WHAT IS GIS?

Geographic Information Systems (Science)

GIS allows you to process, analyze and visualize information about the Earth's surface. GIS is utilized to know "what is where,when" and is a flexible system that allows you to study spatial relationships, PAST AND PRESENT.

It is NOT the software that we use to map data.

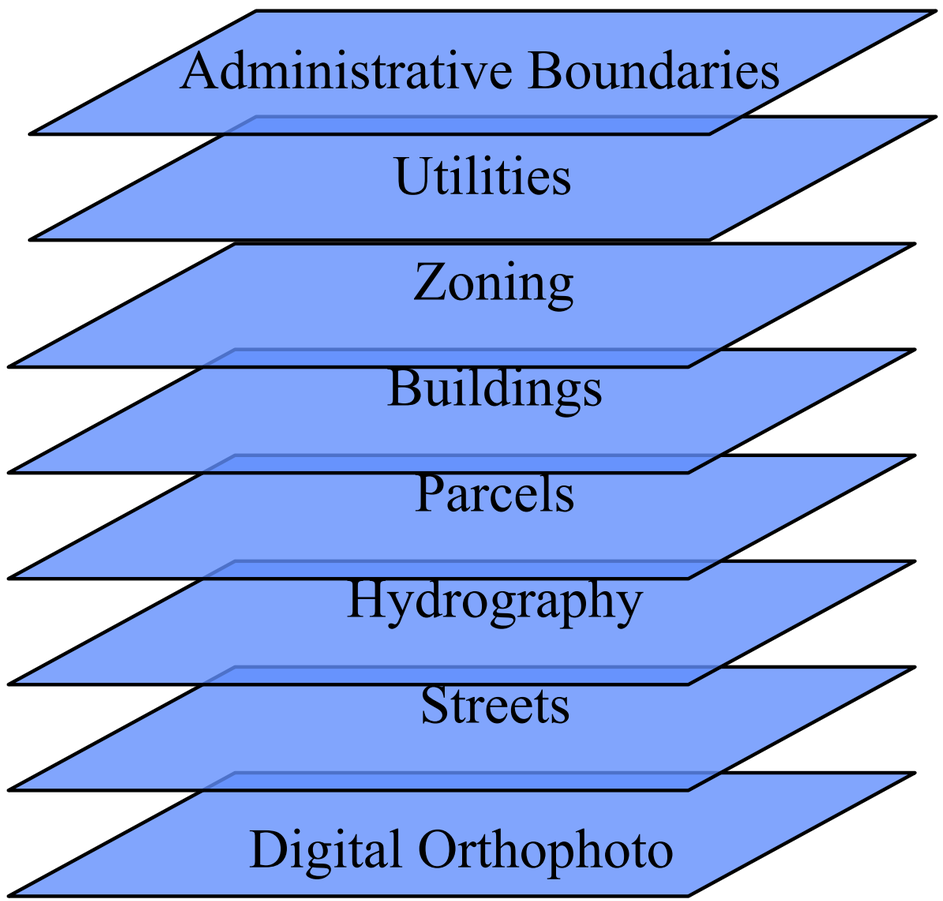
**"Everything is related to everything else,
but near things are more
related than distant things."**
(First rule of geography)

GEOGRAPHIC

- A geographic information system has 5 components:
  - software
  - hardware
  - data
  - methods/procedures
  - users (people)
- GIS is:
  - spatial
  - layered
  - relational

INFORMATION SYSTEM

GIS MODEL



Data is organized in layers, that can be overlayed, compared, and used to represent thematic, quantitative, qualitative, narrative or conceptual information about the world.

These layers can be generated from historical maps, document and satellite images, as well as field notes, surveys, etc.

WHY IT MATTERS

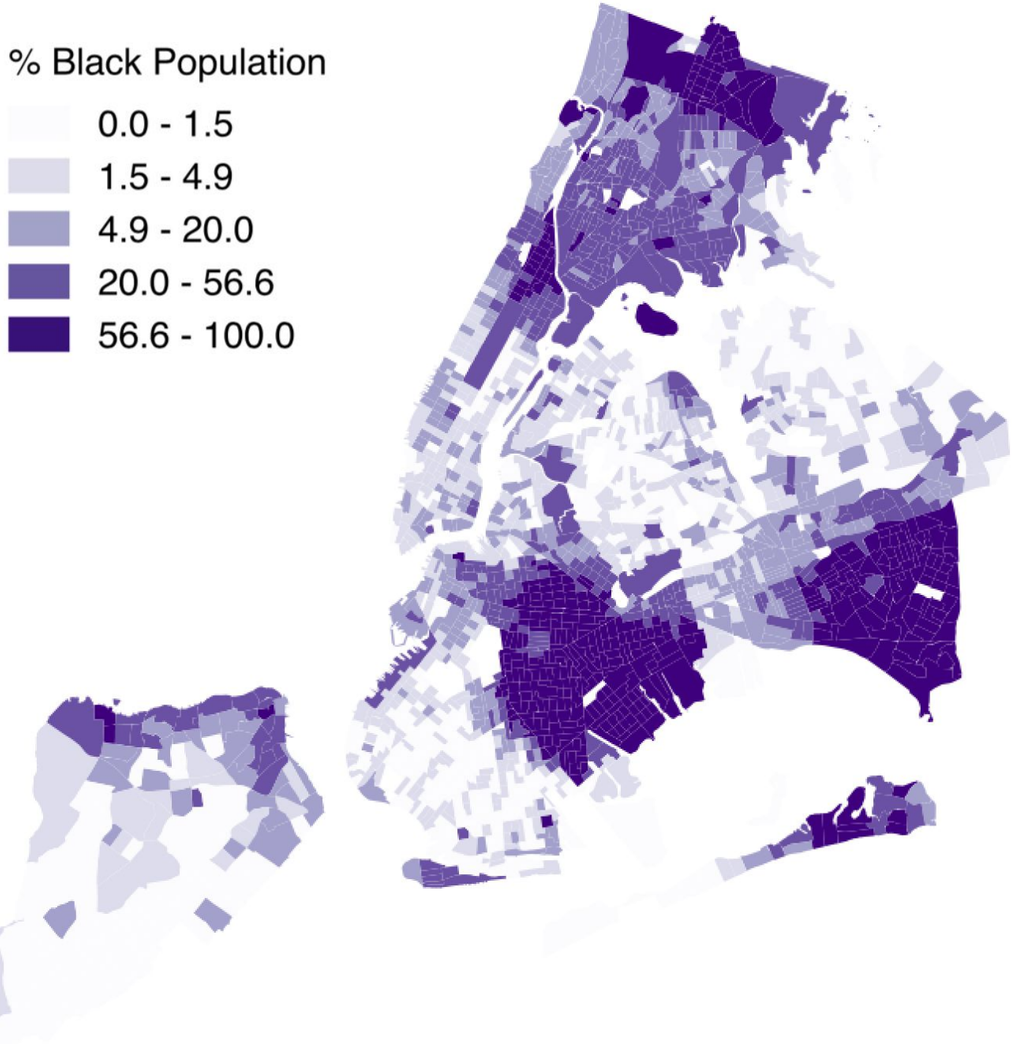
- Where to create new hospitals
- What routes to use to deliver packages
- Where to develop new highways
- Decide which areas will be affected by weather conditions to figure out who needs to evacuate
- Determine if areas have access to resources
- Understand how cities have developed
- How to manage forests, where to cut/plant trees, where to locate roads

...and many more

TYPES OF MAPS

Reference

Thematic



A QUICK HISTORY

- History of Mapping is the History of Technology, Scale, and Power

- The 3 C's*:
  - Control
  - Commerce
  - Conquest

*According to Professor Leah Meisterlin

EARLY MAPS

- Many of the first maps reflected religious philosophies/beliefs along with physical geography

- Most early maps placed the mapmaker's location as the center of the world

- This still happens: Prime Meridian runs through the Royal Observatory in England

- Mapmaking can be an ego- and ethnocentric activity

Source: Maantay & Ziegler (2006)

PURPOSE:THEN AND NOW

- Political Control
  - if you could define boundaries and map an area, it belonged to you

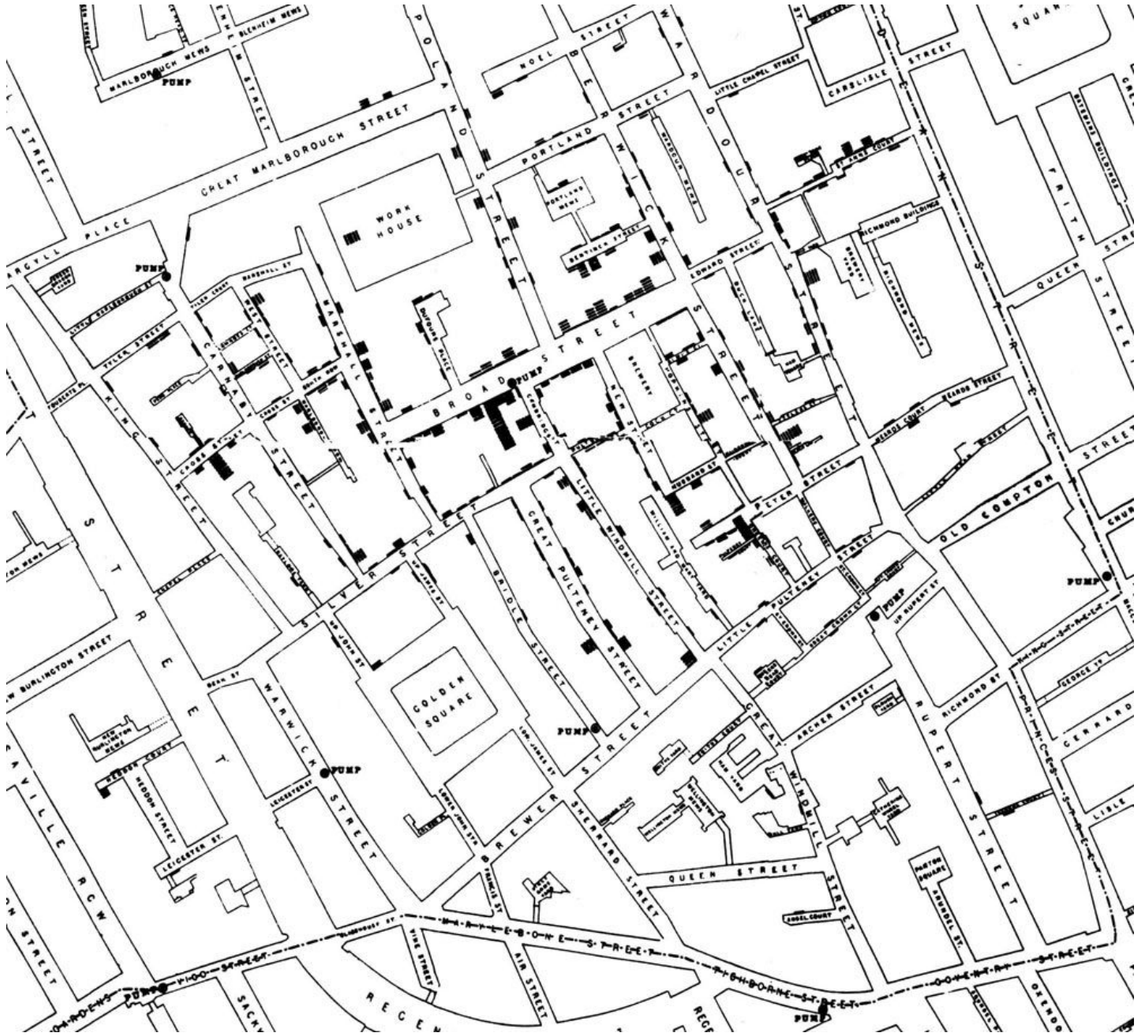
- Governing
  - Can be more efficient if you know your territory

- Trade and Navigation
  - Exploration of new lands

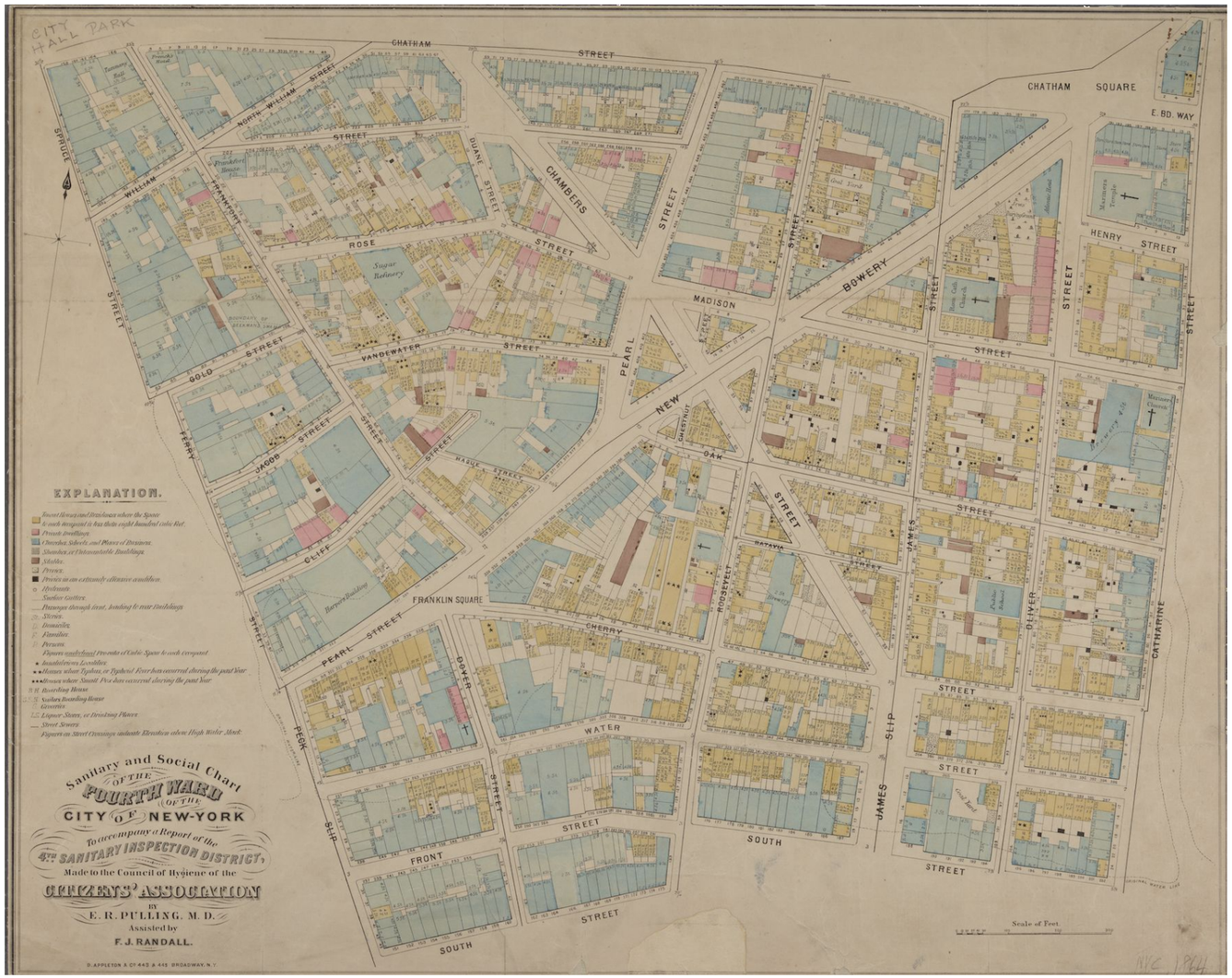
- War and Military Conflict

Source: Maantay & Ziegler (2006)

EXAMPLES



John Snow's Cholera Map (1850s)



Sanitary and social chart of the Fourth Ward of the City of New York (1864)

A QUICK HISTORY*

- 1950s - 1970s: “Era of Innovation”
  - building on military sensing
  - development of remote sensing
  - increasing computational abilities
  - GIS and GISc (cartographic computation) developing in academia

- 1980s - 1990s: “Era of Commercialization”
  - GIS reaches commercial users
  - commercialization of GPS
  - increased access to computational power

*From Professor Leah Meisterlin’s Lectures for Introduction to GIS

A QUICK HISTORY*

- 2000s - today: "Era of Exploitation:
  - location-based services
  - open-sourced GIS software
  - crowd-sourced & volunteered GIS data
  - participatory GIS (pGIS)
  - GIS day
  - increase in interactive webmapping

*From Professor Leah Meisterlin's Lectures for Introduction to GIS

DATA PIPELINE

Process of Creating

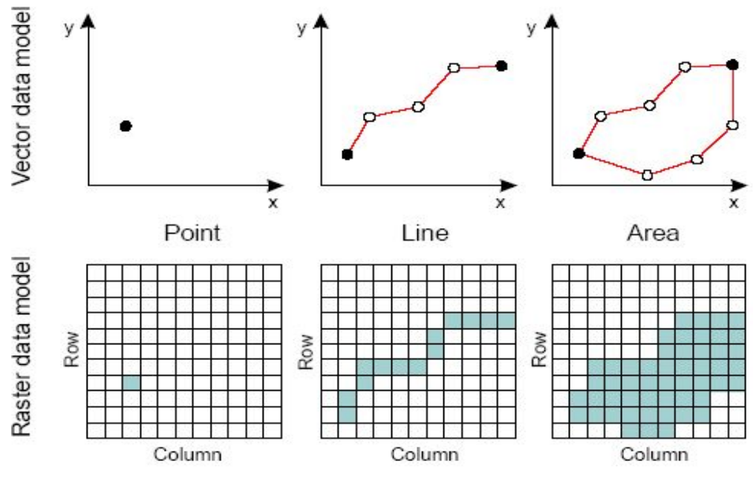
- Data acquisition
- Data storage and retrieval
- Database management
- Data display/interaction
- Data analysis
- Data synthesis/presentation

Source: Maantay & Ziegler (2006)

SPATIAL DATA

specifies where (location) and what kind of feature (shape)

STORED AS GEOGRAPHIC DATA EITHER IN VECTOR OR RASTER FORMAT



ATTRIBUTE DATA

specifies characteristics for that location information, like how much, when, what , etc.

STORED AS TABULAR DATA

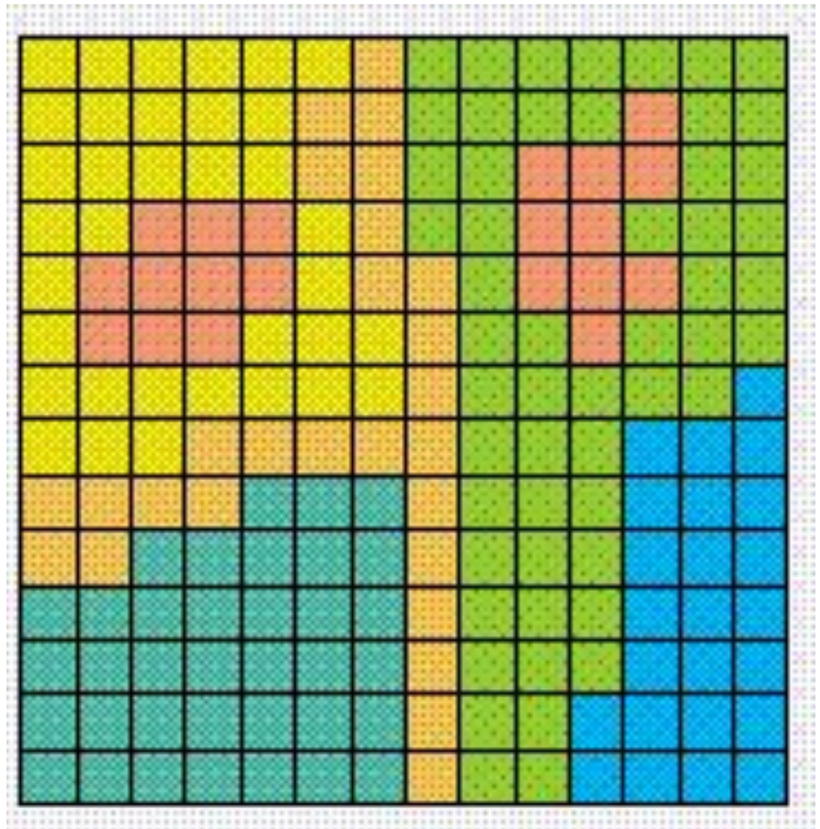
Attribute table - Streets :: Features total: 41825, filtered: 41825, selected: 0

	LEFTLOW	LEFTHIGH	RIGHTLOW	RIGHTHIGH	STREETNAME	STREETDESI
13520	14301.00000000...	14305.00000000...	14300.00000000...	14302.00000000...	COPPER	AV
13581	14301.00000000...	14323.00000000...	14300.00000000...	14324.00000000...	STALGREN	CT
13805	14301.00000000...	14309.00000000...	14300.00000000...	14308.00000000...	MEL SMITH	DR
34181	14301.00000000...	14339.00000000...	14300.00000000...	14340.00000000...	BAUER	RD
34192	14301.00000000...	14321.00000000...	14300.00000000...	14320.00000000...	ENCANTADO	RD
34229	14301.00000000...	14321.00000000...	14300.00000000...	14320.00000000...	PIEDRAS	RD
34241	14301.00000000...	14335.00000000...	14300.00000000...	14334.00000000...	SKYLINE	RD
34255	14301.00000000...	14331.00000000...	14300.00000000...	14330.00000000...	OAKWOOD	PL
34293	14301.00000000...	14317.00000000...	14300.00000000...	14318.00000000...	ARCADIA	RD
34275	14297.00000000...	14331.00000000...	14296.00000000...	14314.00000000...	WINDSOR	PL
13153	14227.00000000...	14233.00000000...	14226.00000000...	14232.00000000...	GRAND	AV

TYPES OF DATA

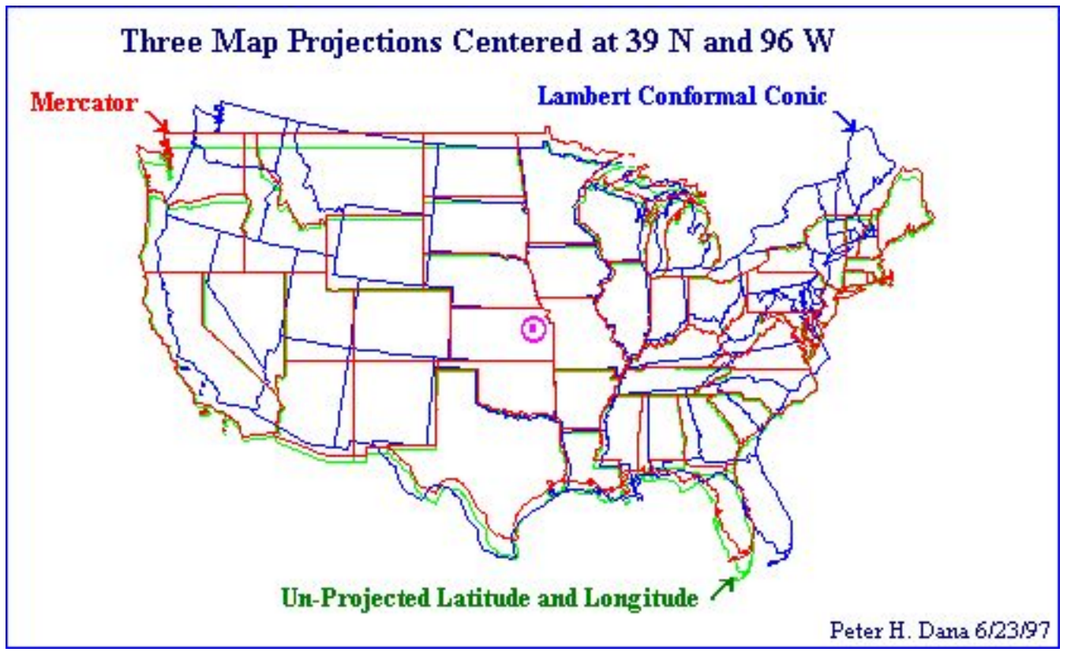
SPATIAL DATA

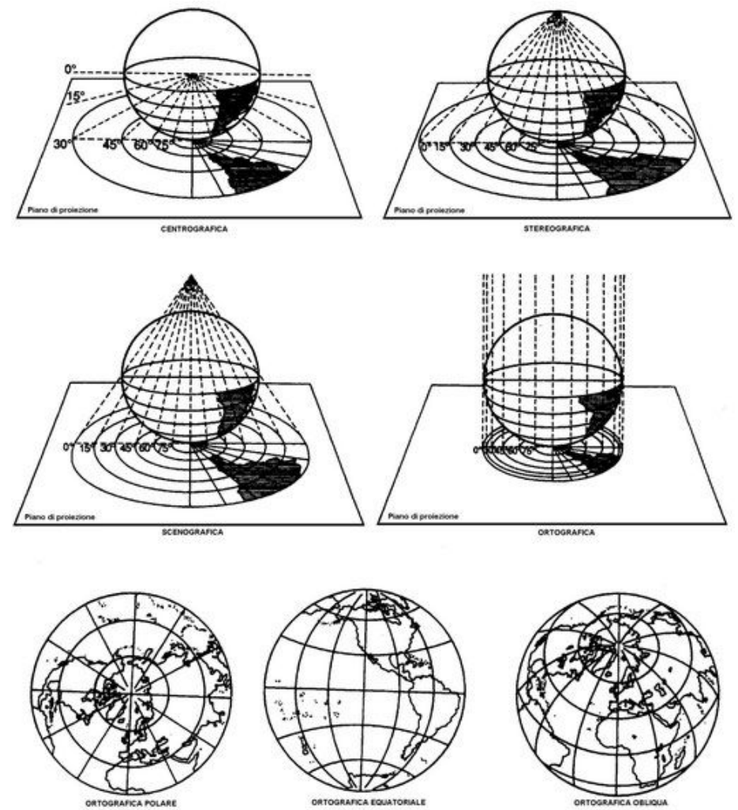
VECTOR



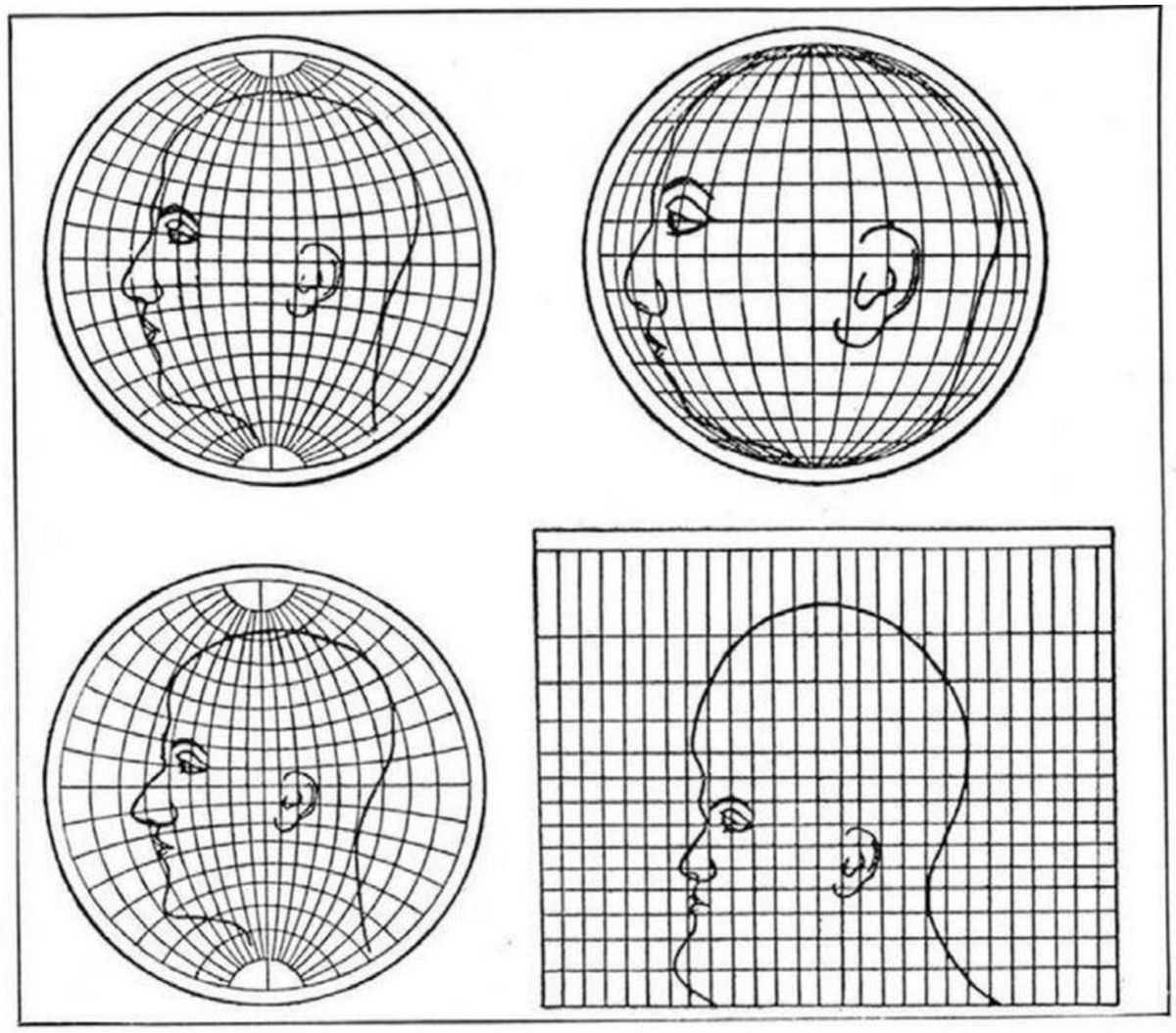
RASTER

PROJECTIONS &

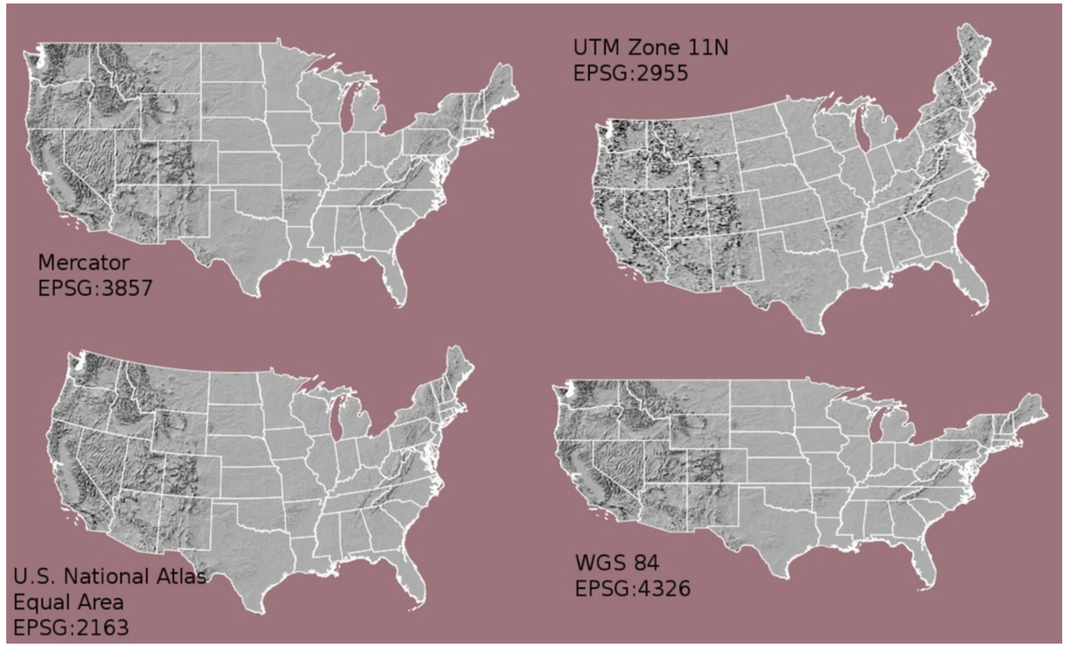




COORDINATE SYSTEMS

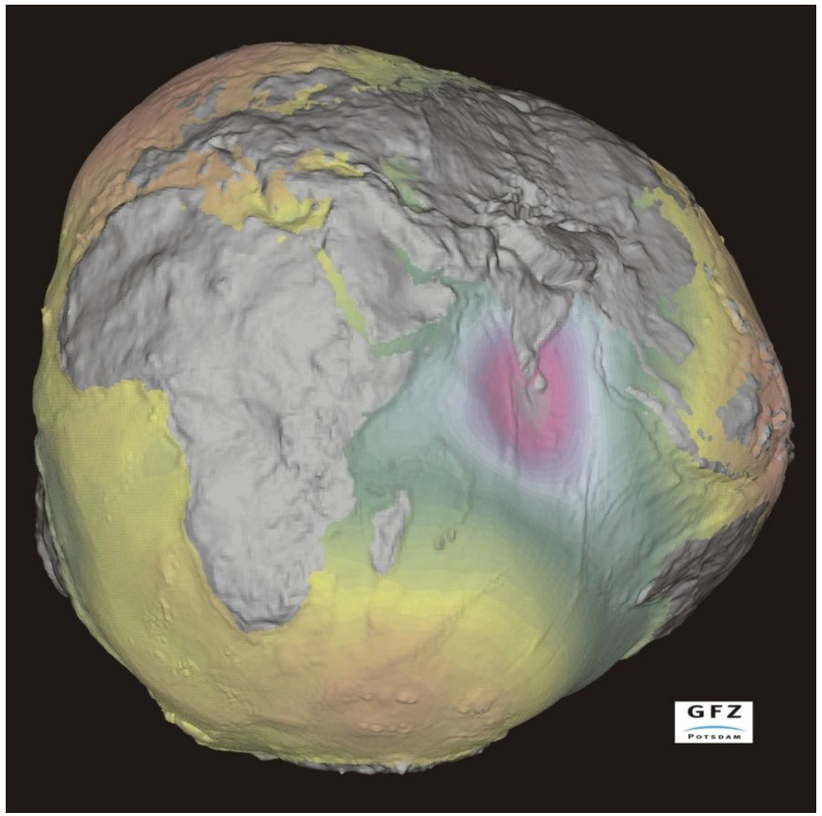


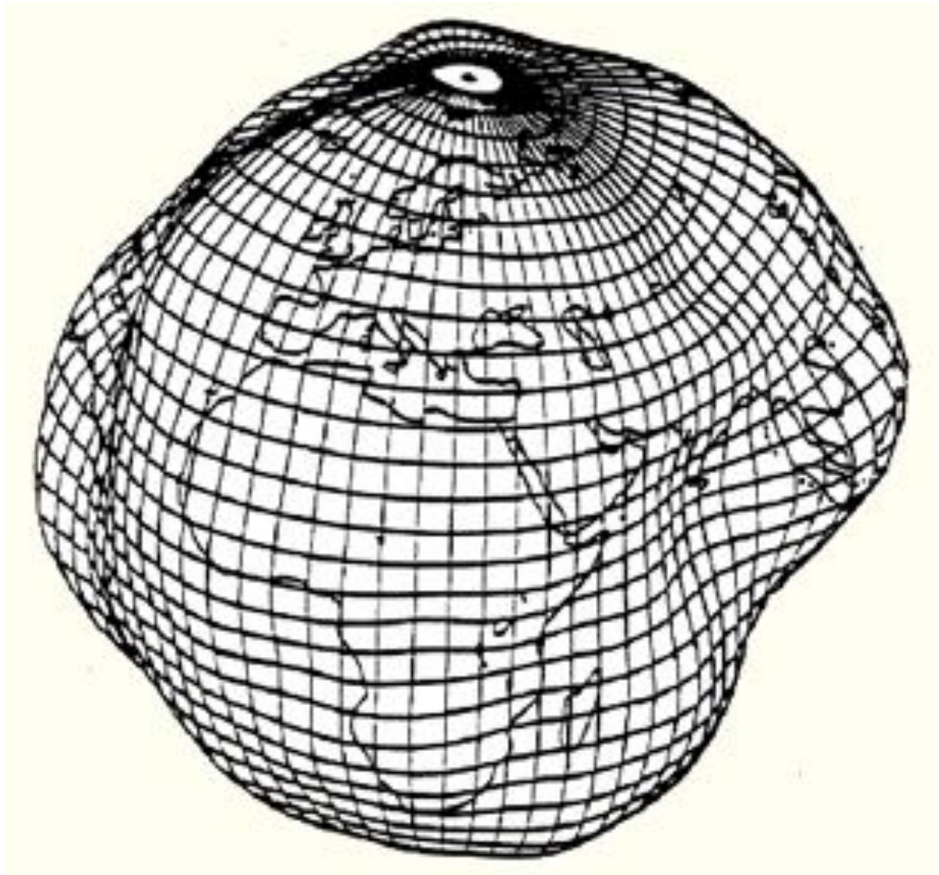
Upper left: Globular. *Upper right:* Orthographic. *Lower left:* Stereographic.
Lower right: Mercator



TRUE SIZE

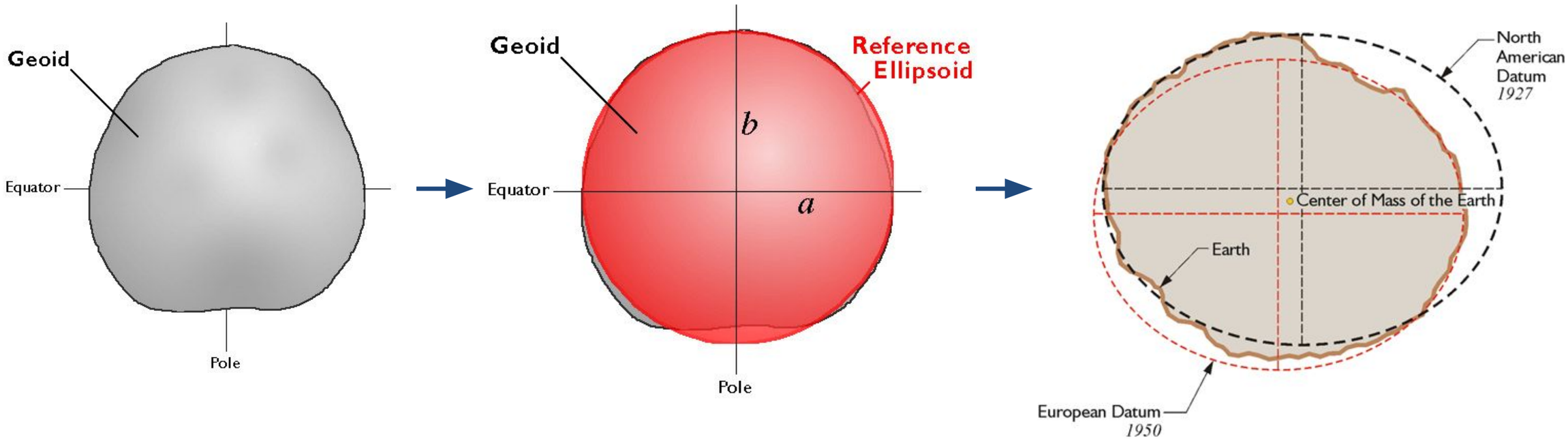
WHAT THE EARTH ACTUALLY LOOKS LIKE





PROJECTIONS

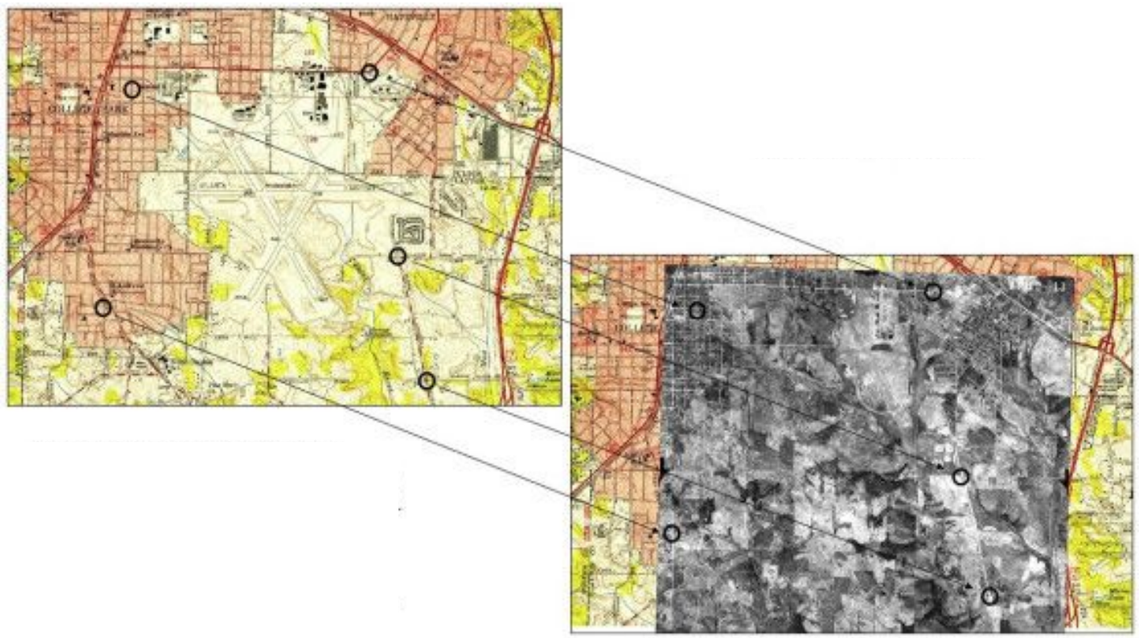
- Geoid -> Ellipsoid -> Datum



PROJECTIONS

HISTORICAL GIS

Georeferencing



Digitizing

https://www.smithsonianmag.com/history/interactive-map-compares-new-york-city-1836-today-180947939/

NEXT WEEK:

- Understand what are the elements of a good map
- Look at a few examples
- Georeference a map