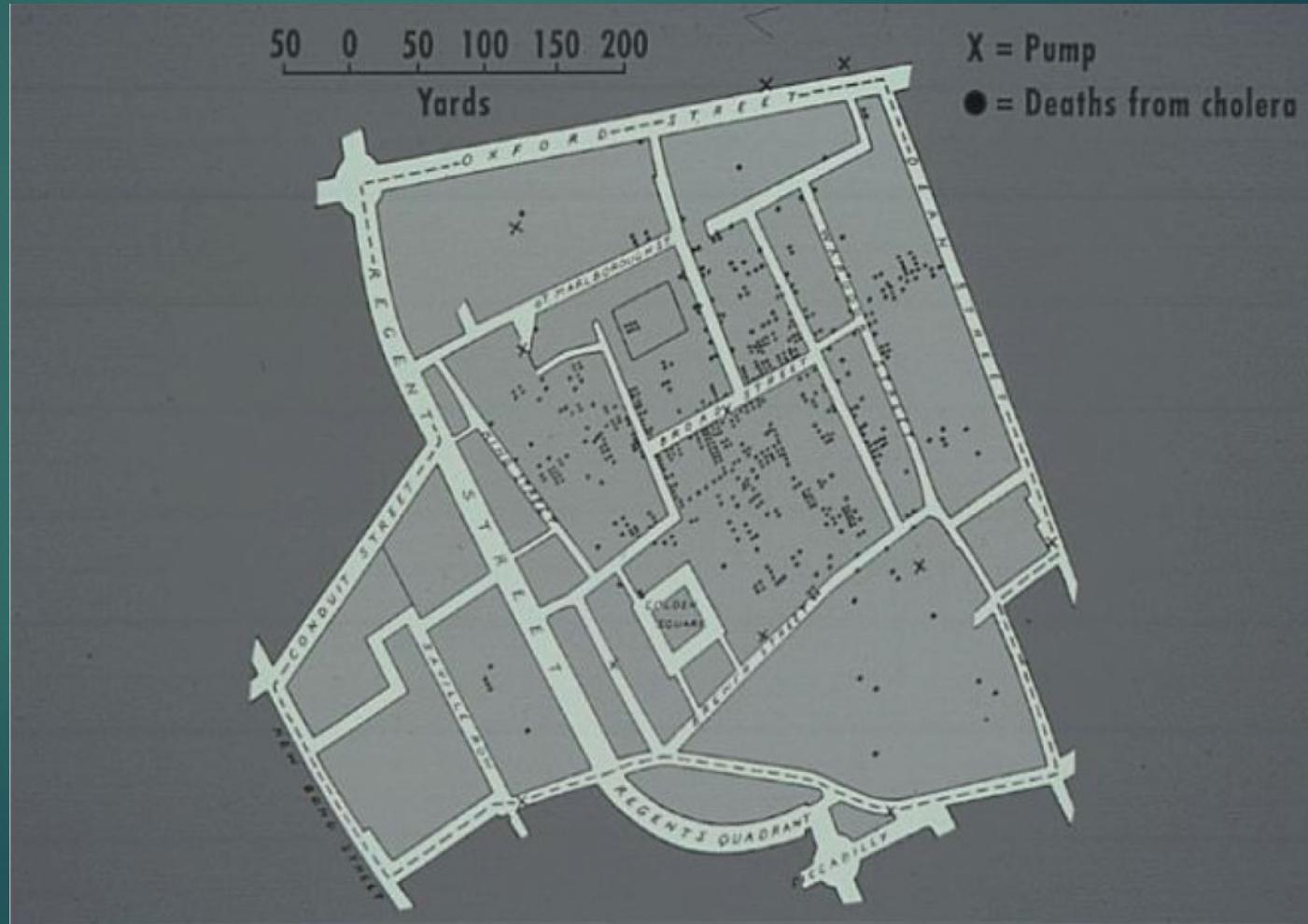
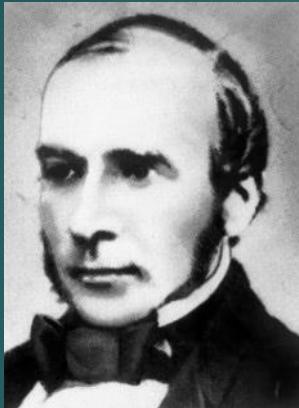


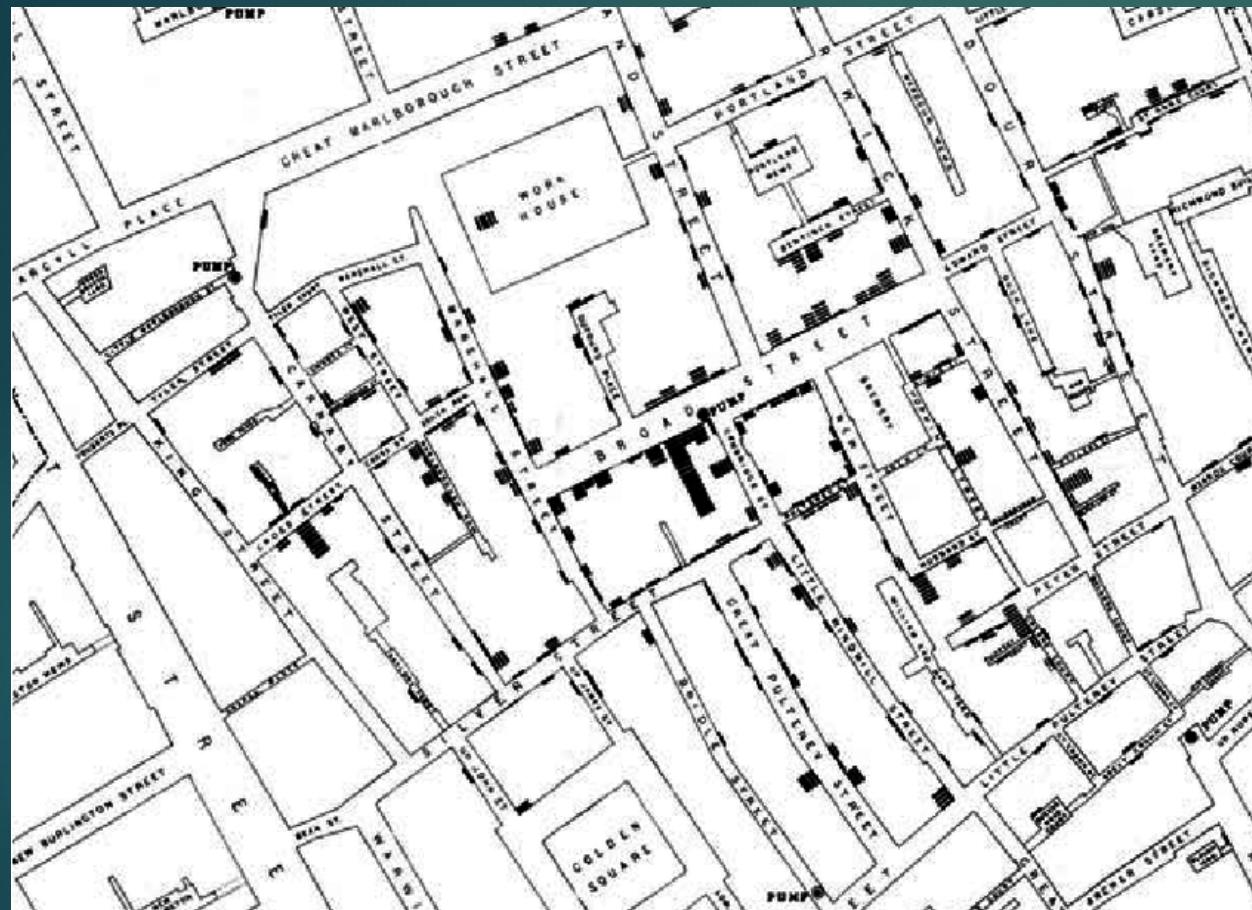


# History and Nature of Geographic Information Science

LECTURE 2: WEEK 1

# John Snow: Using maps to do analysis and solve problems







A modern replica of the pump that led Snow to the inference that drinking water transmitted cholera, located in what is now Broadwick Street in Soho, London (Courtesy Mike Goodchild)

# “Spatial is Special”

- ▶ Entities and events are likely to occur **somewhere**.
- ▶ Working with geographic information is more complicated than other types of information i.e. adding two areas is more complicated than adding two numbers
- ▶ Geographic Information Systems were created at a time when other computer assisted ways of organizing and analyzing information were coming about
- ▶ GIS helps people perform complicated analysis. Finally, it wouldn't be a geography class if we didn't talk about Tobler's First Law of Geography
  - ▶ "Everything is related to everything else, but near things are more related than distant things."

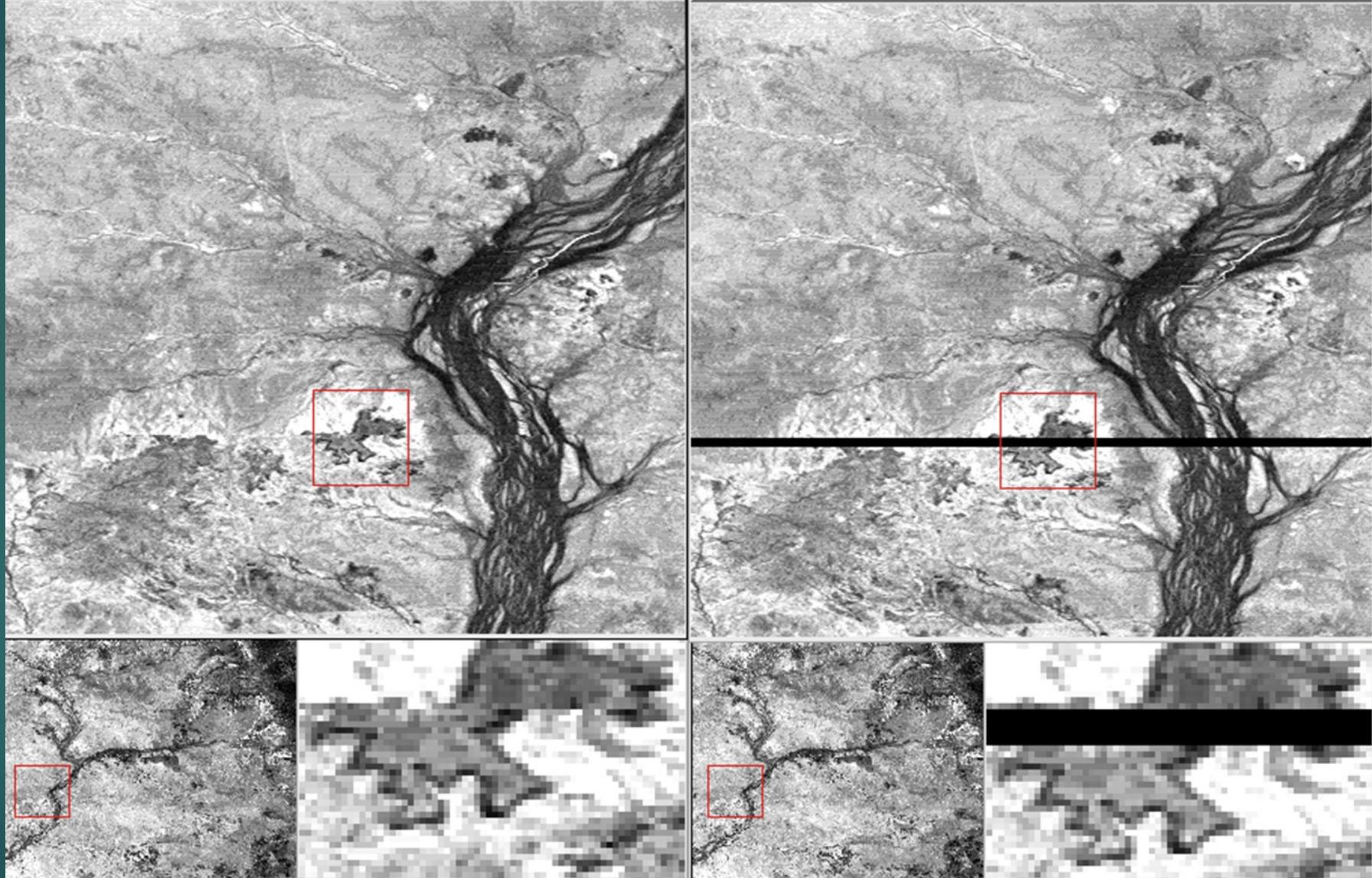
# One history of GIS

- ▶ 1963 – Canada Geographic Information System developed by Roger Tomlinson (often called Father of GIS)
- ▶ 1966 – Harvard Lab for Computer Graphics and Spatial Analysis under direction of Howard Fisher created SYMAP.
- ▶ 1969 – ESRI Inc. is formed by Jack Dangermond as a consulting firm which performed GIS analysis for clients
- ▶ 1972 – Landsat 1 is launched
- ▶ 1981 – ArcINFO is launched by ESRI Inc.
- ▶ 1985 – GPS (Global Positioning Systems) become prime source of data

<https://yoonnachoi.wordpress.com/2008/11/12/making-maps-with-a-typewriter/>

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<https://landsat.usgs.gov/landsat-1-5-mss-collection-1>

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# One history of GIS (con't)

- ▶ 1988 – US Census Bureau distributes TIGER data
- ▶ 1996 – MapQuest is launched
- ▶ 2000 – GPS becomes fully available for civilian use
- ▶ 2004 – OpenStreetMap is created
- ▶ 2005 – GoogleEarth is created
- ▶ 2007 – First iPhone launched which was fully GPS enabled
- ▶ What else has happened in the past 10 years in the geographic information technology realm?



# Open Data / Open Source

- ▶ Open data is data which is open to public use
  - ▶ Who distributes open data?
  - ▶ Whose data isn't open?
- ▶ Open source refers to technology where the source (code) is open to be used to create new technology or improve the current technology

# OpenStreetMap Demo

- ▶ <https://www.openstreetmap.org/>

# So we talked about all of these important figures in the history of GIS

- ▶ Waldo Tobler
- ▶ Roger Tomlinson
- ▶ John Snow
- ▶ Michael Goodchild

# The History of Women in Mapping

- ▶ “Upon reading a book on the history of cartography in the 1960s, one would think that no women were involved in cartography or the map trades. No women’s names were listed in the indices, even if occasionally a woman was mentioned in passing within the text.”

- Judith Tyner (2016)



# The Nature of Geographic Information

Ultimately the nature of geographic information is about taking the world and organizing it so we can analyze it with a computer



WE CAN DO THIS IN MANY WAYS...

# Points, Lines, and Polygons!

## POINTS



*Dot of ink*

## INES



*Dragged flow of ink*

## AREAS

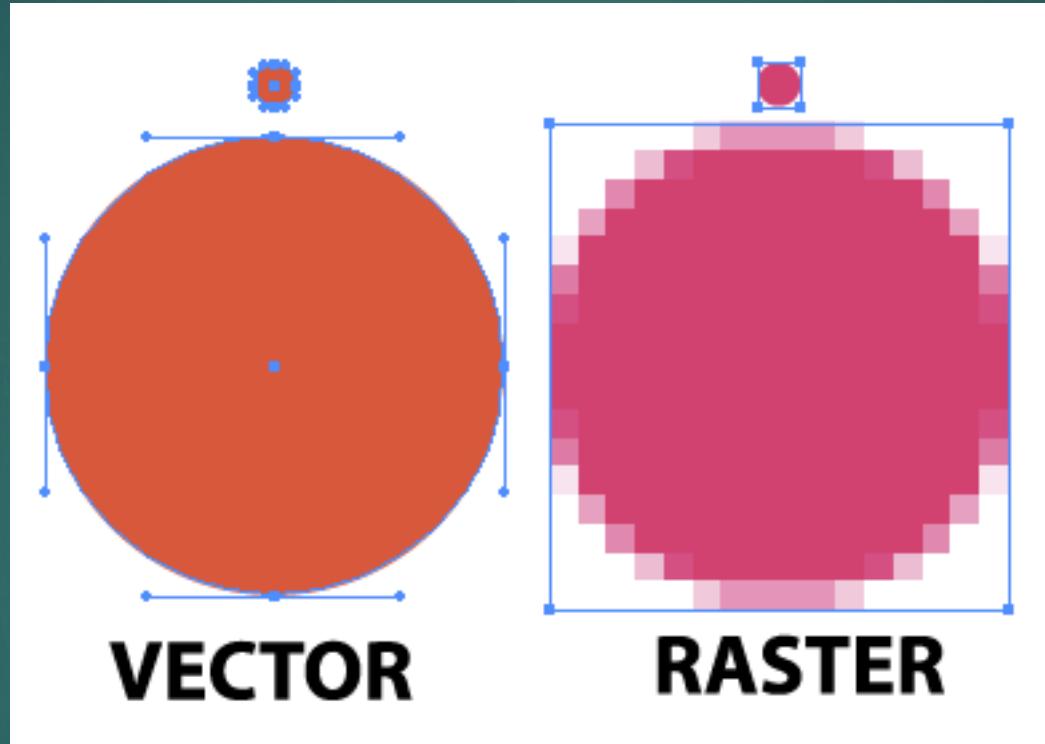


*Dragged and filled flow of ink*

# Vector vs. Raster

## MATHEMATICAL EQUATIONS

- ▶ Mathematical equations translated into points that are connected by either lines or curves
- ▶ Volume of data depends on number of vertices
- ▶ Often used for human and environmental data
- ▶ Resolution is variable



## PIXELS

- ▶ Loses image quality as you zoom in
- ▶ Volume of data depends on cell size
- ▶ Often used for remote sensing and imagery
- ▶ Fixed resolution

<https://www.freedomofcreation.co.uk/2017/09/20/vector-vs-raster-i-use/>

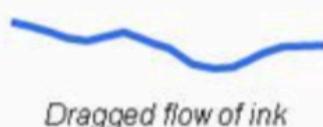
## The “Paper Map World” (analog)

### POINTS



*Dot of ink*

### LINES



*Dragged flow of ink*

### AREAS



*Dragged and filled flow of ink*

## The “GIS Map World” (digital)

X, Y coordinates



(Vector)

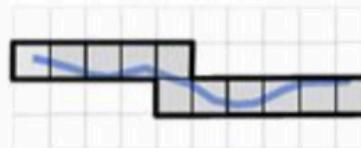


(Vector)

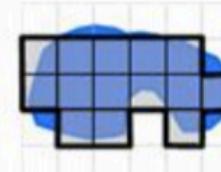


Cell Col, Row

(Raster)



(Raster)



**POINTS** are stored as individual X, Y coordinates (Vector) or as individual Column, Row cell entries in a grid (Raster)

**LINES** are stored as a set of mathematically connected X, Y coordinates (Vector) or as a set of connected grid cells (Raster)

**AREAS** are stored as a set of mathematically connected X, Y coordinates defining the boundary (Vector) or as a set of contiguous cells defining the interior (Raster)

# Continuous fields vs. Discrete objects

