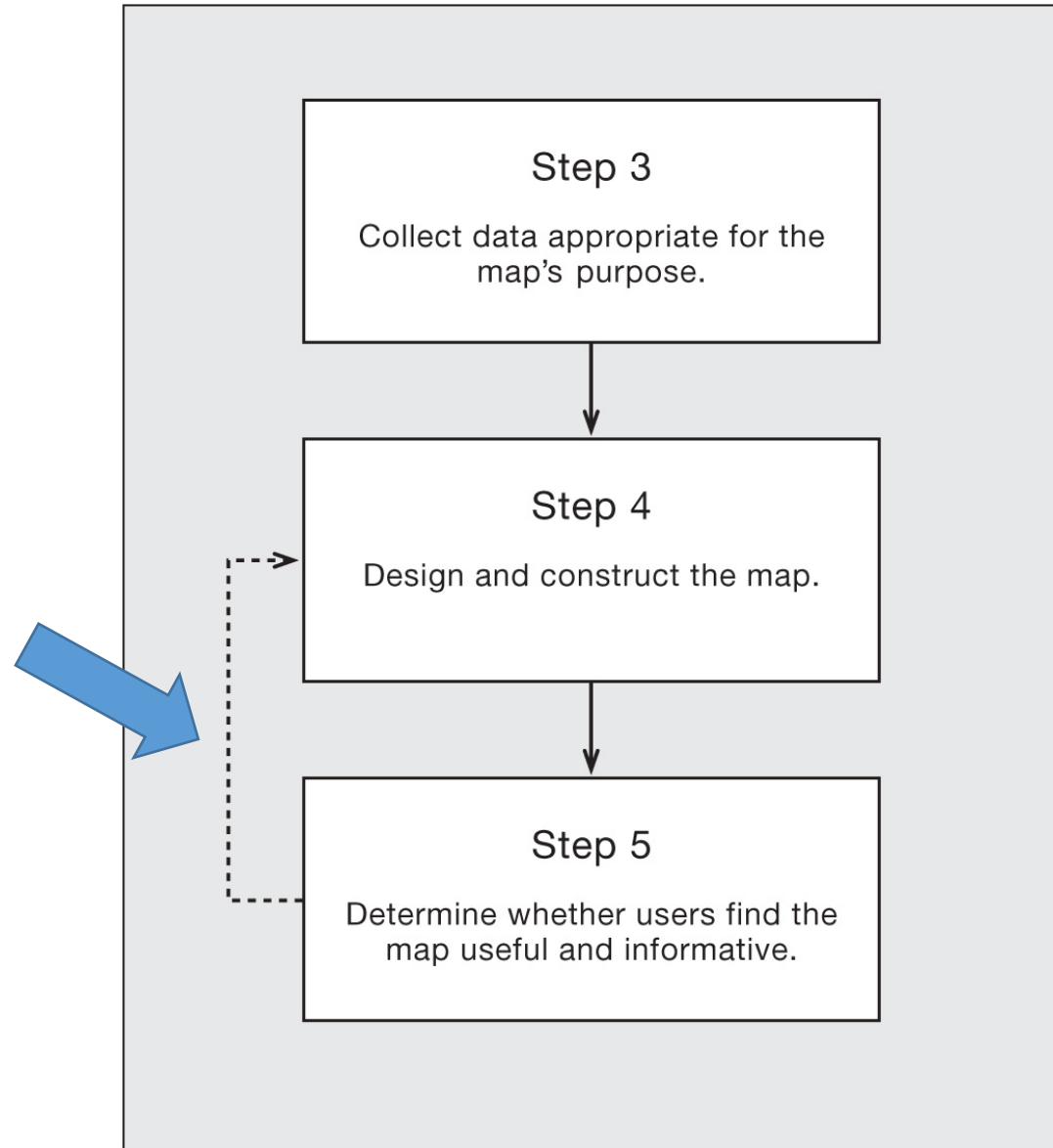
Copyright © 2009 Pearson Prentice Hall, Inc.



Copyright © 2009 Pearson Prentice Hall, Inc.

The Mapping Process

The design loop

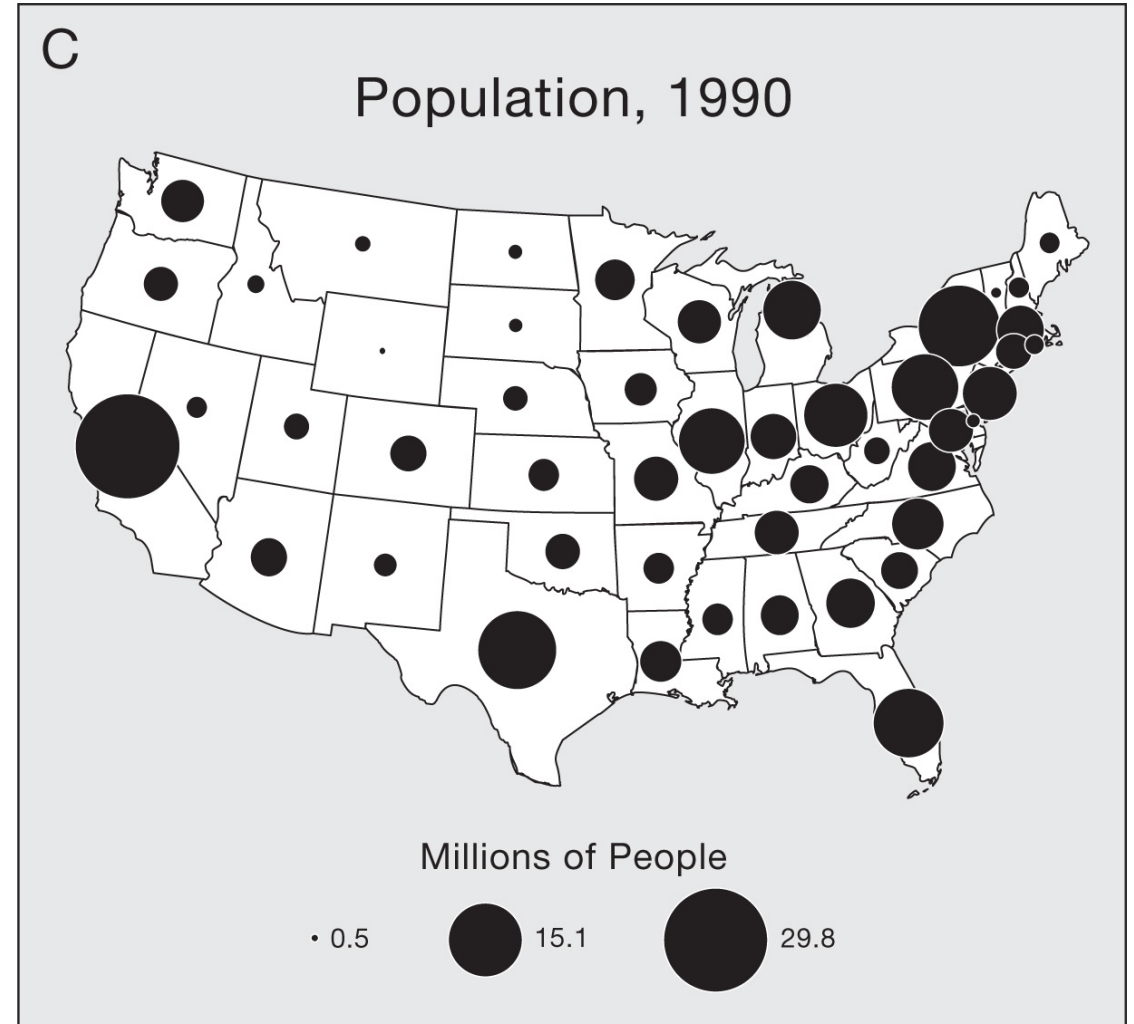
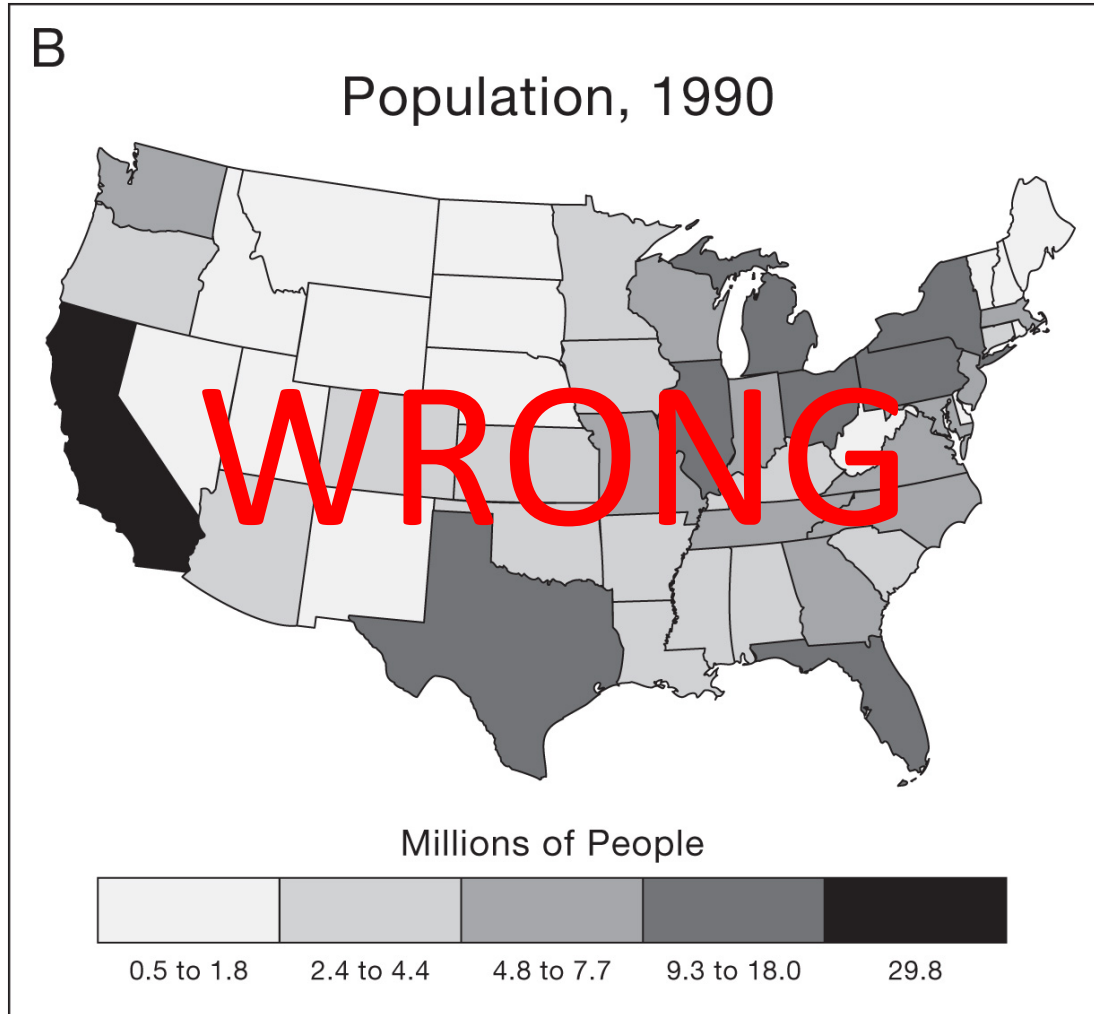


Slocum's list of items to consider

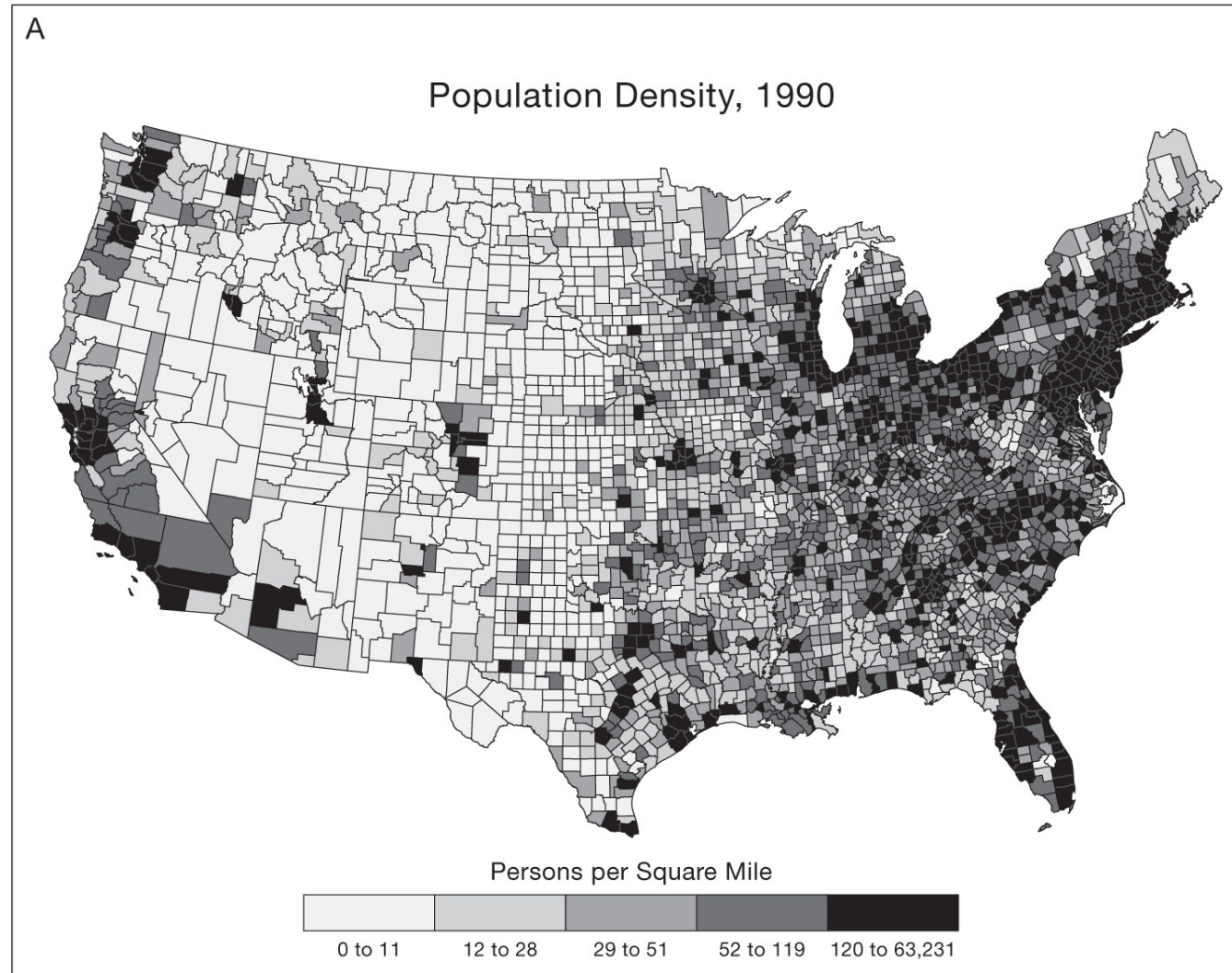
1. How will the map be used? General or specific?
2. What is the dimension of the data? (point, line, area, volume)
3. What is the level of measurement? (Stevens)
4. Do the data need standardization? (totals, percentages)
5. How many attributes?
6. What is the role of time?
7. Are there technical restrictions?
8. Who is the audience?
9. What are the time/cost constraints?

Raw totals

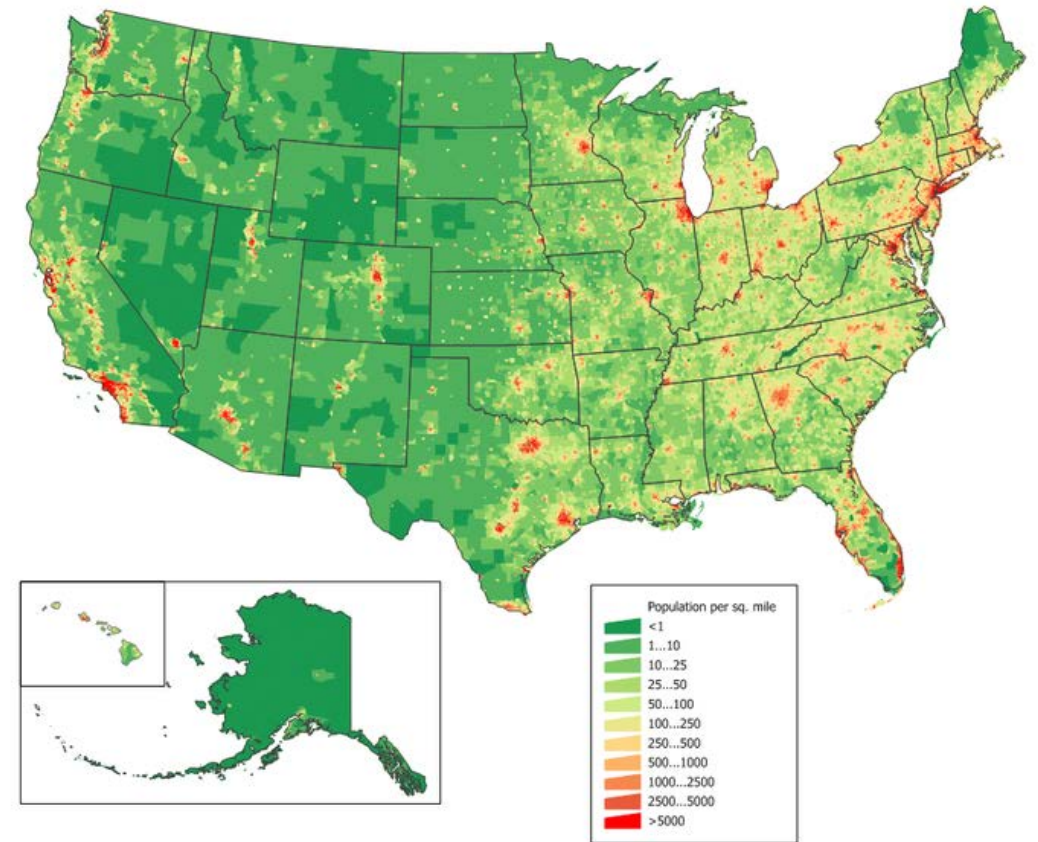
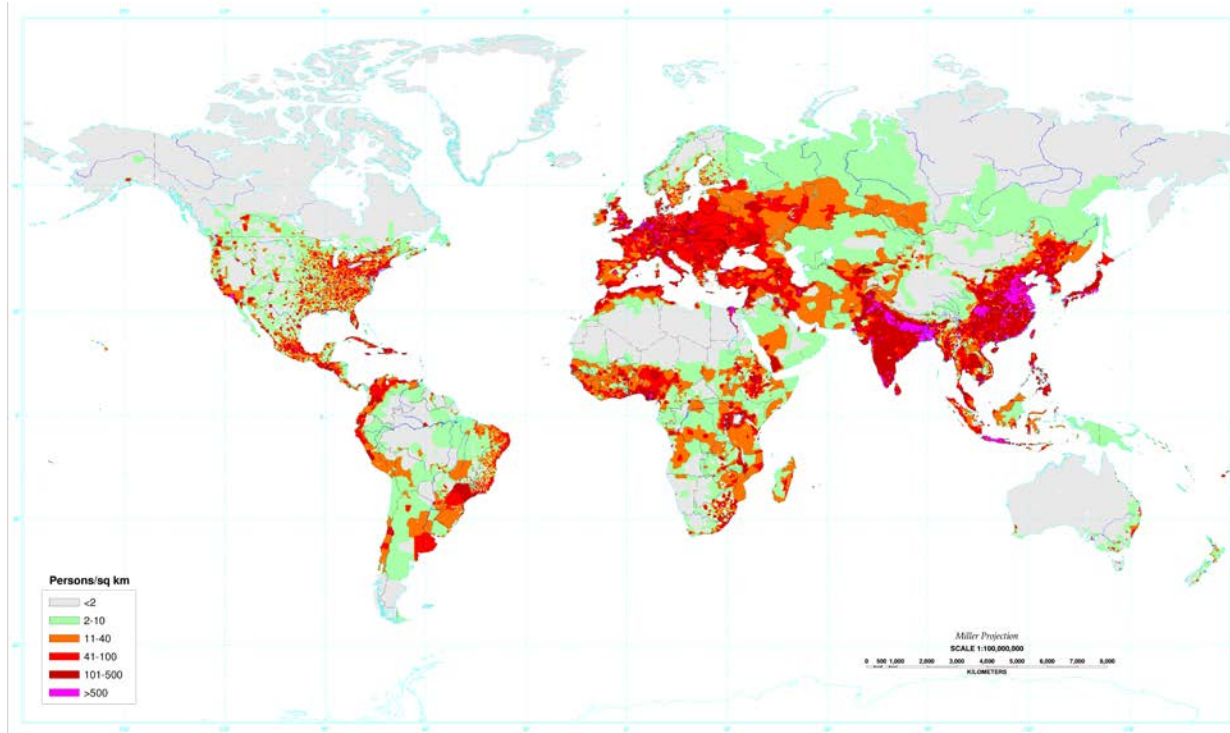
RIGHT



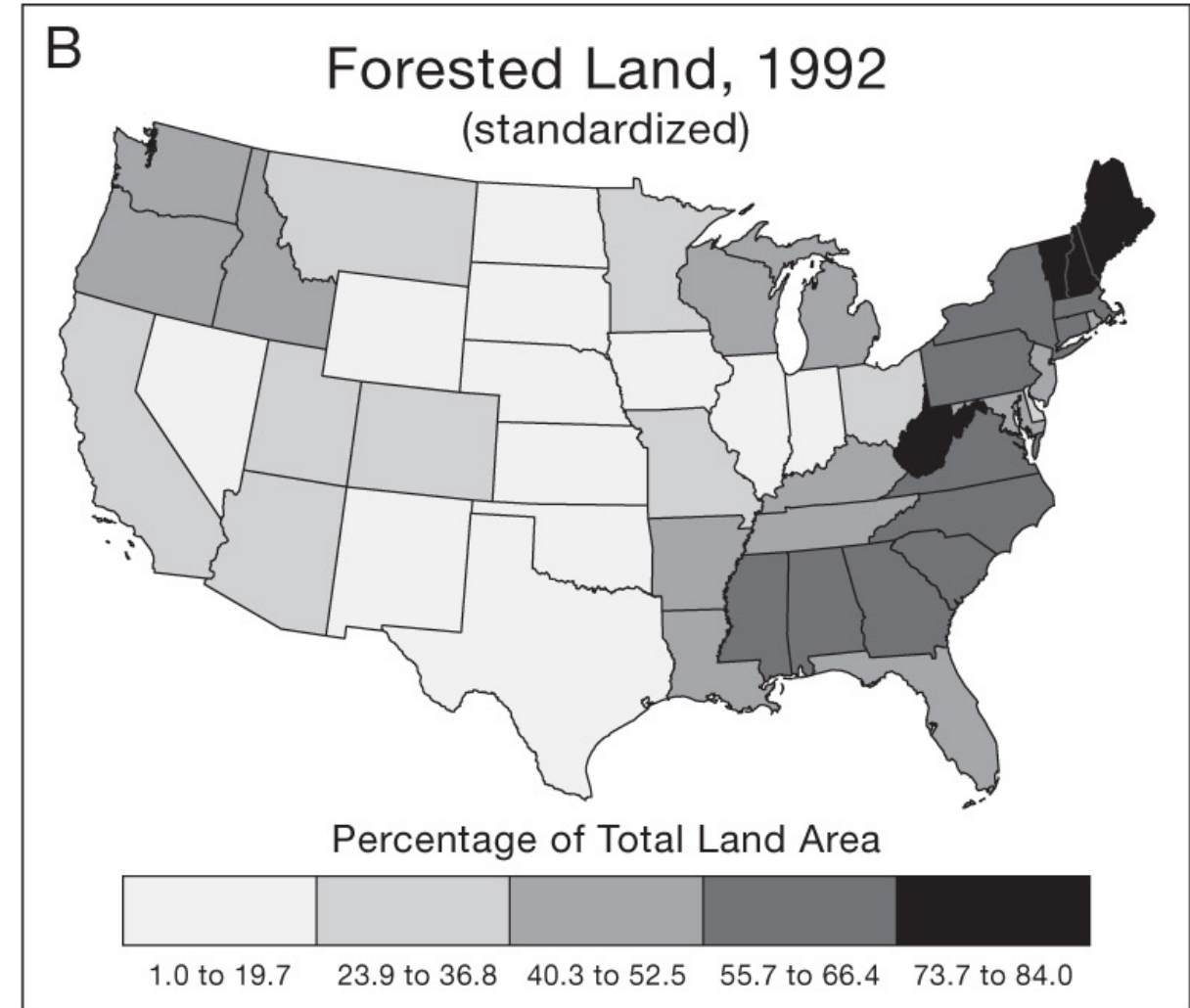
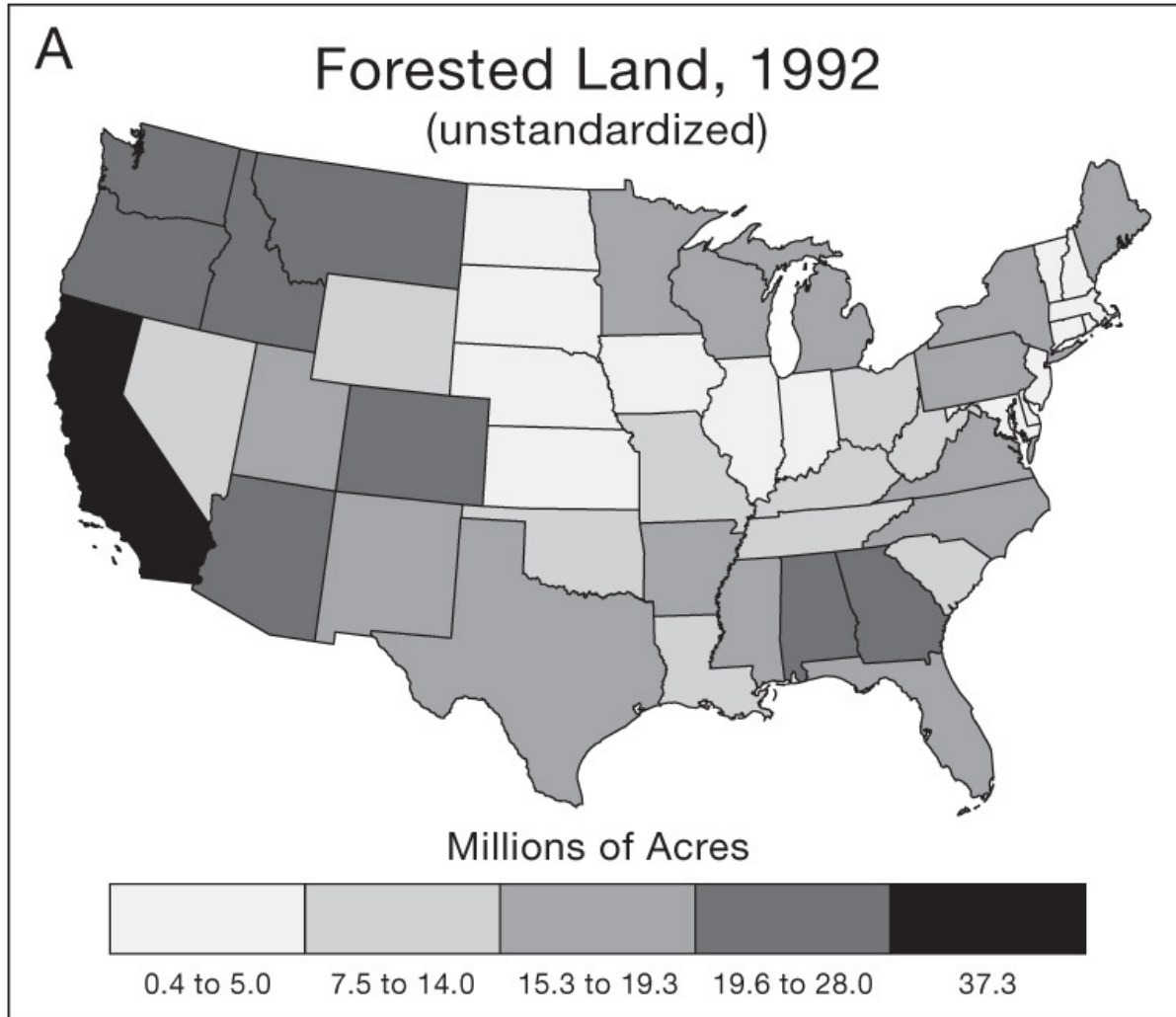
Normalization: MAUP



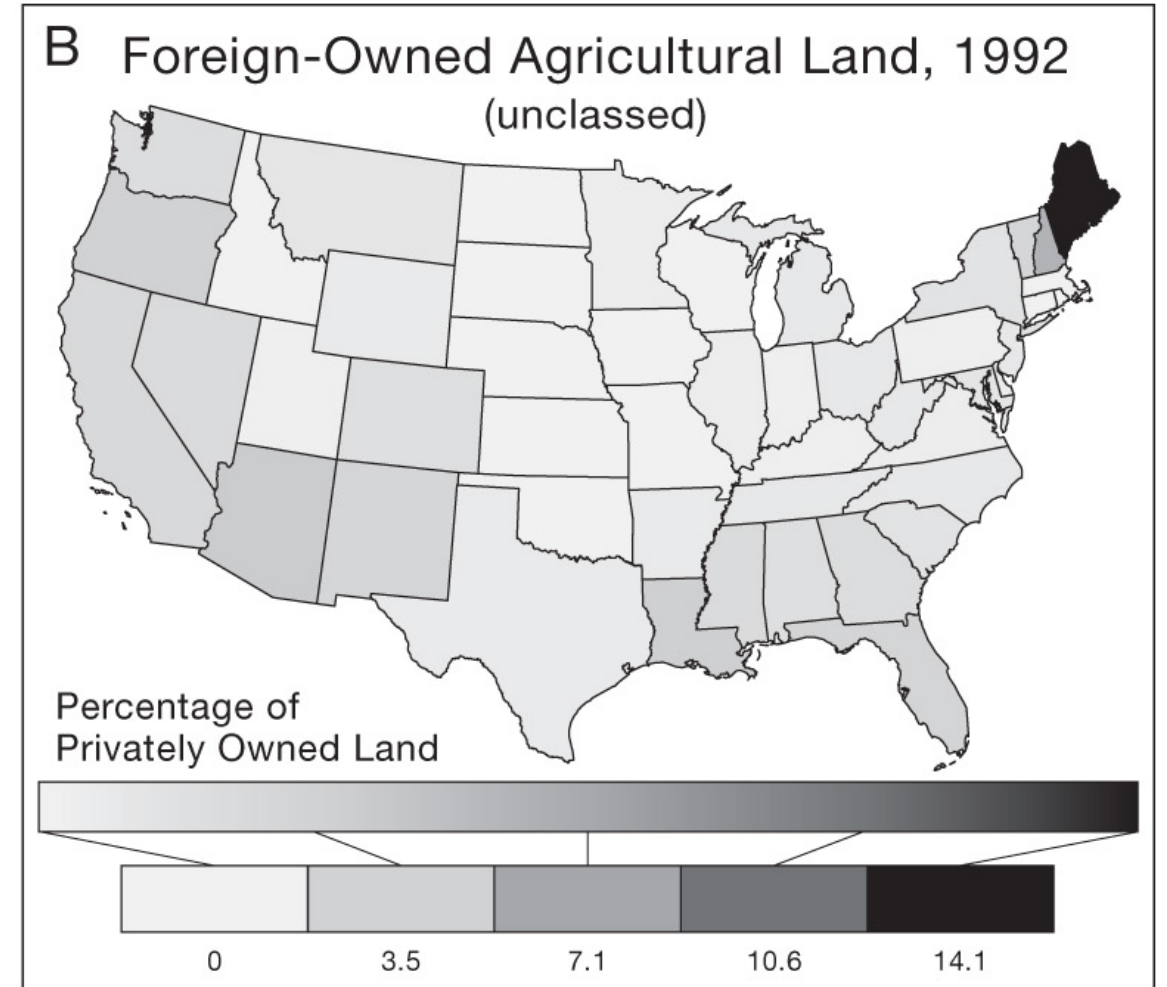
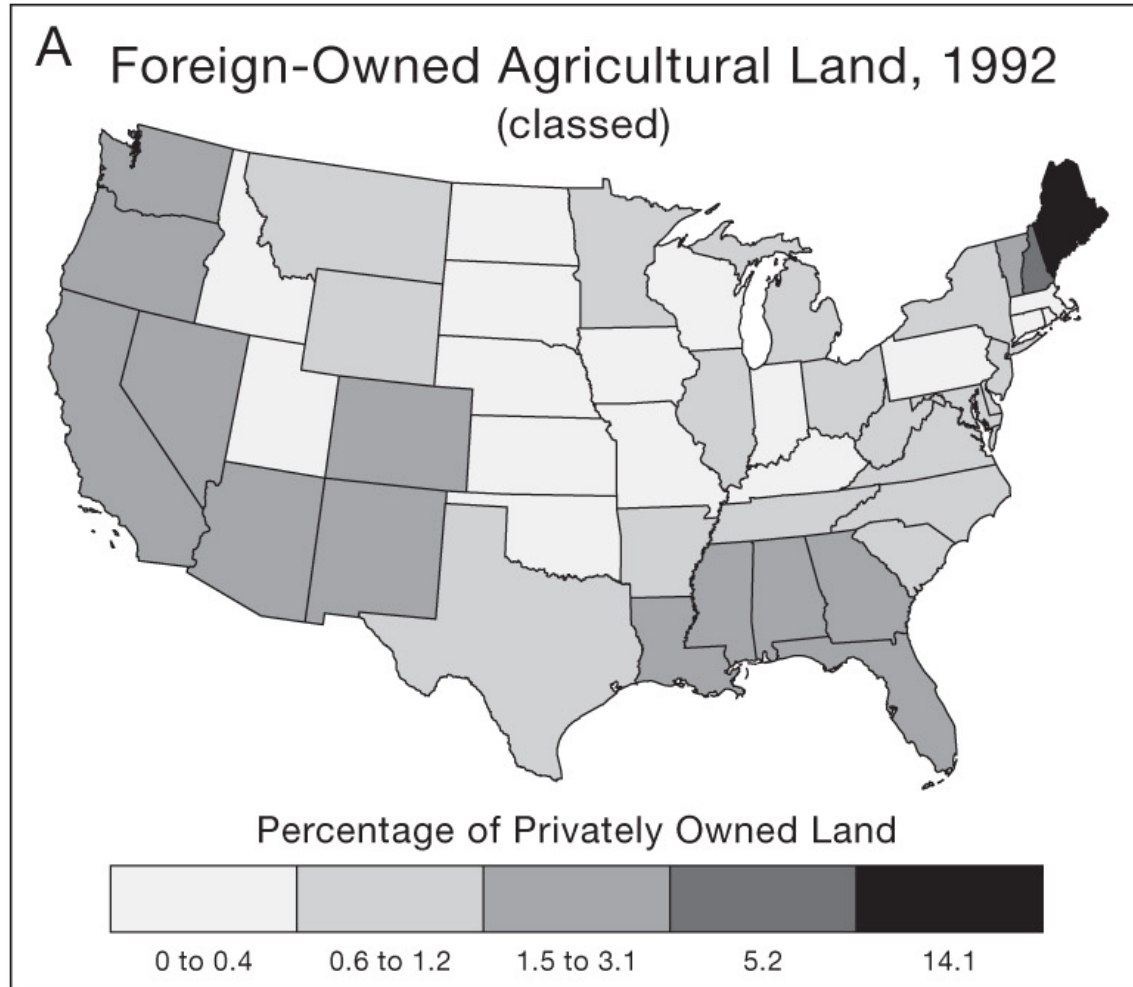
Symbolization (Wikipedia)



Data standardization



Data classification



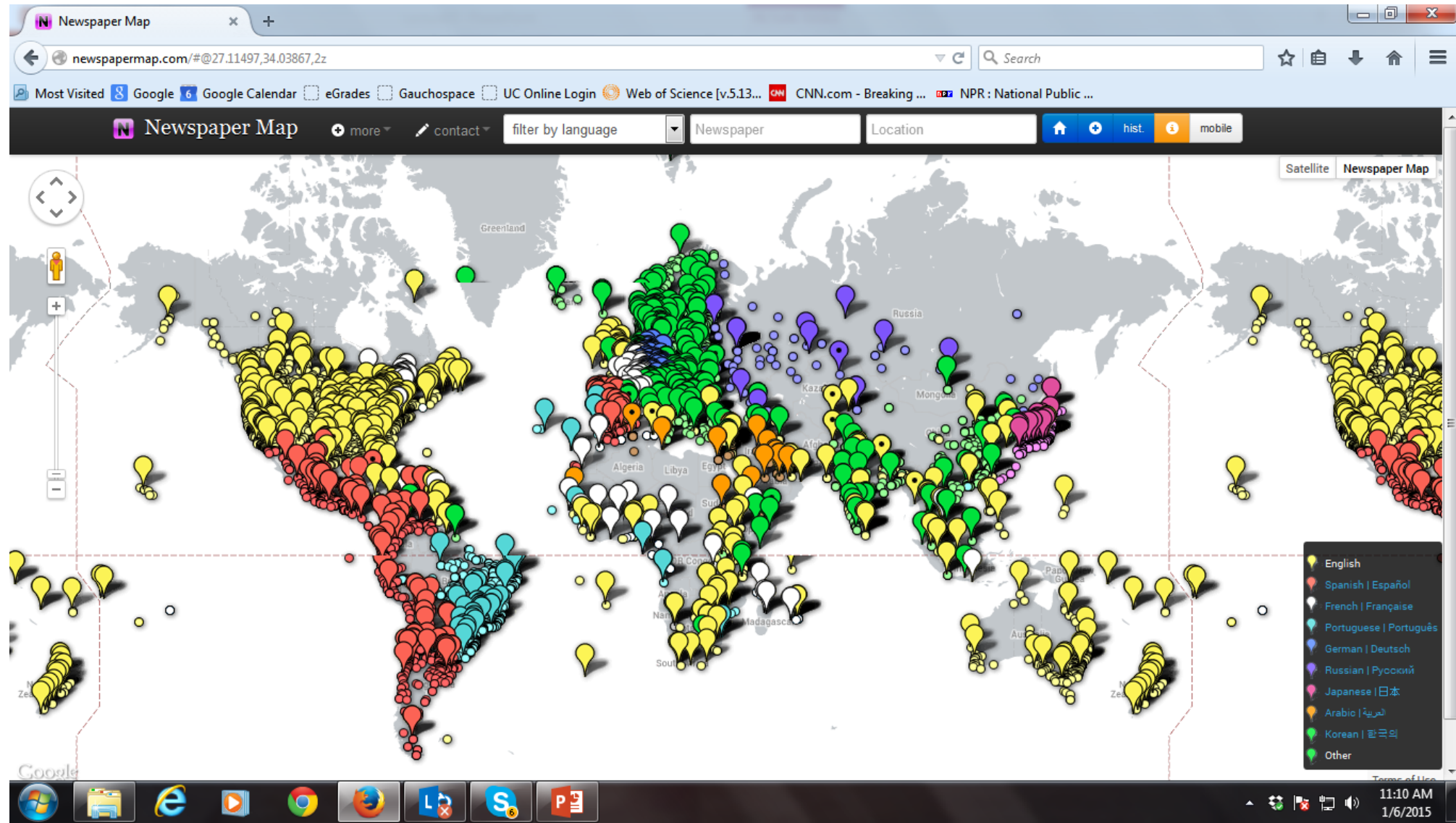
Technology and cartography

- Expert systems for design decisions
- Innovation in methods
- Animation: time
- Rise of data exploration
- Big data
- Multimedia and hypermedia
- Electronic Atlas, data clearinghouse, online mapping tools
- Virtual environments, virtual and augmented reality
- Spatialization

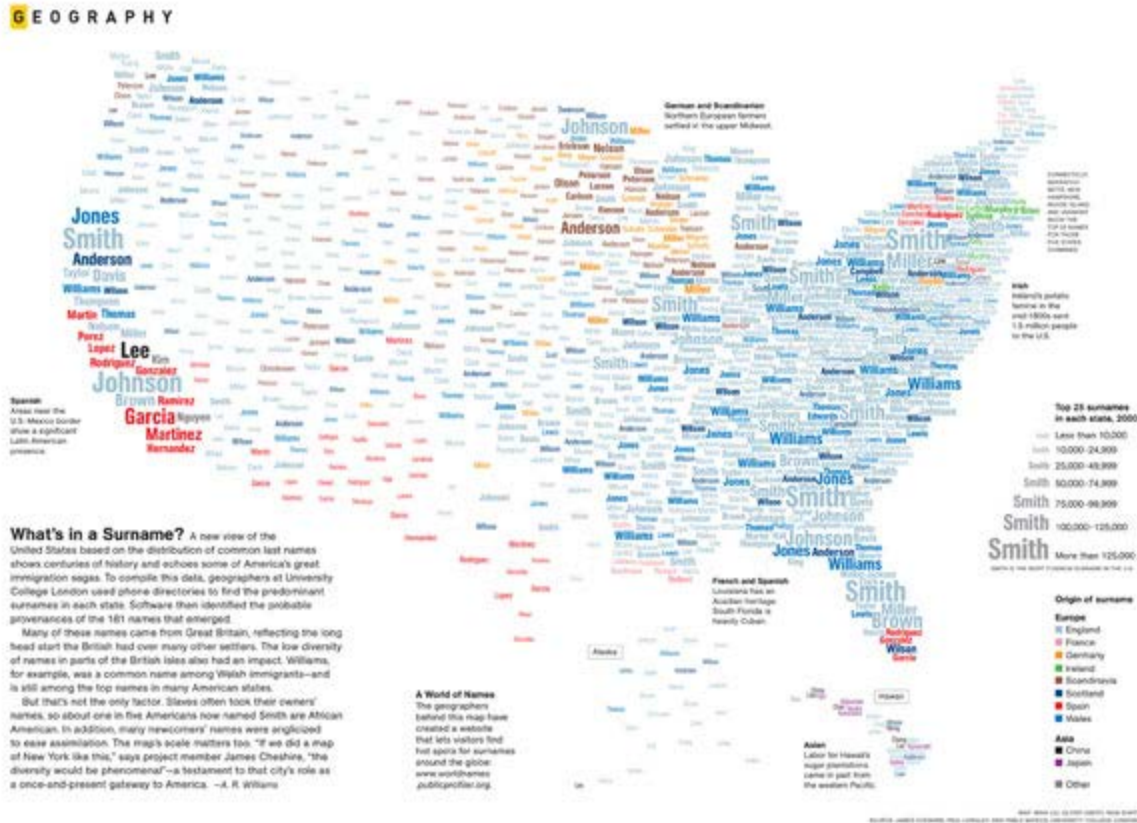
Animation <http://www.marinetraffic.org>

The screenshot displays the Marine Traffic Vessel Finder website in a browser window. The browser's address bar shows the URL www.marinetraffic.org. The website header includes the text "VesselFinder.com" and "Ships: 48289". The main content area features a map of California with numerous ship icons (represented by colored triangles) scattered across the coastal waters. The map includes labels for major cities such as Sacramento, San Francisco, San Jose, Los Angeles, and San Diego. On the right side of the page, there is a sidebar with several sections: "online map finder" with a "Click Here." button, "SATELLITE AIS" with links for "Orbcomm", "exactEarth", and "Google Satellite", "FREE AIS TRACKING" with links for "Vessel Finder", "Marine Traffic", "Cruise Mapper", "gTrax AIS Tracker", "Ship Finder", and "ShipAIS UK", and "FLEET TRACKING". The bottom of the browser window shows the Windows taskbar with various application icons and the system clock indicating 11:15 AM on 1/6/2015.

Web map as data portal



Spatialization



Source: James Cheshire spatial.ly



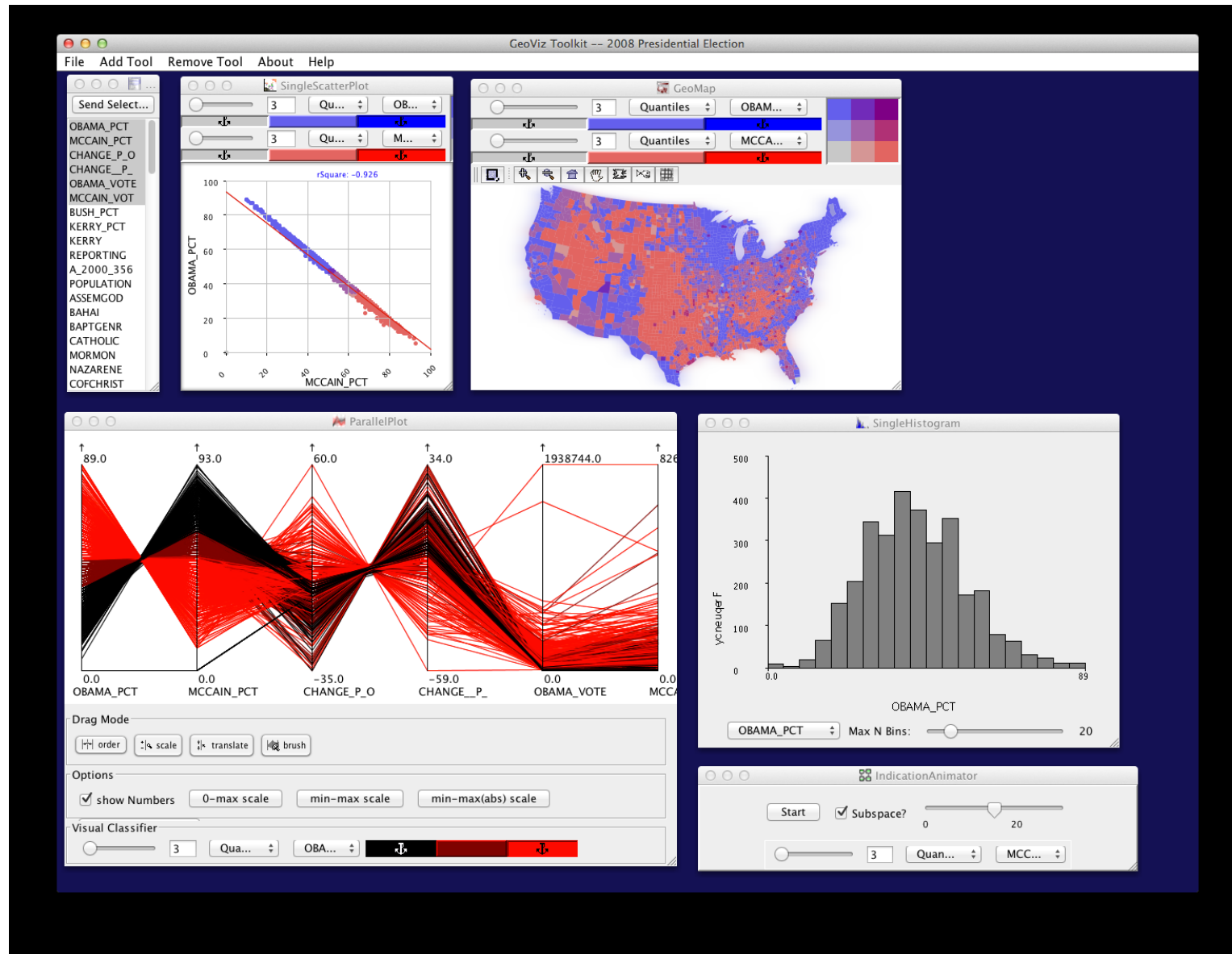
Source: Tokyo firm Information Architects

Geographic visualization

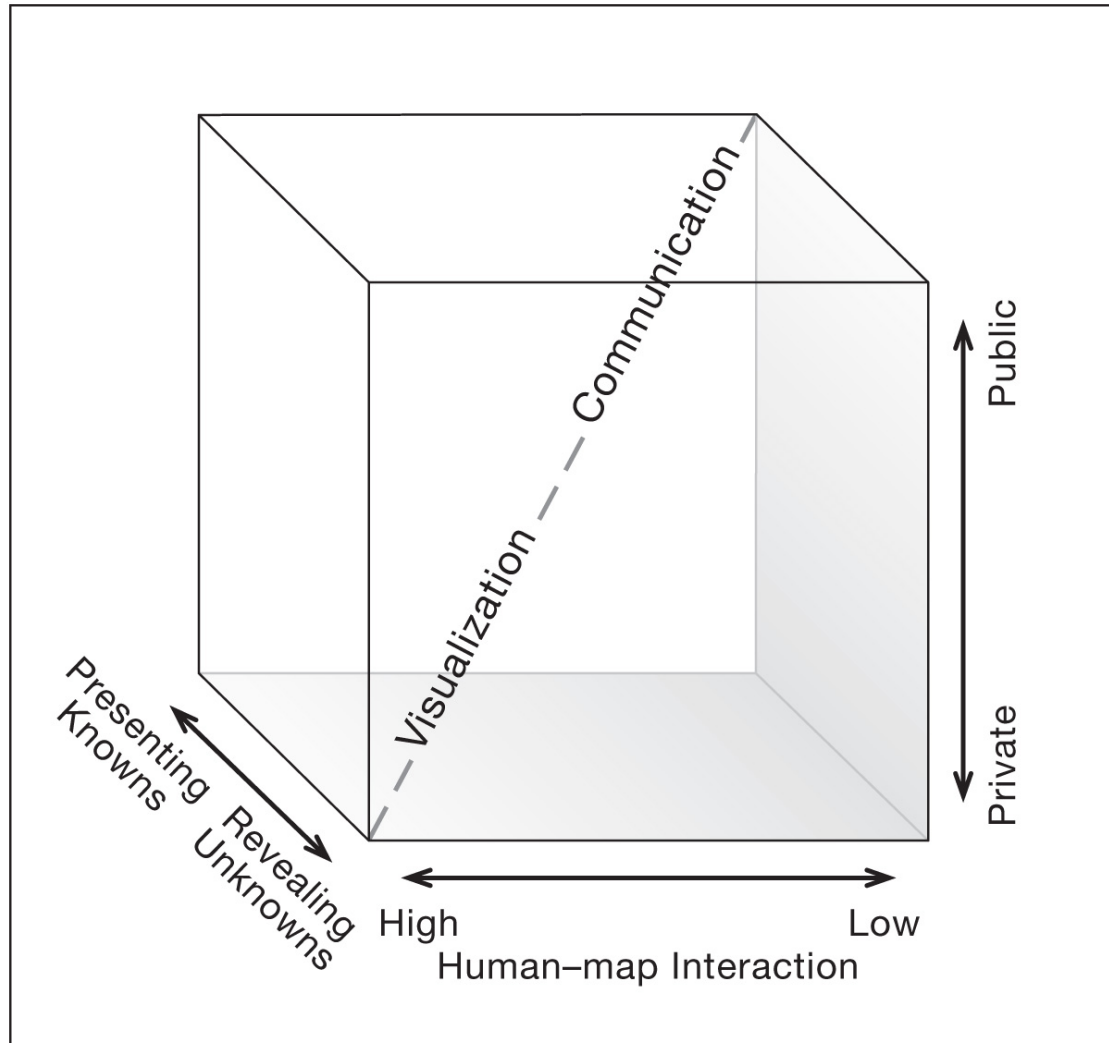
- Origin of visualization term from computer graphics
- Scientific visualization dates from 1990s
- Infovis (<http://ieevis.org/>) since 1989
- MacEachren uses term geovisualization (1999)
- Huge increase in tools/methods/innovation
- Many design oriented blogs, journals, conferences, e.g. <http://www.axismaps.com/blog>, Cartographic perspectives, NACIS



Geoviz studio



Visualization Cube (MacEachren and Taylor, 1994)

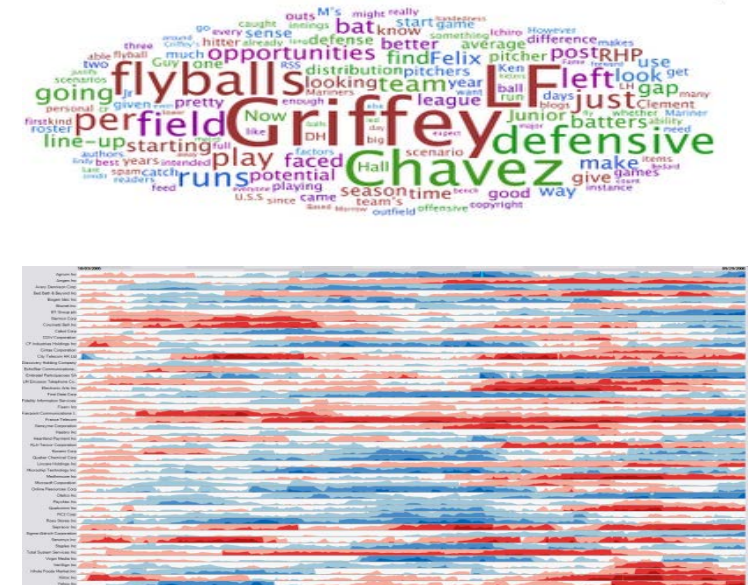
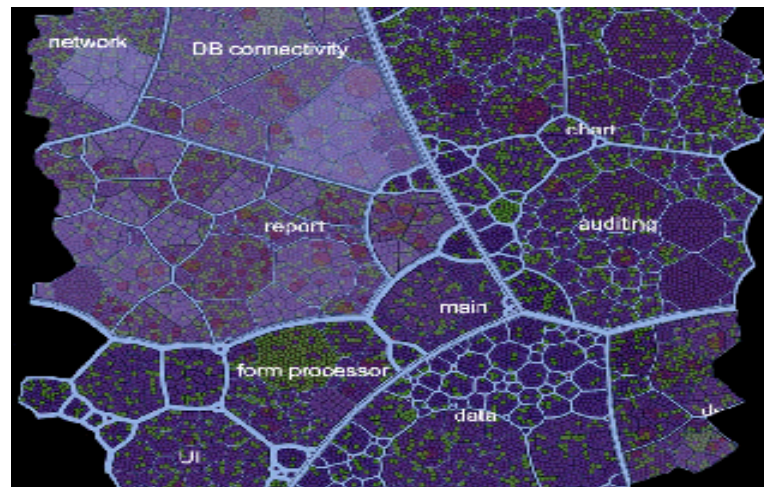
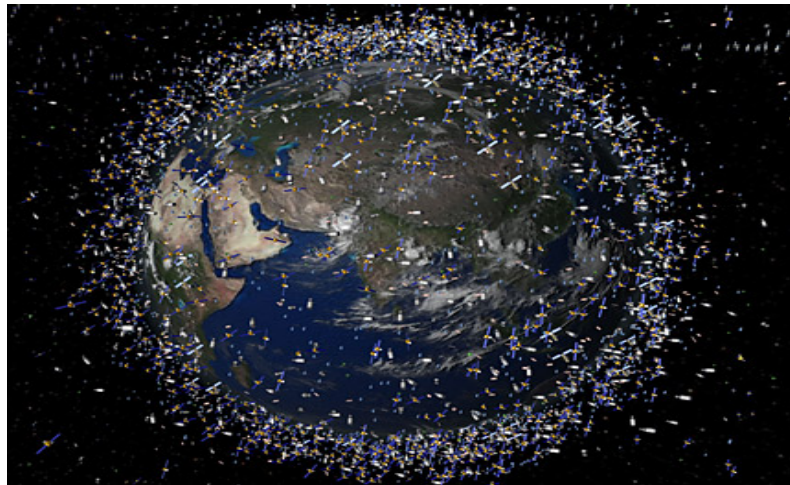
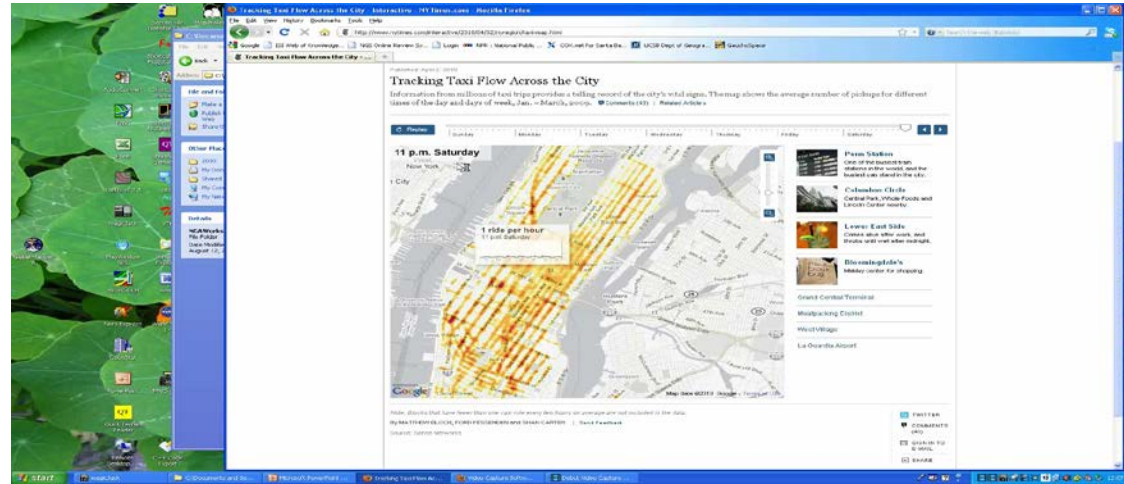
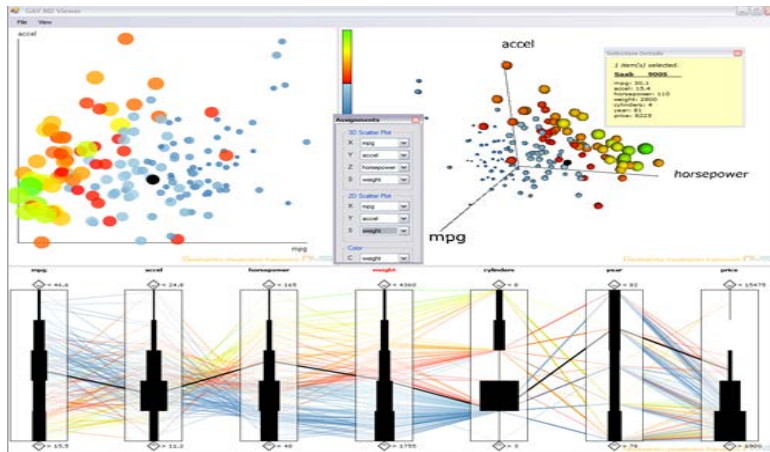


New methods

- Huge surge in innovative software
- New methods, interaction, social media etc.
- Able to handle very large data sets and real time
- Map and web become synonymous, e.g. Googlemaps
- Fusion of measurement methods, sensors, imagery into mapping
- Positioning revolution leads to LBS
- Emergence of the mash-up
- Rise of open source, scripting, distributed processing

Visual analytics:

the science of analytic reasoning, facilitated by interactive visual interfaces.



- <http://vita.itn.liu.se/gav/gav/1.174303/GAV-Demo.png>
- http://www.natural-environment.com/images/blog/space_junk_2.jpg
- <http://kottkegae.appspot.com/images/taxi-flow-nyc.jpg>
- http://ajperez.net/Images/InfoViz_small2.gif
- http://2.bp.blogspot.com/_InzW19Cnoul/SaMDNpGCIZI/AAAAAAAAA8/3DGaPvuW7-Q/s1600-h/GriffeyWordle.png
- <http://www.perceptualedge.com/blog/wp-content/uploads/2009/01/horizon-graph-large.jpg>

globalfloodmonitor.org

The screenshot shows a web browser window displaying the website <https://www.globalfloodmonitor.org>. The browser's address bar shows the URL and a "Secure" connection. The website's navigation menu includes "Global Flood Monitor", "About", "Research", "Download", and "Contact".

The main content area features a satellite map of Europe. A blue overlay on the map indicates a flooded region in the north of England. A red location pin is placed on the map, and a pop-up window titled "Stillingfleet" is open, displaying a tweet:

Stillingfleet

Tweets

Terry Harrison Sent word to the page!!
***** Apparently flooding just past the Locks at Naburn. He has told me this is passable with care. — in Stillingfleet

[See on Twitter](#) Apr 8, 2018, 8:50 AM UTC

At the bottom of the map area, there is a timeline control with a play button and a timestamp: "Apr 9, 2018, 11:52 PM UTC". To the right of the timeline is the logo for the "IVM Institute for Environmental Studies" and "FLOOD TAGS".

The Windows taskbar at the bottom of the screen shows the system clock as 9:54 AM on 4/9/2018.

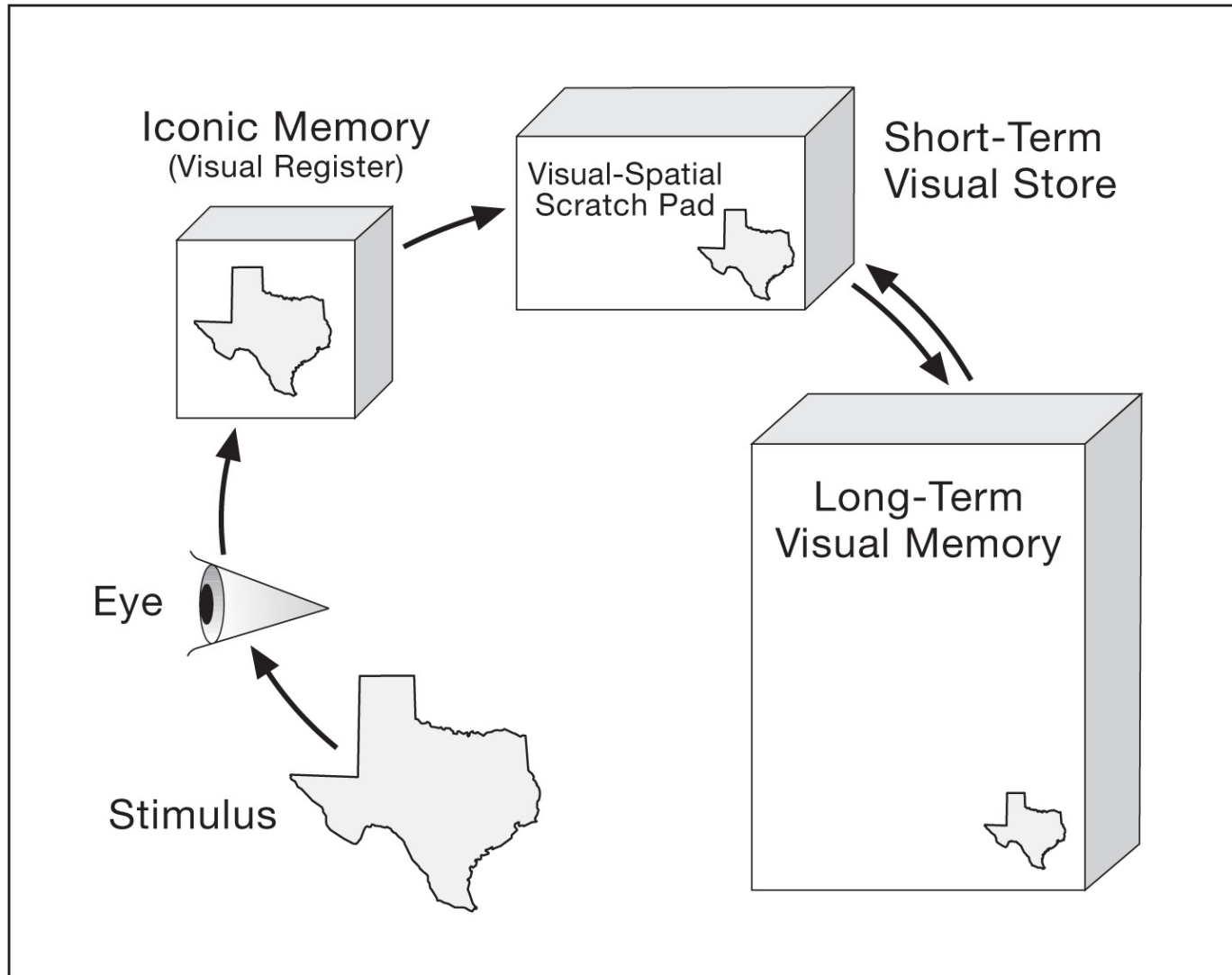
Example: LBS Query Data

The tag map of queries made between 8pm and midnight is dominated by queries about fast food. Red indicates positive deviation from the expected norm; blue indicates negative deviation (mainly shops in this late-night example).

Source: Wood, J., Dykes, J., Slingsby, A. and Clarke, K. C. (2007) Interactive visual exploration of a large spatio-temporal data set: reflections on a geovisualization mashup. *IEEE Transactions on Visual Computing and Graphics*, vol. 13, no. 6, pp. 1176-83.

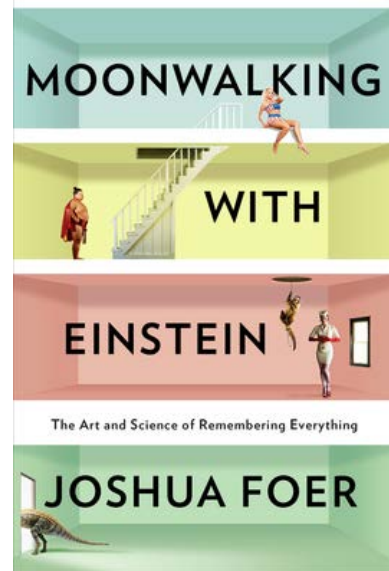


Role of memory



Method of loci (The Memory Palace)

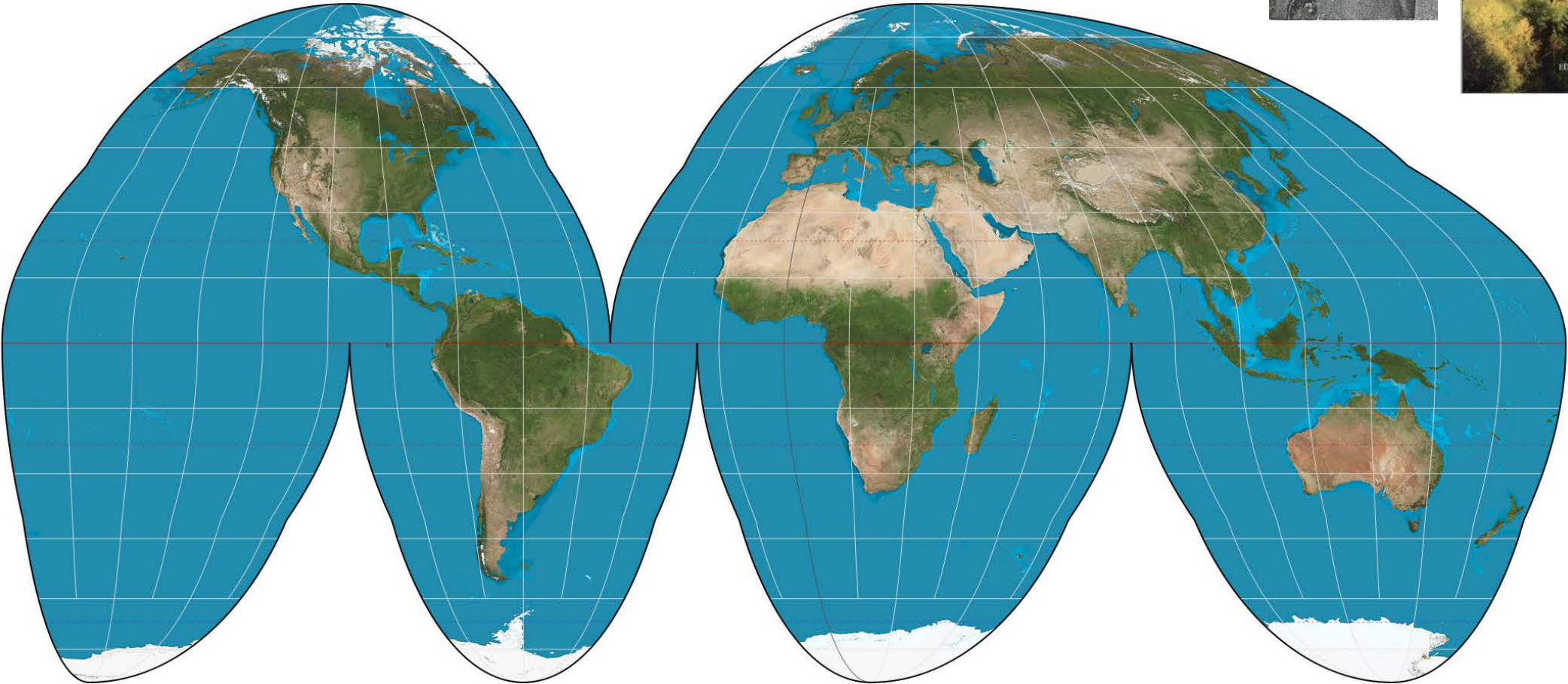
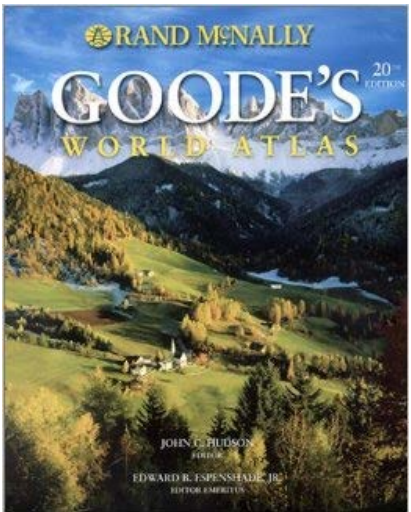
- Roots in ancient Greece
- *Rhetorica ad Herennium*, Cicero's *De Oratore*, and Quintilian's *Institutio Oratoria*
- “the subject memorizes the layout of some building, or the arrangement of shops on a street, or any geographical entity which is composed of a number of discrete loci. When desiring to remember a set of items the subject literally 'walks' through these loci and commits an item to each one by forming an image between the item and any distinguishing feature of that locus. Retrieval of items is achieved by 'walking' through the loci, allowing the latter to activate the desired items”
- Maps may tap into this strong memory capability



History of US Academic Cartography

- Slocum's 4 periods
- Incipient :JP Goode (Chicago), Erwin Raisz (Harvard), Guy-Harold Smith (Ohio St), RE Harrison (Life)
- Post-war: Wisconsin, Kansas, Washington
- Growth of Secondary Programs (1960s-80s)
 - (UCLA, Michigan, South Carolina, Syracuse)
- Integrated curriculum with GIS (since 1990s)
 - UCSB, SUNY Buffalo, South Carolina

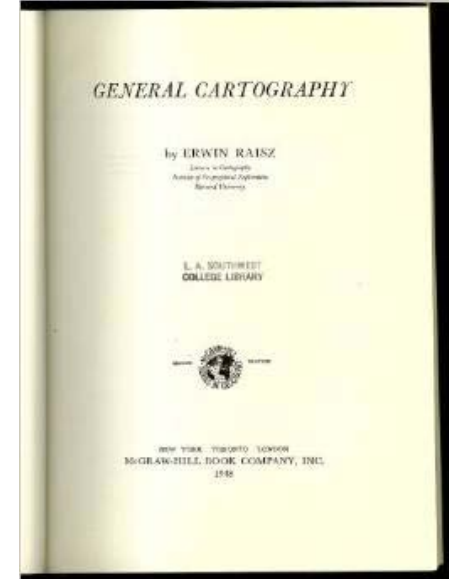
J.P. Goode



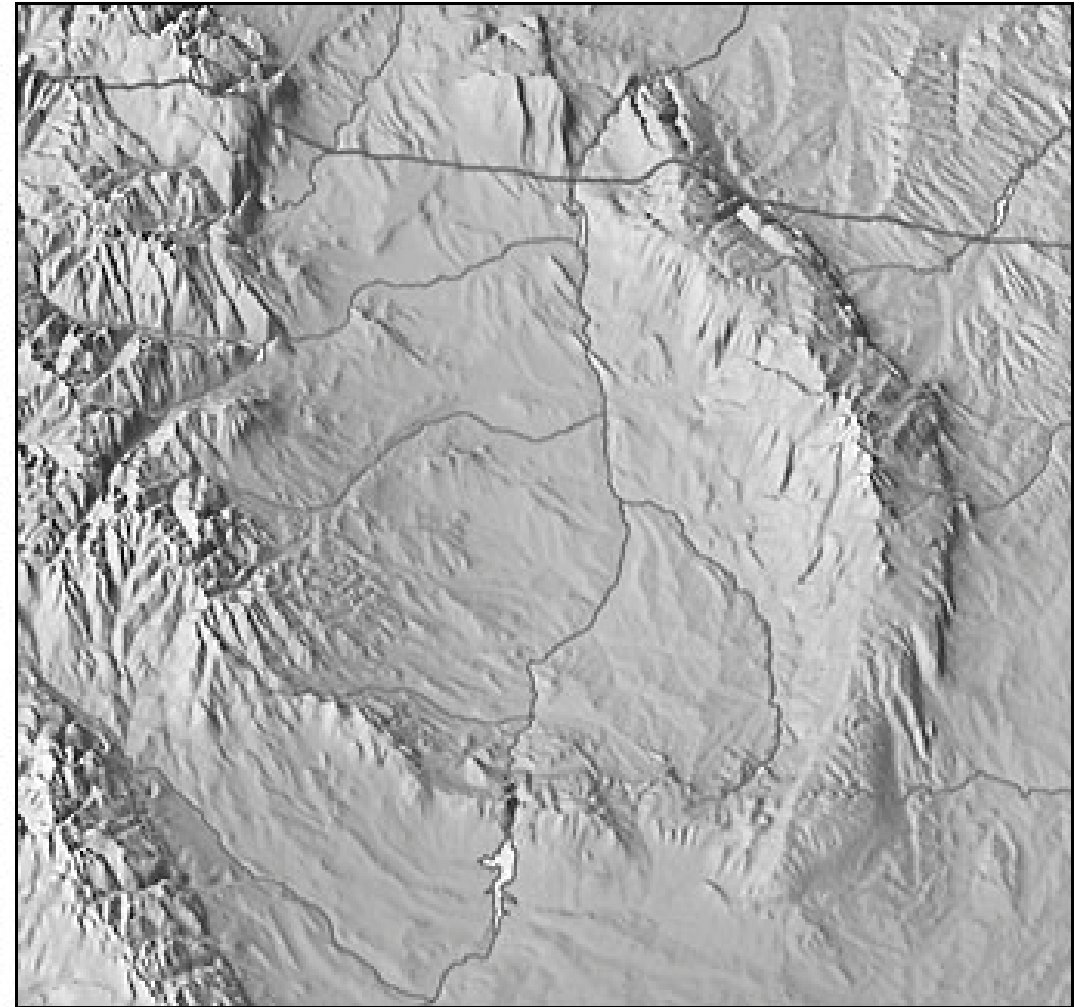
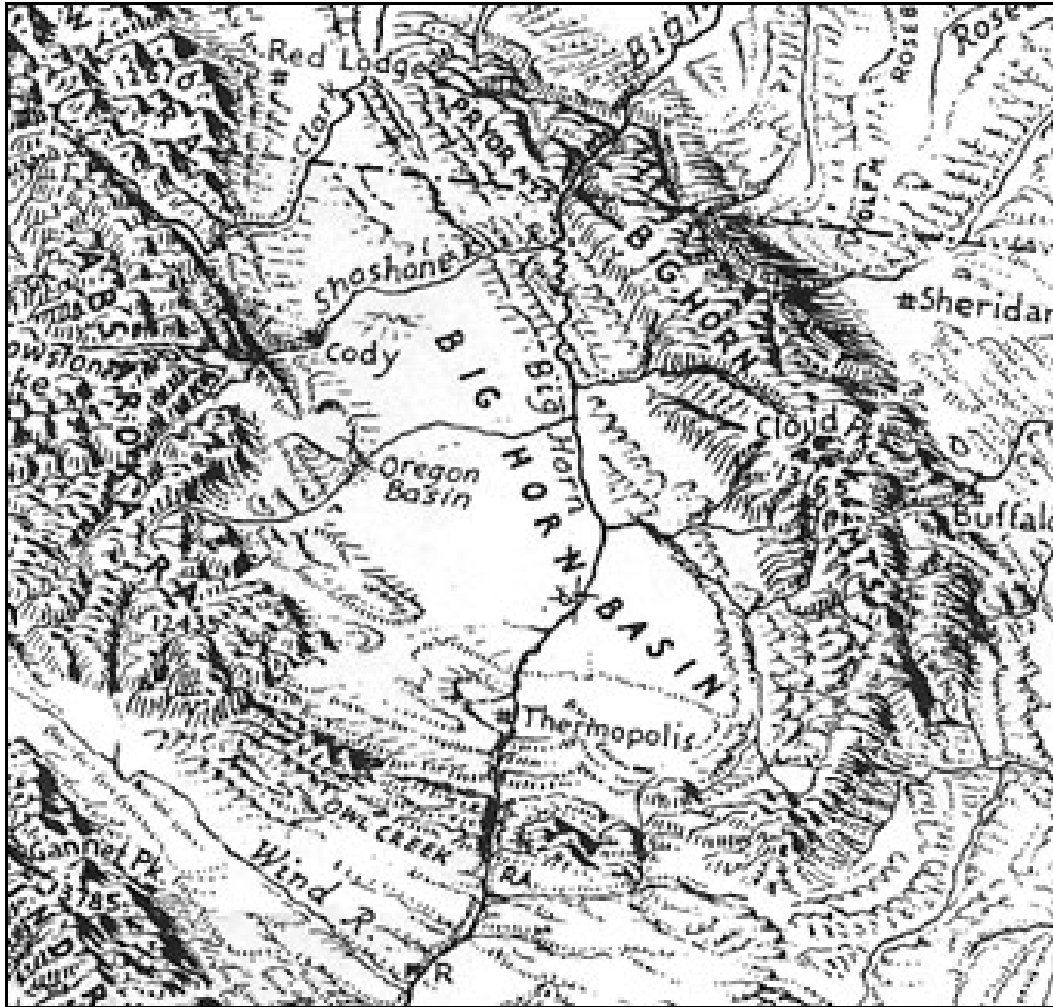
Goode Homolosine 1923 Source: Wikipedia

Erwin Raisz

- Author of the first cartography textbook in English, *General Cartography* (1938)
- Known for detailed hand-drawn physiographic maps, distinct style
- While a student, offered the first cartography class in the US (Columbia University)
- In 1931 he joined the Institute of Geographical Exploration at Harvard University
- Taught cartography and was curator of the Harvard map collection for 20 years



Erwin Raisz



Bighorn Basin, Wyoming, drawn by Erwin Raisz (left) and the same area rendered as plan oblique relief from Shuttle Radar Topography Mission data (right).
Source: <http://www.shadedrelief.com/physical/pages/about.html>

Richard Edes Harrison



Source: Library of Congress, Map Division

Slocum's Observations on period 4

- Integration of cartography and GIS
- Completion of the digital transition
- Less emphasis on coding, more on the user interface
- More attention to dynamics, animation and multimedia
- Emergence of Analytical Cartography
- Close relationship between academic mentors and new programs

Summary

- Thematic cartography vs. reference
- Geographic information is important to mapping
- Data organization and classification is vital
- The mapping process has steps and feedback
- Change in technology has changed cartography
- Vision and memory are closely linked
- Overview of the development of academic cartography
- Early American cartographers shared creative approaches