"thematic maps" are spatial representations of measurable things (statistics, numbers)
- General reference maps, "multi-thematic"
- Meteorological maps for example
  - Isobars, isotherms ...
  - The "theme" is weather/climate, maps represent interpolated point measurements (isolines)
  - The "attribute" being measured/mapped is barometric pressure, or temperature
    - Univariate (one attribute)
Five Steps (for communicating information with maps)

- Slocum 2005, Thematic Cartography and Geographic Visualization, mention that, "some have criticized the appropriateness" of formalizing the mapping process into steps, but it does serve make organizing questions;

  • How should aerial density be represented?
    - Choropleth, Generalization
  • Purpose vs. Convention, Who is the intended audience?
    - Example: Tourist Maps
    - Level of measurement (color/symbolization)
    - Standardization
  • Dimensionality of representation
    - Point (0 D), Line (1 D), Area (2 D)

- Most maps today are made by "naïve map makers" who do not consider the steps (according to Slocum et al.)

  • Geographers are now faced with new problems, new tools and more data then we know what to do with!

Mental Maps

Each map gives a distinct impression, before and after apartheid
Muehrcke (Introduction, online)

- Map: a spatial representation of the environment
- “picture is worth 1000 words”, maps are (spatial) visual representations, should transcend language and should be free of biased

• Mental (cognitive) maps
  - The mental maps of children consist of connective pathway, everything relates to their internal position (called “egocentrism”)
  - At some point in development, young adults develop “geocentrism” where they can place themselves in the external environment

• Indirect sources of information influence your mental map
  - Geocentrism develops with exposure/access to information
  - “As the crow flies” is a geocentric ability
  - Your mind can create a mental map of places you haven’t been (TV, Movies, Internet …)
  - Cardinal directions, Euclidian geometry

  - Distance and direction are geocentric constructs

National Geographic
The Incredible Human Body (2002)

“The Knowledge”
- The mental maps of London’s taxi drivers
(Brief) History of Cartography

- Maps have a long history
- Earliest maps date back to 6000 BC, prehistoric wall paintings
- Maps created by the Egyptians, Assyrians and Babylonians
  - Fragments of clay tablets
  - The Nile, and maps of “heaven”
- Charts became of vital importance during the time of the Greek empire, ~600 BC
- Strong links with religion and identity
- The age of exploration brought new challenges
  - How to navigate at sea

mapping is very old...

- 5000 year history
- Earliest form of communication
- 6200 BC oldest known (Turkey)
- But also cave paintings
  - 60,000-30,000 BC
Egyptian heaven, "field of reeds"  
~2500BC  
- One of the oldest surviving maps from this period (it's made of clay)

Gasur map (Mesopotamia)  
~2200BC  
- Found near Kirkuk, Iraq in 1931  
- Oldest known map show "extent"

Map of the "Field of reeds"  
Depicts the afterlife with Osiris, a record of the good life in the afterlife.  
~2500BC

King Khufu, Giza  
Pyramids built with 25 ton blocks

Topographic Map  
Valcamonica, Italy  
Iron Age, ~800BC

Hereford Mappamundi  
Latin mappa "cloth" and mundus "the world"  
1300 AD  
(Middle Ages)  
5' x 4' woodcarving  
The known world consisted of land north of the equator and the eastern hemisphere  
Note: East is up, Jerusalem is at the center
The Psalter Map
1260
Called a "tripartate" map, or a "T-O" style map
600 surviving examples of this type of map from the Middle Ages exist
East is up, Jerusalem is at the center
17th Century, Pawnee Star Chart
Nebraska plains tribe, clear view of the flat circular horizon
Oval boarder is the horizon, the Milky Way can be seen down the middle
Summer sky is on the left, Winter Sky on the right

Marshall Islanders Map
Made with palm sticks and shells, shows the relative locations of islands and the prevailing swells.
Used to navigate outrigger canoes in the open ocean

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Tenochtitlan Codex Mendoza
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Crossed canals divided Aztec city into social districts
Astronomical surveys, architecture made use of solar alignments

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Portolan Chart
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One of the 1st maps of the New World
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1500
One of the 1st maps of the New World
East is up, North is to the right
Oblique map showing the arrival of the English
1585
Henricus Hondius World Map, 1630
Mercator's Arctic Map
1595
- Passages through the North Pole

China 19th Century
- Korean part of China
- Maps allowed for Bureaucratic control of vast territory
- Medieval religion, the "the ways" (Confucianism, Taoism, Buddhism)
Aboriginal Art, Australia

Spiritual connection to place, “dream time”

Britain’s colonization of Australia in 1788 displaced Aborigines

In 1992 the Australian High Court ruled that sacred aboriginal lands should be recognized.

Ayers Rock was renamed Uluru

“maps” in the form of drawings on pieces of bark, and dream time art (maps), were used to demonstrate the spiritual connection to places

Napoleon’s Grand Armée into Czar Alexander’s Russia in 1812-1813

As many as 400,000 people 175,000 horses died
Maps as a means to understand a simplified reality

Why do we use maps?
- Convenience
- Simplicity
- Believability

Credibility
- Seeing is believing
- Strong visual impact
- Tainted judgments

Driving time is much different than overland distance, but this map ignores this.
Do you call it “Coke”, “Soda”, “Pop”, or something else?

*America’s Pop vs. Soda controversy*

Source: http://www.popvssoda.com/
Do you call it “Coke”, “Soda”, or something else?

*America’s Pop vs. Soda controversy*


**Harvard University Dialect Survey**

- \(\text{aunt}\)
  - [\(\#\) as in "ah" (6.52%)]
  - [\(\#\) as in "ant" (75.13%)]

Source: [http://hcs.harvard.edu/~golder/dialect/maps.php](http://hcs.harvard.edu/~golder/dialect/maps.php)

History of (contemporary) Cartography

Slocum Ch 2 pp22-31

- Harris 1950s, brought to the public “cartography”
- Robinson (U Wisconsin), Jenks (U Kansas), Sherman (U Washington) 1950s-60s
  - Emphasized production issues initially (the craft), but later shifted to more academic issues, established Cartography in academia
- Waldo Tobler (U Michigan) 1960s-70s
  - 2nd generation, a student of Sherman’s at U Washington
  - Moellering and Monnier are two others from this 2nd generation
  - Muehrcke was Waldo’s students, 3rd generation
  - Slocum, Clarke, Buttenfield, also 3rd generation
- Cartography, in particular analytic cartography, is young relative to other academic disciplines
  - GIS is still, even after ~25 years, relatively young
  - Originated with Arc/Info in the 1980s
History of (contemporary) Cartography

- Faces to the names

Left: John (Jack) Estes (1939 – 2001)  
Right: Waldo Tobler  

Left: John (Jack) Estes (1939 – 2001)  
Right: Keith Clarke  

Analytical (Computer) Cartography

Tobler (1959) Automation and Cartography, Geographical Review  
Tobler (1976) Analytical cartography, The American Cartographer

Where did GIS come from?

1966 SYMAP, developed at the Laboratory for Computer Graphics and Spatial Analysis at the Harvard Graduate School of Design  
Late 1960s, Early 1970s  
GRID, POLYVERT, ODYSSEY  
1970s, Census, DIME Geocoding  
TIGER, topological data structure  
ESRI, Jack Dangermond borrows the ideas (= the people) working at Harvard Labs  
1981 - ArcInfo  
1992 - ArcView  
2001 - ArcGIS