

# UC Santa Barbara

## Core Curriculum-Geographic Information Science (1997-2000)

### Title

Unit 020 - Maps as Representations of the World

### Permalink

<https://escholarship.org/uc/item/65s4m30d>

### Authors

020, CC in GIScience  
Olson, Judy M.

### Publication Date

2000

Peer reviewed

# Unit 020 - Maps as Representations of the World

by Judy M. Olson  
Department of Geography, Michigan State University

This unit is part of the *NCGIA Core Curriculum in Geographic Information Science*. These materials may be used for study, research, and education, but please credit the author, Judy M. Olson, and the project, *NCGIA Core Curriculum in GIScience*. All commercial rights reserved. Copyright 1998 by Judy M. Olson.

---

## Advanced Organizer

### Unit Topics

- This unit considers maps as representations and contrasts maps with other representations of the world. It also contrasts the representational view with other views of maps.

### [Table of Contents](#)

### [Metadata and Revision History](#)

---

# Unit 020 - Maps as Representations of the World

## 1. Introduction

- The representational view of maps: conceptualizes maps as marks on paper that stand for definable things on the earth's surface.
- Definition of (geographic) map almost always includes the term representation
  - **map...1 a:** a representation usu. on a flat surface of the whole or a part of an area
  - **b:** a representation of the celestial sphere or a part of it
  - **2:** something that represents with a clarity suggestive of a map... (Webster's)
- The term "map," however, in non-geography uses does not necessarily refer to a representation but to how things are arranged or how they relate to one another
  - ... **3:** the arrangement of genes on a chromosome -- called also *genetic map* [italics in source]
  - **4:** FUNCTION 5a [which reads:] a mathematical correspondence that assigns exactly one element of one set to each element of the same or another set (Webster's definition of map, continued)
- For whatever reason, at geographic scales, "map" means a *representation* of the earth and not earth's patterns themselves. And it usually refers to a graphic representation, although the term "map" can be used more broadly to refer to any representation of geographic space.
- To reach a graphic representation, there must be a mental conception (or representation) of the world. It determines how we map, and maps in turn influence the mental representation.

## 2. Other representations of the world

- Maps are not the only representation of the world; others include:
  - air photos
  - satellite imagery
  - snapshots
    - those from space most obviously represent the earth but
    - those of smaller areas, even everyday snapshots, represent some part of the earth as well
  - drawings and artwork
  - words
    - verbal description is an integral part of how we learn about the world and think about it (see unit 006 "Human Cognition of the Spatial World")
  - tables

- digital coordinate data with attributes
  - (see unit 008, "Representing the Earth Digitally")
- Maps are the representations most readily and universally identified with geography

### **3. The uniqueness of the map among representations of the world**

- content as well as area shown is selective
  - (unlike air photos, satellite imagery, snapshots)
- maker has control over emphasis
  - (unlike air photos, satellite imagery, snapshots)
- emphasis is on spatial relations
  - (unlike drawings and artwork, in which spatial relations support some other message)
- it is an analogue of what is represented
  - (unlike words, tables, and digital data)

### **4. Other views of maps**

- as communication devices
  - emphasis is on transmitting knowledge from source to recipient
- as artifacts reflecting history, culture, and technology
  - a T in O map reflects beliefs of the Middle Ages and the technology of the time for making graphic representations
- as political documents
  - the choices of what maps are made and what is included in them are political decisions as much as scientific ones (Harley, 1989)
- creators of features on the earth
  - the "Green Line" in Beirut was literally a green line on a map that noted where the division would be, not a representation of something already there
- as tools
  - emphasis on what can be done with them
- NOTE: None of these views is at odds with maps as representation

### **5. The representational view as the "scientific" view**

- "objective" model of the world in the sense that
  - rules are applied
  - the map is subject to verification and is replicable

caution: a modifier before "map" can negate that scientific view

- mental maps are "representations"
  - can be subjected to scientific inquiry but are not scientific documents as such
- sketch maps
  - the modifier suggests the departure from the scientific

## 6. The representational view as the "data storage" view

- Representation suggests correspondence between marks and referents
- Map is "successful" if mark/referent relationship is logical
- Communication, use, functionality, etc. need not come in under a strict representational view
- Such a strict view is seldom taken; efficacy of maps from user point of view esp. important
  - (see unit 006 on "Human Cognition of the Spatial World")

## 7. Representation as the unifying element in Geographic Information Science

- Historically, the areas of cartography, GIS, and remote sensing had no unifying name
  - Geog Info Science is a relatively new name for this area
- They have long been lumped together, however, often referred to as "techniques" (an unfortunate term for a collection of such rich areas)
- They differ from other subfields in geography, however, because they deal with *representation*
- Geog Info Science does not deal with representation in narrow sense of that term, but representation and its implications, which are many, diverse, and rich

## 8. Types of maps

- Type of map affects how and what we represent
- The most general categories are
  - general reference
    - shows many different things; can see where specific objects are relative to one another
    - user generally is looking to see where a specific feature is located relative to others
  - thematic
    - shows a distribution
    - user generally wants to see pattern
- There is actually a continuum of maps from general reference to thematic

many maps fit somewhere in between the extremes

- Map type is not just characteristics of the map but can be determined by use, e.g.,
  - *can* look at *distribution* of major roads on a general-reference atlas map
  - *can* find specific *location* of observation units (say, counties) on a thematic map
- Can classify maps in other ways: by content (climate, socio-economic...), form (dot, choropleth, animated...), display technology (electronic, paper,...), production technology (manual, automated,...), scale (large, medium, small), resolution (county, state,...), and on and on.
- The reference/thematic division is the most general and perhaps the most related to representation issues

## 9. Elements of Representation

- Some major determinants of how a feature/distribution/space will be represented
  - Spatial form of the object
    - point
    - line
    - area
    - surface
    - volume
  - Spatial form of the distribution
    - clustered
    - spread out with some clustering
    - smooth and continuous
    - non-smooth
  - What kind of change is involved
    - none (time slice, single viewpoint, etc.)
    - time
    - viewpoint
    - cartographic form
    - geographic process
  - Conceptual measurement involved
    - qualitative
    - quantitative
    - ordered
    - ordinal
    - interval
    - ratio
  - Relationship between variables if more than one is shown on thematic map
    - parts and wholes (e.g., total population and percentages in different age groups)
      - (special case: 3-component composition, e.g., urban, rural, empty land percentages)

- counts and characteristics of what is counted (e.g., total population and average income)
    - functional (e.g., education and income)
    - composited variables (e.g., water contamination susceptibility)
- Graphic marks available
  - point
  - line
  - area
- Attributes of these marks: visual variables
  - size
  - shape
  - color value (lightness/darkness)
  - color hue (green, red, blue,...)
  - color saturation (dull blue, vivid blue,...)
  - texture
  - orientation
- General idea is to use the graphic marks and visual variables in analogous fashion of some sort
- Generalization is inevitably involved in any representation of the world, maps included
  - (see unit 030 on "Abstraction and Incompleteness")
- Good representation vs. bad representation
  - No "best" way, but better and worse ways
  - Judgement of better and worse takes us beyond representation itself to uses of maps and map effectiveness

## 10. Relevance to GIS

- GIS output is most often a map
  - people produce more maps than ever now that GISs are available
- Representational issues are very important for that reason
  - need for cartographic principles and understanding is increased by the availability of GIS
  - GIS is helping to broaden the forms of maps we can feasibly produce
- Some map issues are particularly relevant in GIS
  - Boolean overlay maps were far less common before GIS; they are a frequently-produced form now
  - we need to build good representational defaults into GIS programs

- what we do with the results of GIS generally involves representation
  - although visualization has a separate meaning from GIS, GIS has been instrumental in bringing visualization into geographic information science
  - visualization is representation for purposes of discovery
  - the study of maps as tools in scientific study (discovery), as opposed to their presentational use, has been influenced by GIS

## 11. Exam and Discussion Questions

1. Discuss the representational view of maps and compare to other potential viewpoints. Are those other viewpoints generally complementary or conflicting? Can you think of any examples that might differ from what is "generally" the case?
2. Explain why the representational view of maps might be called the "scientific" view. The "data storage" view.
3. What are some of the determinants of how phenomena are represented on maps?
4. What does "visual variable" mean? What are the visual variables?

## 12. References

- Dent, Borden D. 1996. *Cartography: Thematic Map Design*, 4th ed. Wm. C. Brown Publishers, Dubuque, Iowa. A thorough look at thematic mapping; widely-used text in college-level thematic cartography courses.
- Harley, J. B., 1989. "Deconstructing the map." *Cartographica* 26(2): 1-20. A post-modernist view of maps.
- Robinson, Arthur H., Joel L. Morrison, Phillip C. Muehrcke, A Jon Kimerling, Stephen C. Guptill. 1995. *Elements of Cartography*, 6th ed. John Wiley & Sons, Inc., New York. A general cartography textbook widely used in college-level courses.
- Woodward, David. 1992. "Representations of the World," chapter 4, pp. 50-73, in Ronald F. Abler, Melvin G. Marcus, and Judy M. Olson, eds., *Geography's Inner Worlds: Pervasive Themes in Contemporary American Geography*, Rutgers University Press, New Brunswick, New Jersey. Representation as a theme in geography that cuts across virtually all subdisciplines.

---

## Citation



To reference this material use the appropriate variation of the following information:

Judy M. Olson (1998). Maps as Representations of the World, *NCGIA Core Curriculum in GIS*, National Center for Geographic Information and Analysis, University of California, Santa Barbara, Unit 020, <http://www.ncgia.ucsb.edu/giscc/units/u020/u020.html>, posted December 23, 1998..

---

First posted: December 23, 1998. [Last revised](#): December 23, 1998.

---

# Unit 020 - Maps as Representations of the World

## Table of Contents

### Advanced Organizer

Topics Covered in this Unit  
Metadata and Revision History

1. Introduction
  2. Other representations of the world
  3. The uniqueness of the map among representations of the world
  4. Other views of maps
  5. The representational view as the "scientific" view
  6. The representational view as the "data storage" view
  7. Representation as the unifying element in Geographic Information Science
  8. Types of maps
  9. Elements of representation
  10. Relevance of GIS
  11. Exam and discussion questions
  12. References
- Citation
-

# Unit 020 - Maps as Representations of the World

## Metadata and Revision History

### Page contents

1. [About the main contributor](#)
  2. [Details about the file](#)
  3. [Key words](#)
  4. [Index words](#)
  5. [Prerequisite units](#)
  6. [Subsequent units](#)
  7. [Revision history](#)
- 

### 1. About the main contributor

- author: Judy M. Olson, Department of Geography, Michigan State University,

### 2. Details about the file

- unit title: Maps as Representations of the World
- unit key number: Unit 020

### 3. Key words

### 4. Index words

### 5. Prerequisite units

### 6. Subsequent units

## 7. Revision history

- First draft completed: November 15, 1998
- Posted to website: December 23, 1998

- 
- [Back to the Unit](#)