

# EnvSci 360 – Computer and Analytical Cartography

## Lecture 11 *Bias in Mapping*

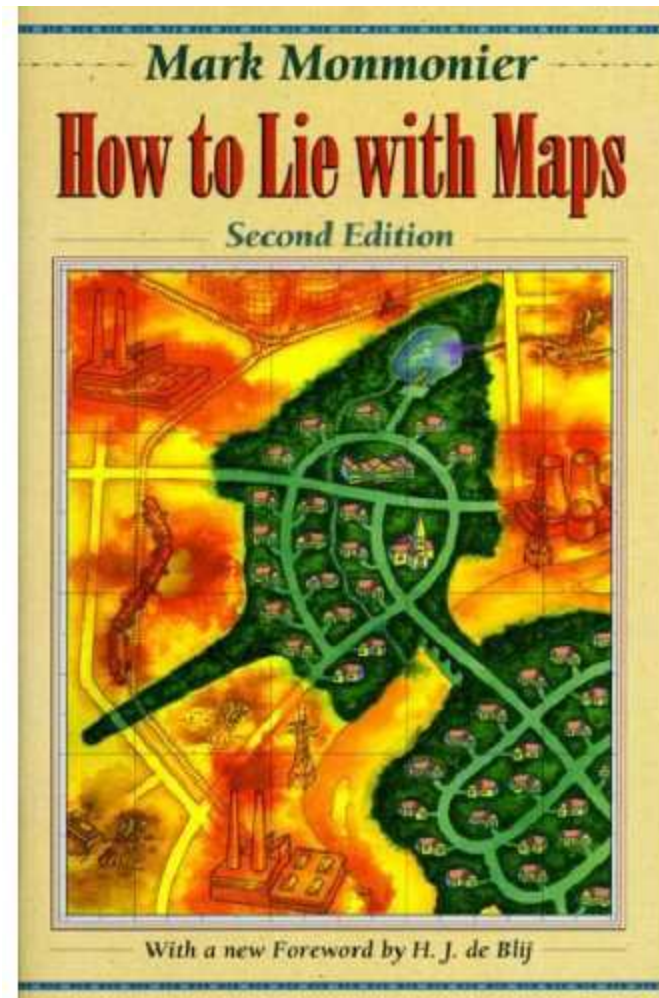


# *Introduction*

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✦ ***"Not only is it easy to lie with maps, it's essential."***

- First sentence in How to Lie with Maps by Mark Monmonier



# ***Why Do Maps Lie?***

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- ✦ Maps have a dual purpose: not only to inform their audience, but also to impress them — to persuade, to make a point, to sell a product.
- ✦ Maps reflect the interest of their cartographers – and people can easily be fooled



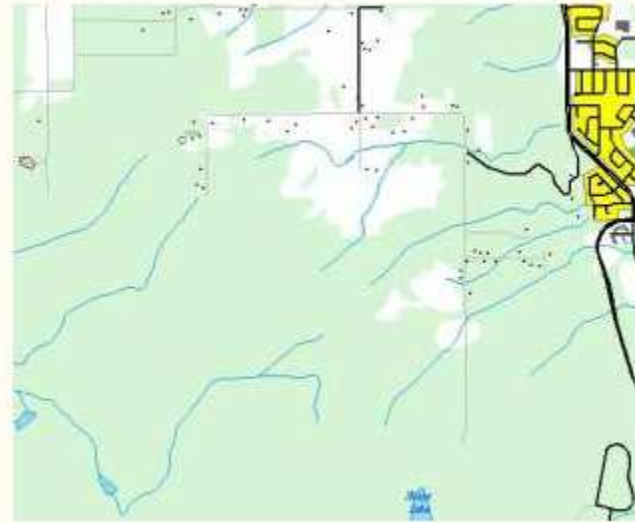
# ***Why Must Maps Lie?***

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- ✦ They must be selective in the information they present
  - “selective truth” (aka omission)



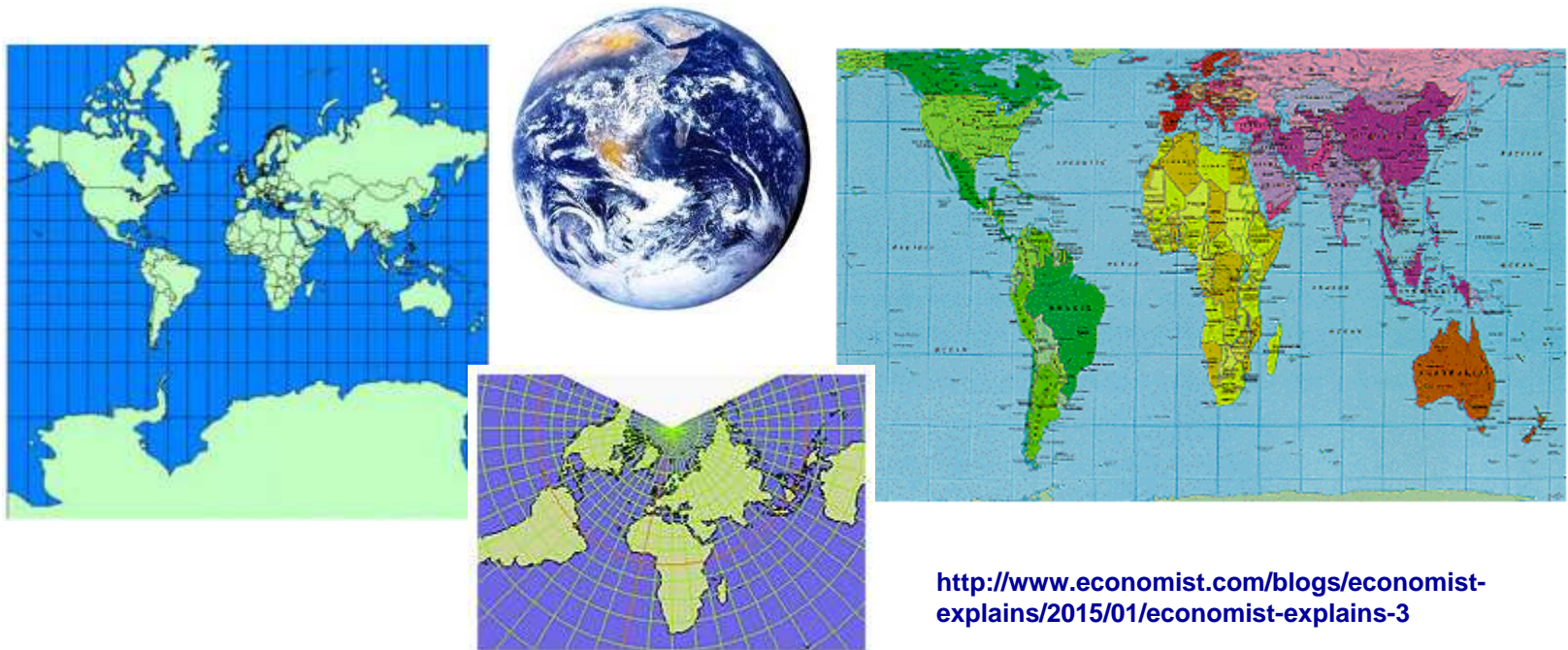
<http://www.gis.unbc.ca>



# *Why Must Maps Lie?*

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- ✦ They require projections, which distort angles, area or shapes

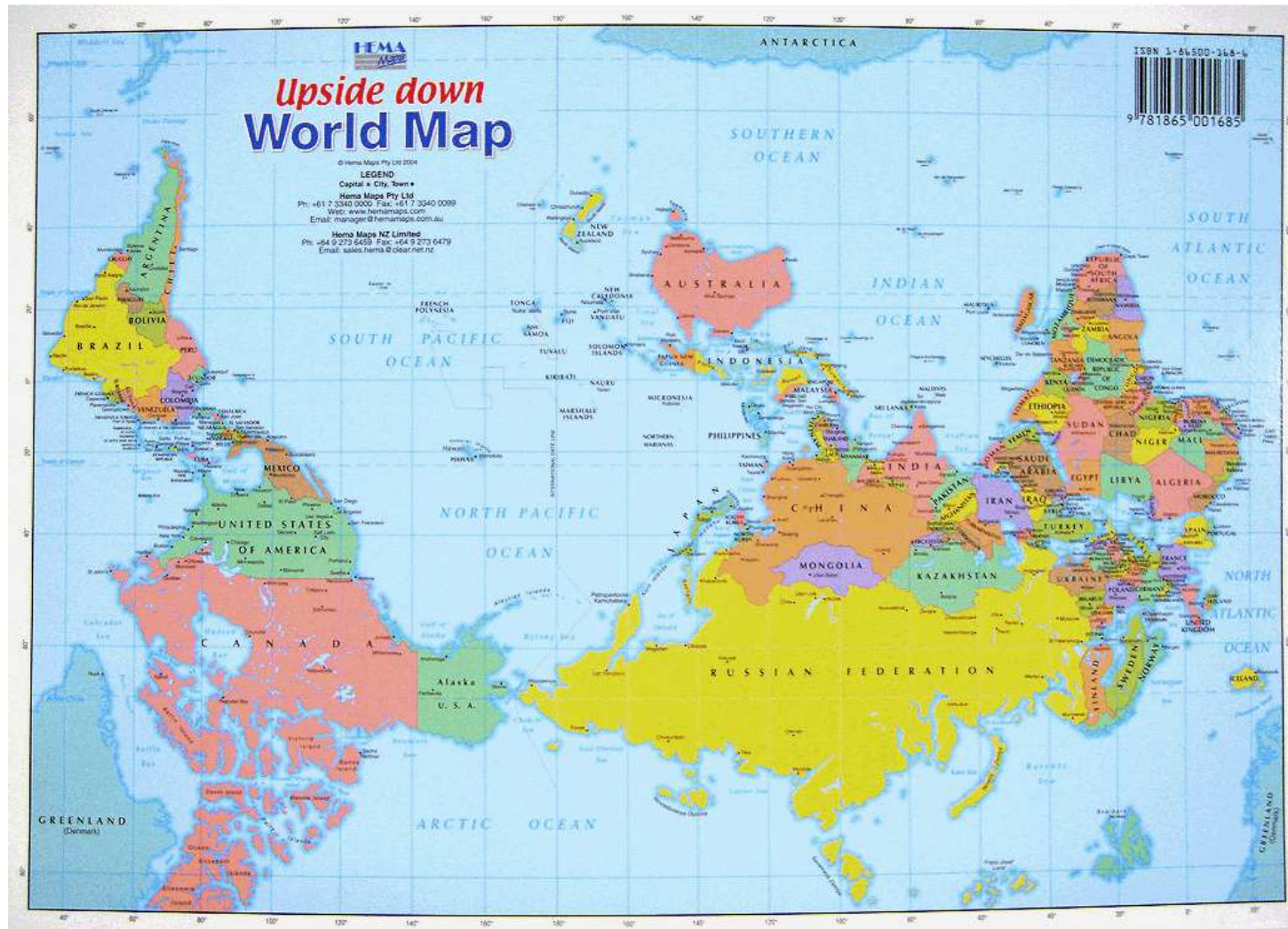


<http://www.economist.com/blogs/economist-explains/2015/01/economist-explains-3>

<http://www.learnnc.org/lp/editions/mapping/6434>



# Who Says North is "Up"?







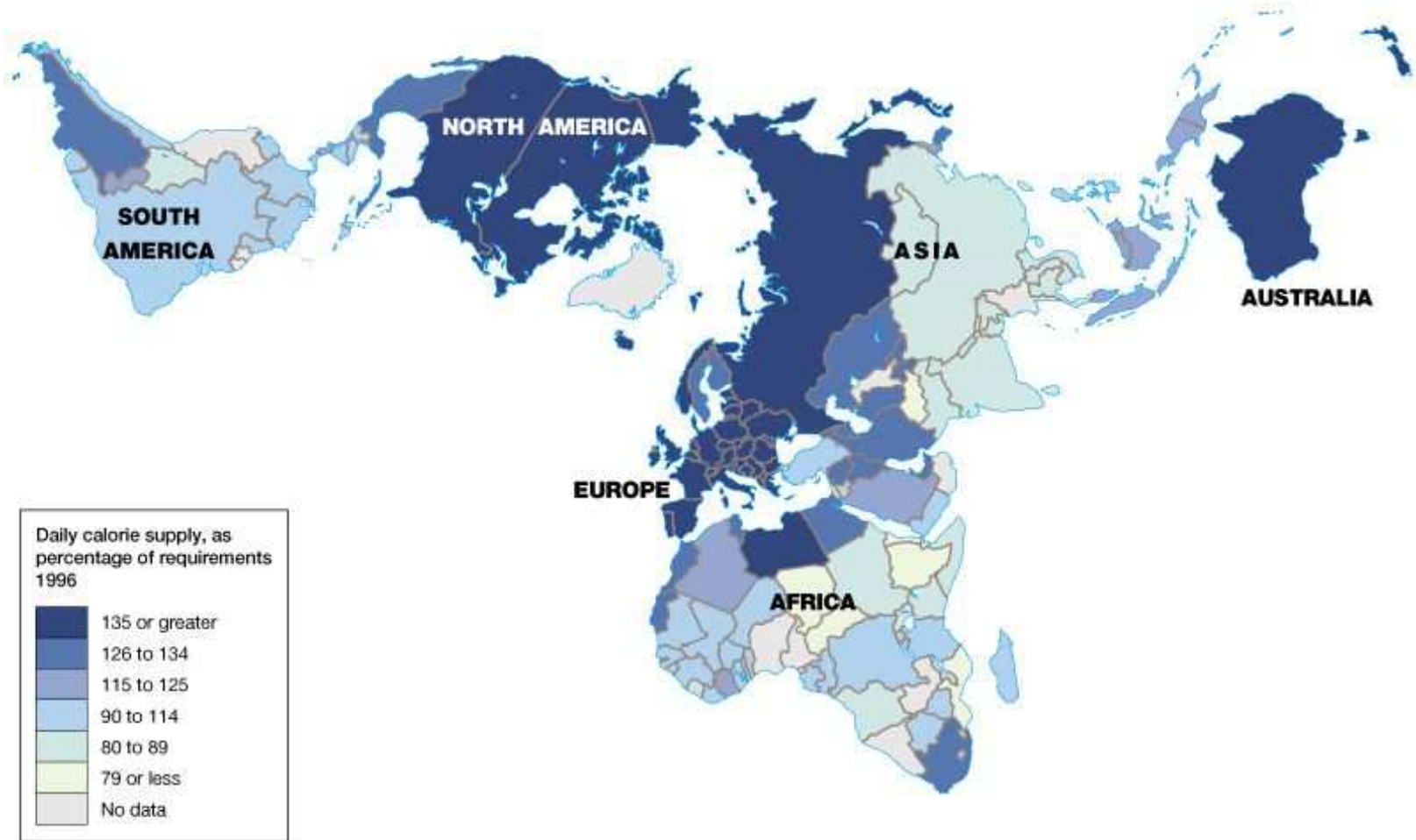
# *Who Says North is "Up"?*

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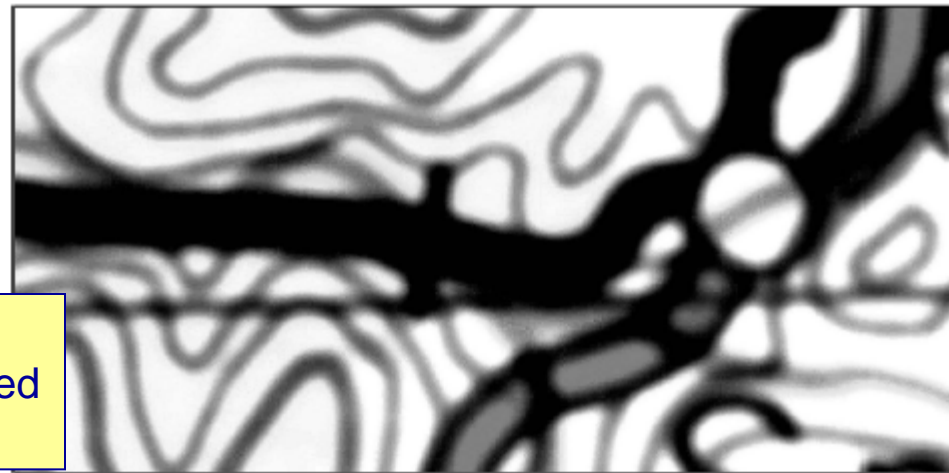
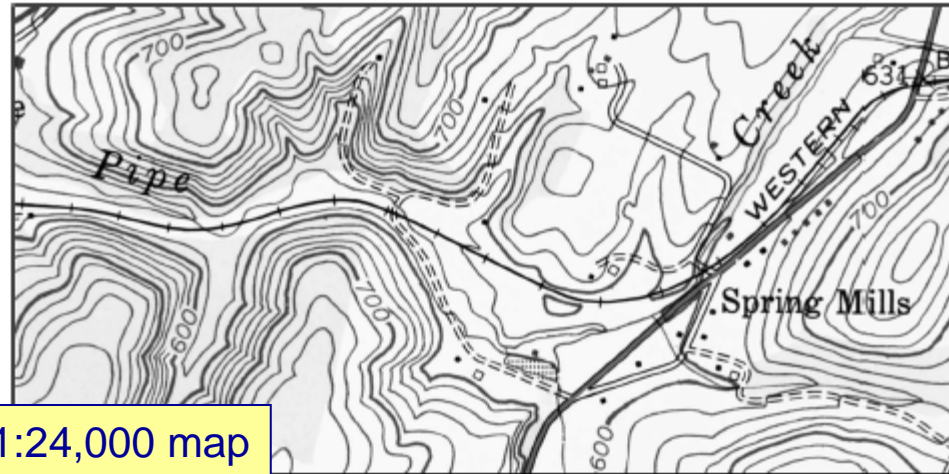


# Who Says North is "Up"?



# Why Must Maps Lie?

- ✦ Maps inherently have a scale
  - Maps at small scale leave out detail included in large-scale maps

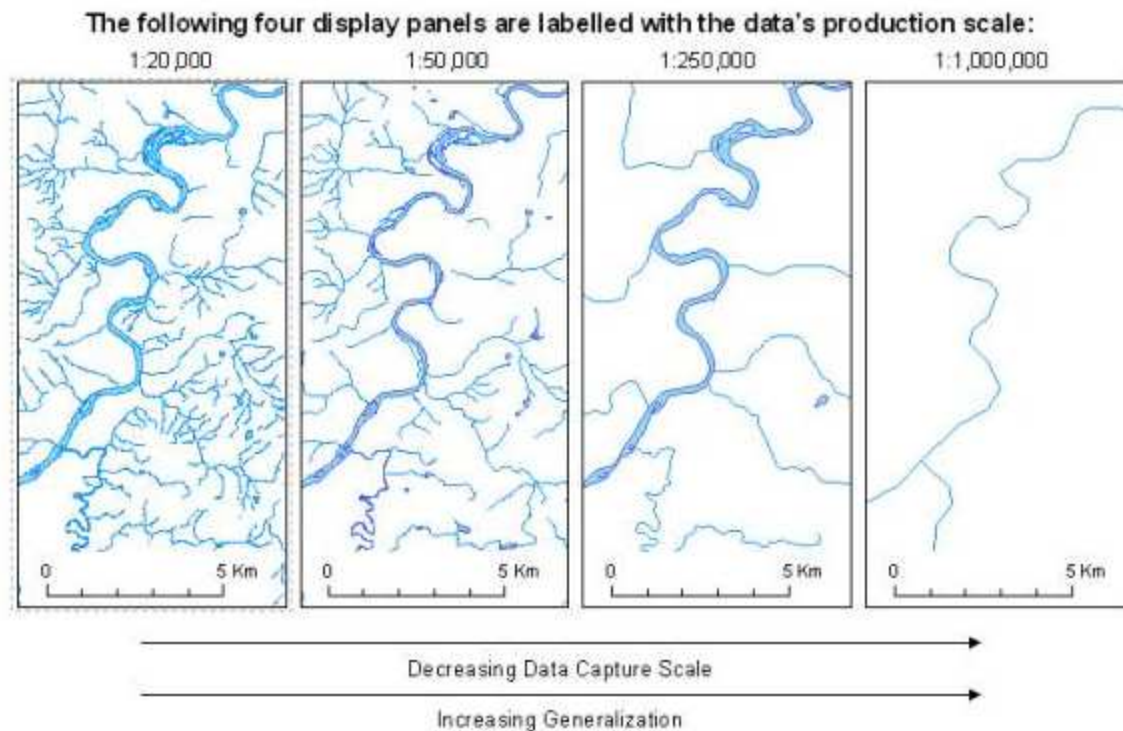


"Lying with Maps", Statistical Science, Aug. 2005



# Why Must Maps Lie?

- ✦ Lines must be displaced, smoothed or simplified and area features simplified for readability's sake.



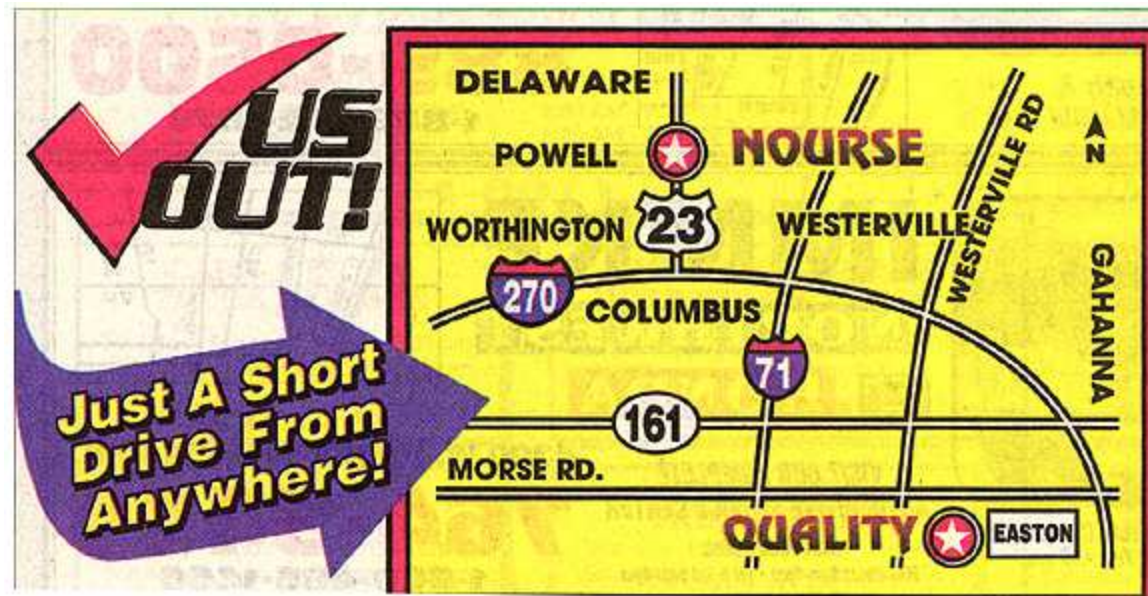
All four panels have the same display scale\*.

\*Actual display scale of the figure above depends on your computer monitor size.

<http://www.gis.unbc.ca>

# How Maps Lie

- ✦ Advertising suggesting that your store is in a convenient location

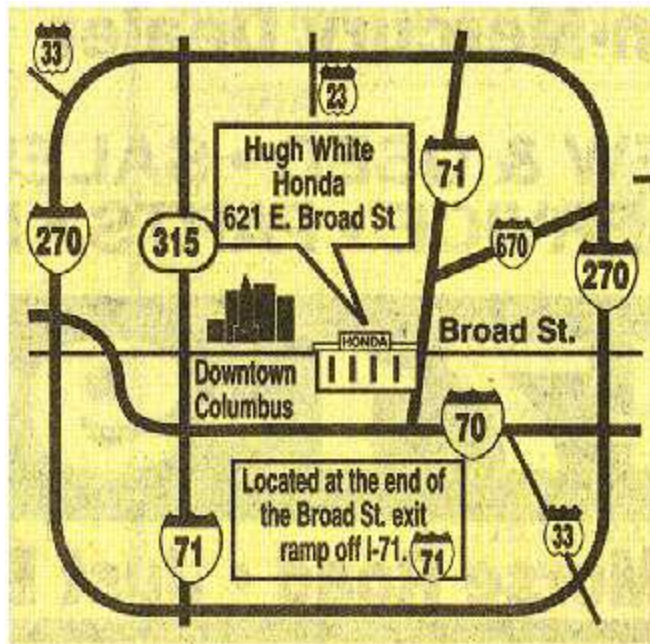


<http://go.owu.edu>



# How Maps Lie

- ✦ Advertising suggesting that your store is in a convenient location



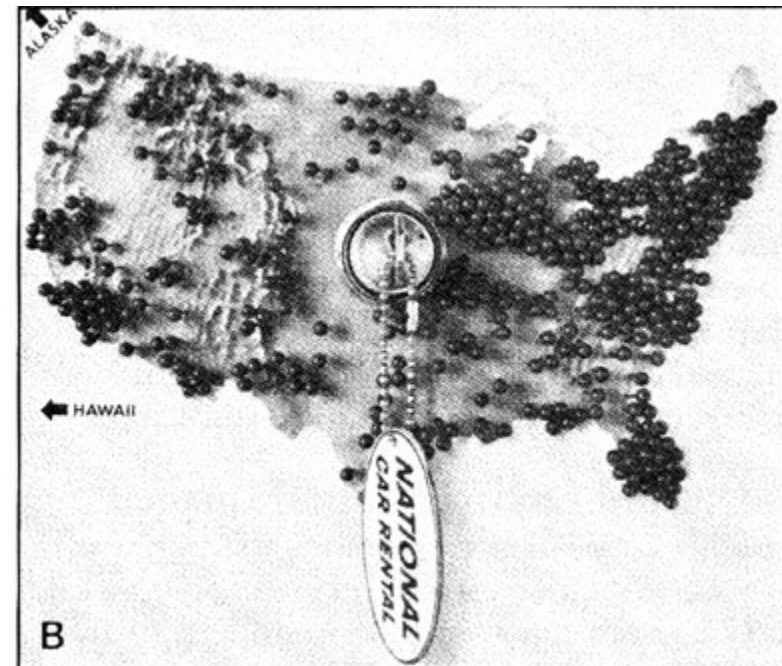
<http://go.owu.edu>

<p>1 <b>WEST BROAD</b> 278-9378 3300 WEST BROAD ST. (1/2 MILE E. OF GREAT NORTHERN MALL)</p>	<p>2 <b>SOUTH HIGH</b> 491-0909 3171 S. HIGH ST. (BETWEEN WILLIAMS RD. &amp; SOUTHGATE SHOPPING CTR.)</p>	<p>3 <b>GRANDVIEW HEIGHTS</b> 487-0900 900 URLIN AVE. (1 STOP LIGHT W. OF GRANDVIEW AVE.)</p>	<p>4 <b>HAMILTON RD.</b> 751-9100 2087 HAMILTON RD. (SOUTH OF I-70)</p>
<p>5 <b>SW COLUMBUS</b> 278-9555 191 WILSON RD. (BROAD &amp; WILSON)</p>	<p>6 <b>EAST COLUMBUS</b> 751-9400 111 SCHOFIELD DR. (BROAD &amp; HAMILTON)</p>	<p>7 <b>EAST MAIN</b> 239-6464 3569 EAST MAIN ST. (1/2 MILE E. OF BARNETT ST.)</p>	<p>Check Out Our Web Site! <a href="http://www.sus.com">http://www.sus.com</a> <i>*Ask Manager For Details</i>                        Franchising Opportunities Available</p>



# How Maps Lie

- ✦ Advertising suggesting that your store is in a convenient location



<http://go.owu.edu>



# How Maps Lie

- ✦ Show that your rail line is more direct than it actually is

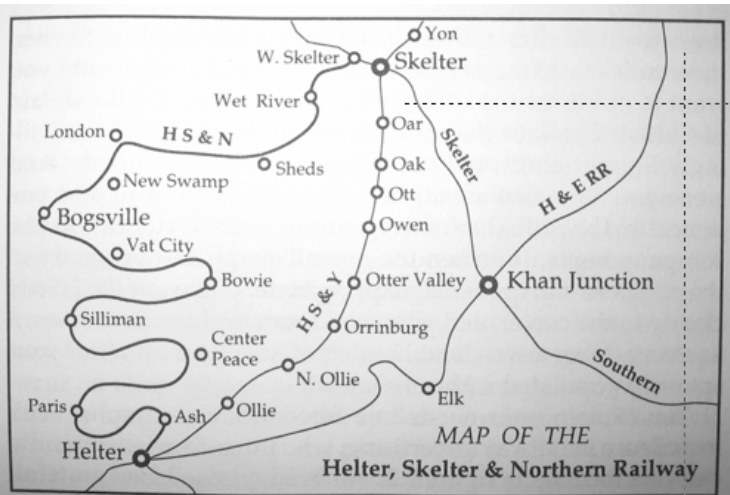


FIGURE 5.1. Engineering department's map of the Helter, Skelter and Northern Railway.

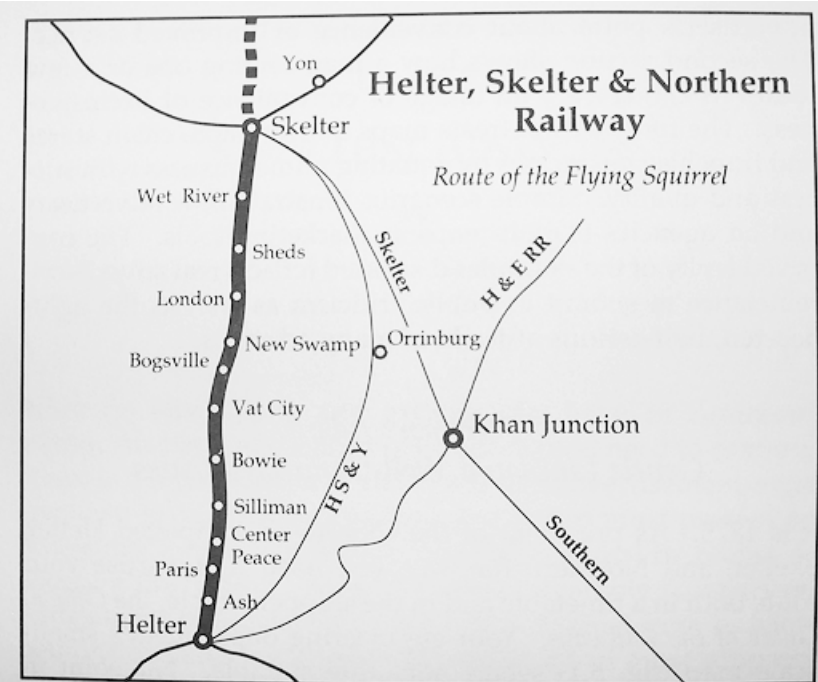
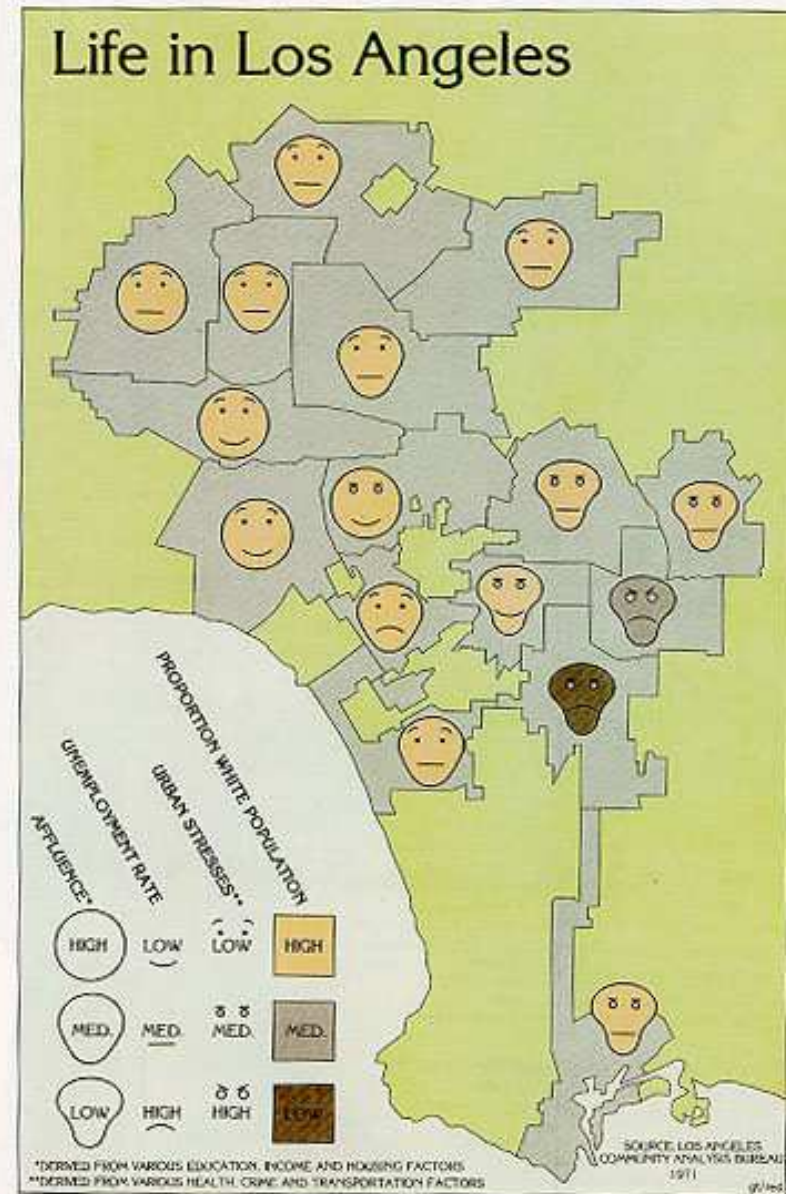


FIGURE 5.2. Advertising and timetable map of the Helter, Skelter and Northern Railway.

## How Maps Influence

✦ Using influential (or racist) symbols



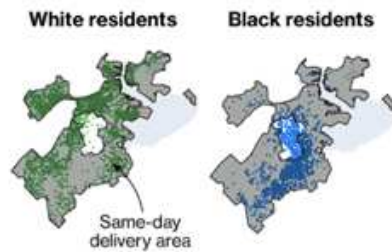


# How Maps Influence

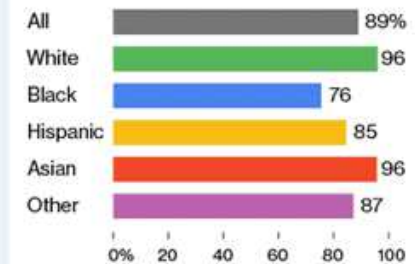
✦ Can maps introduce racial bias?



Three ZIP codes in the center of Boston, including the Roxbury neighborhood, are excluded from same-day coverage.



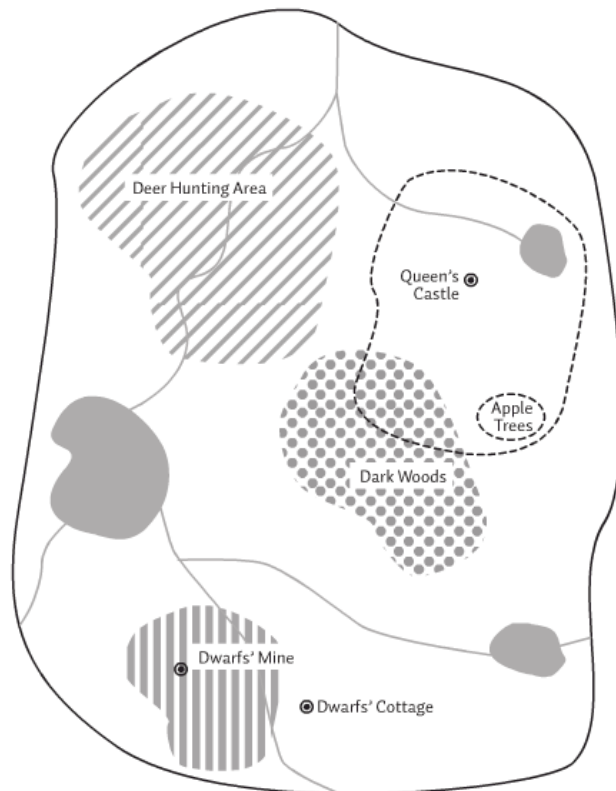
Percentage of residents living in ZIP codes with same-day delivery



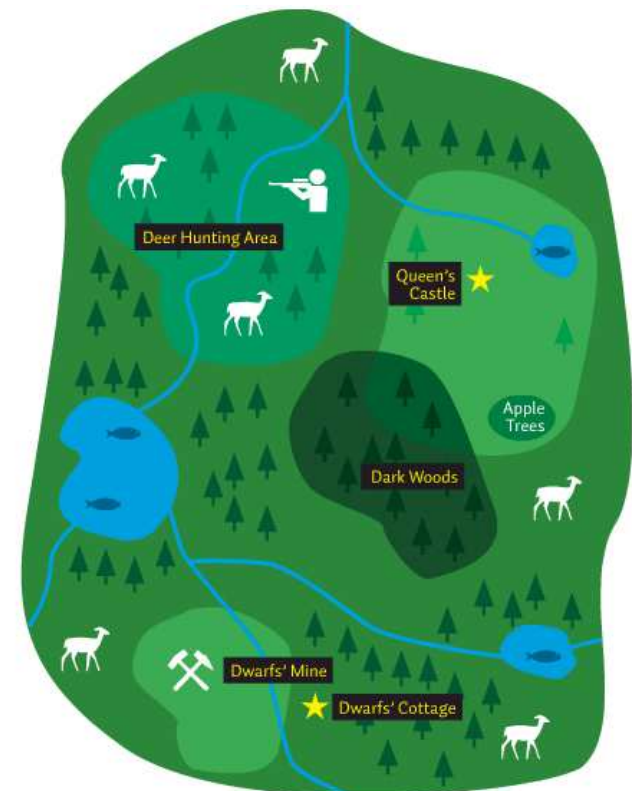
<https://www.gislounge.com/mapping-equality-locating-racial-bias/>

# How Maps Influence

## ✦ Use of color and symbols vs. black and white



Color can attract attention to an otherwise unattractive map and make an area seem more interesting. Using symbols further increases visual interest, and can make people want to go to an area, rather than just show where things are.



"Rhetoric in GraphicDesign", Barbara Emanuel



# ***How Maps Influence***

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## ✦ “Eleven Rules for Polishing the Cartographic Image”

- 1. Be shrewdly selective**
- 2. Frame strategically**
- 3. Accentuate the positive**
- 4. If caught, have a story**
- 5. Minimize the negative**
- 6. Dazzle with detail**
- 7. Persuade with pap**
- 8. Distract with aerial photographs and historical maps**
- 9. Generalize creatively**
- 10. Enchant with elegance**
- 11. When all else fails, try bribery**

Also see

<http://www.citylab.com/design/2015/06/when-maps-lie/396761/>

# How Maps Can Mislead

- ✦ Choropleth maps and the impact of different class breaks

Equal Interval

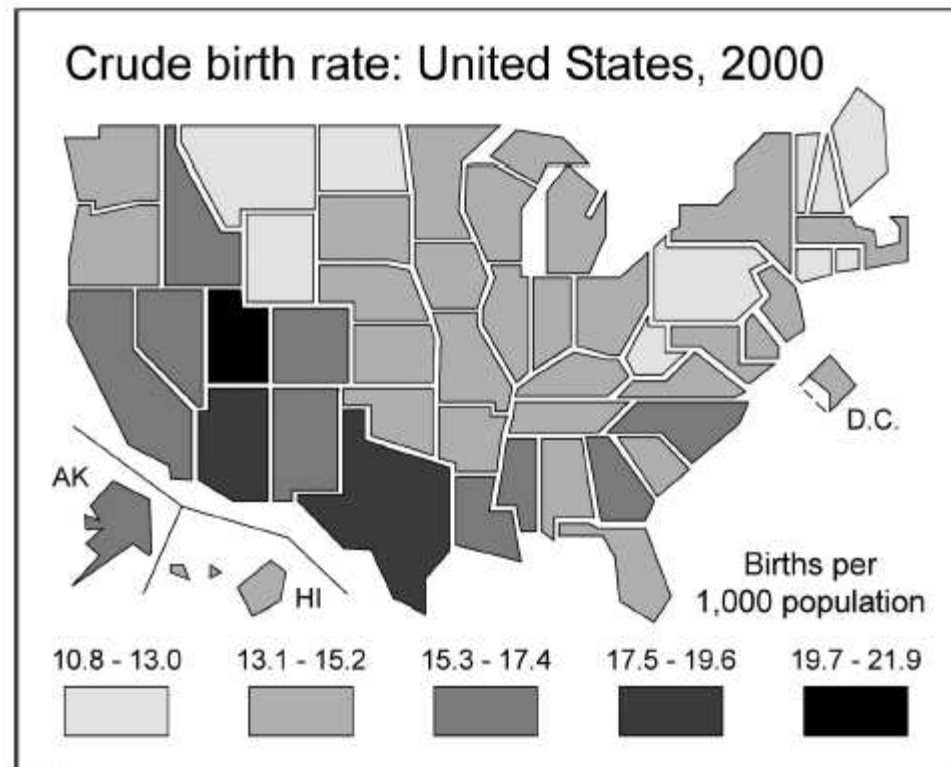


FIG. 2. Crude birth rates, 2000, by state, based on equal-intervals cut-points and plotted on a visibility base map.

"Lying with Maps", Statistical Science, Aug. 2005



# How Maps Can Mislead

- ✦ Choropleth maps and the impact of different class breaks

Quantile

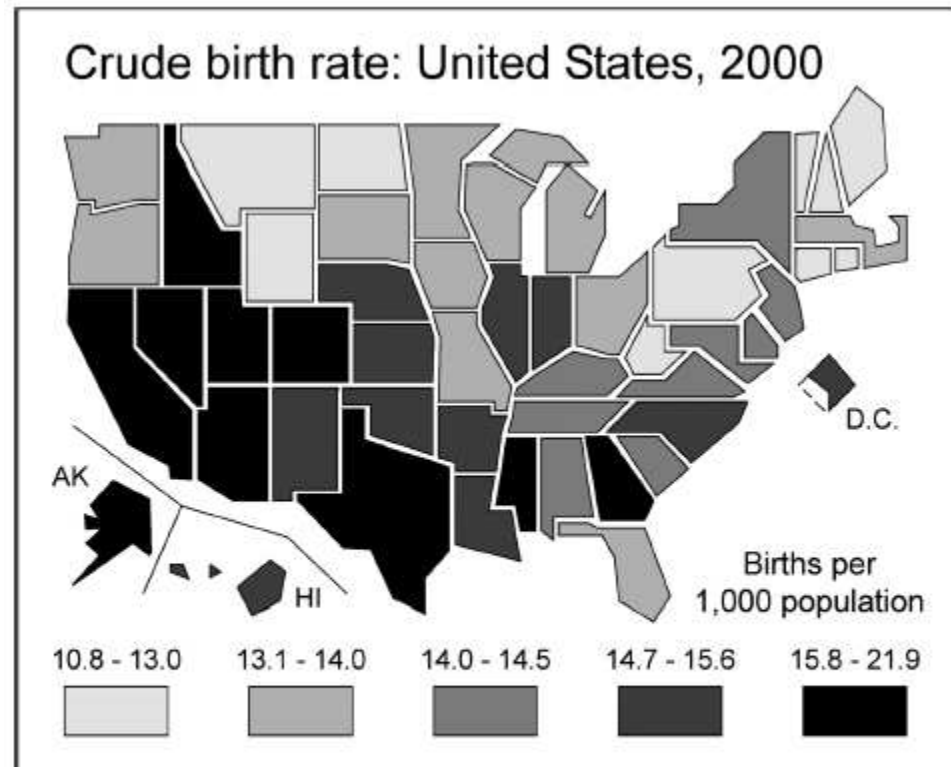


FIG. 3. Crude birth rates, 2000, by state, based on quantile cut-points and plotted on a visibility base map.

# How Maps Can Mislead

- ✦ Choropleth maps and the impact of different class breaks

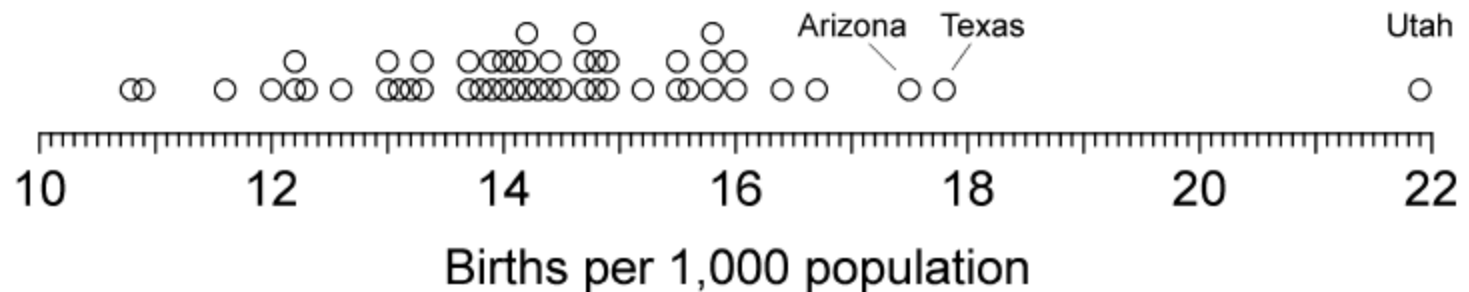


FIG. 4. *Number line describes variation in the data for Figures 2 and 3.*



# How Maps Can Mislead

- ✦ Choropleth maps and the impact of different class breaks

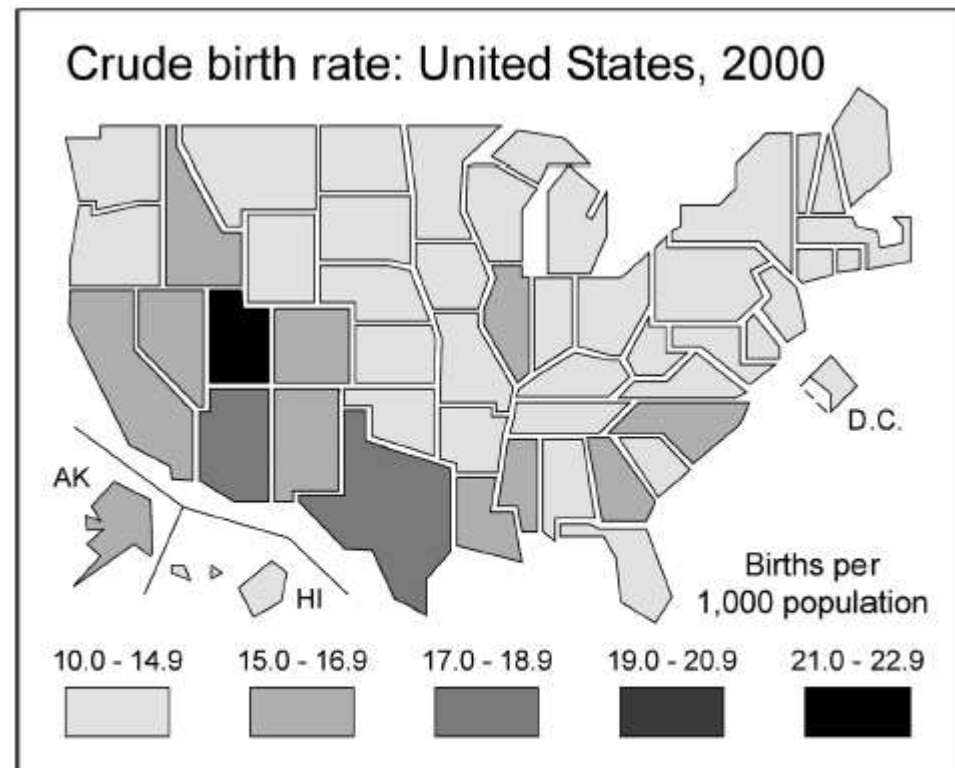


FIG. 5. Crude birth rates, 2000, by state, categorized to suggest dangerously low rates overall.

# How Maps Can Mislead

- ✦ Choropleth maps and the impact of different class breaks

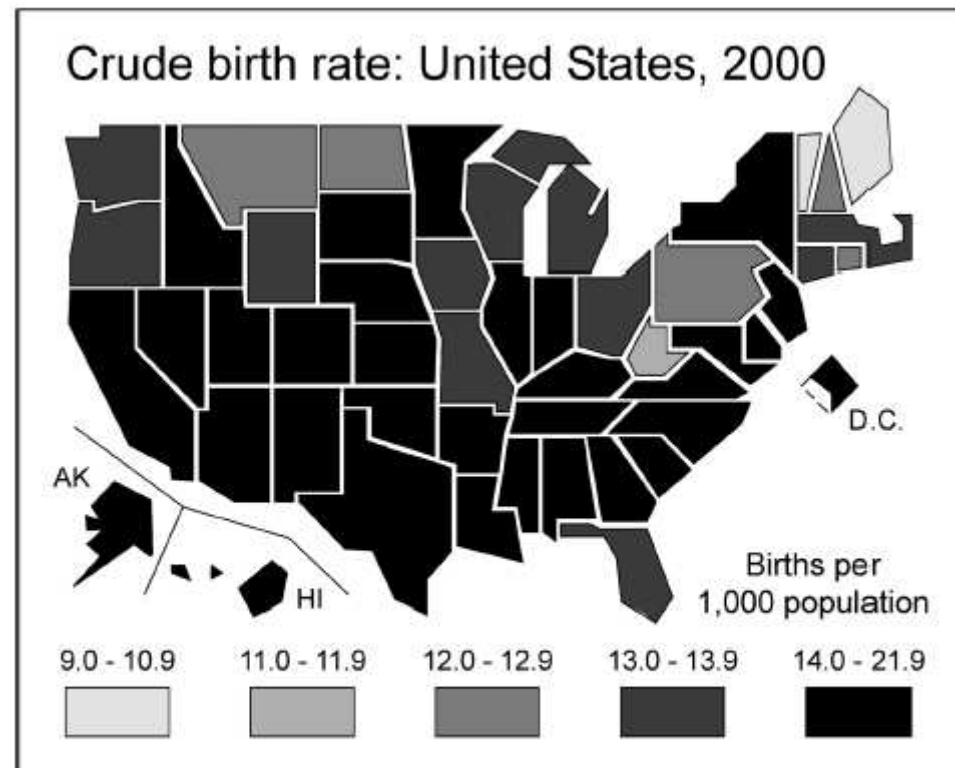


FIG. 6. Crude birth rates, 2000, by state, categorized to suggest dangerously high rates overall.



# How Maps Can Mislead

- ✦ Choropleth maps and the impact of different class breaks

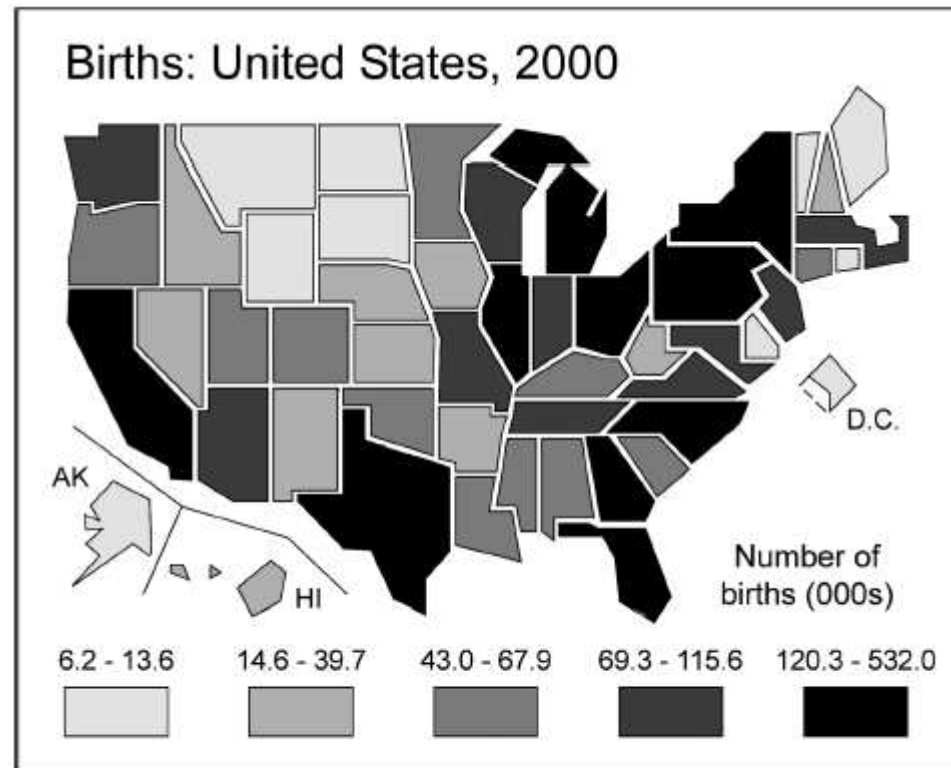


FIG. 7. *The darker-is-more-intense metaphor of choropleth maps offers a potentially misleading view of numbers of births.*

# How Maps Can Mislead

- ✦ Choropleth maps and the impact of different class breaks

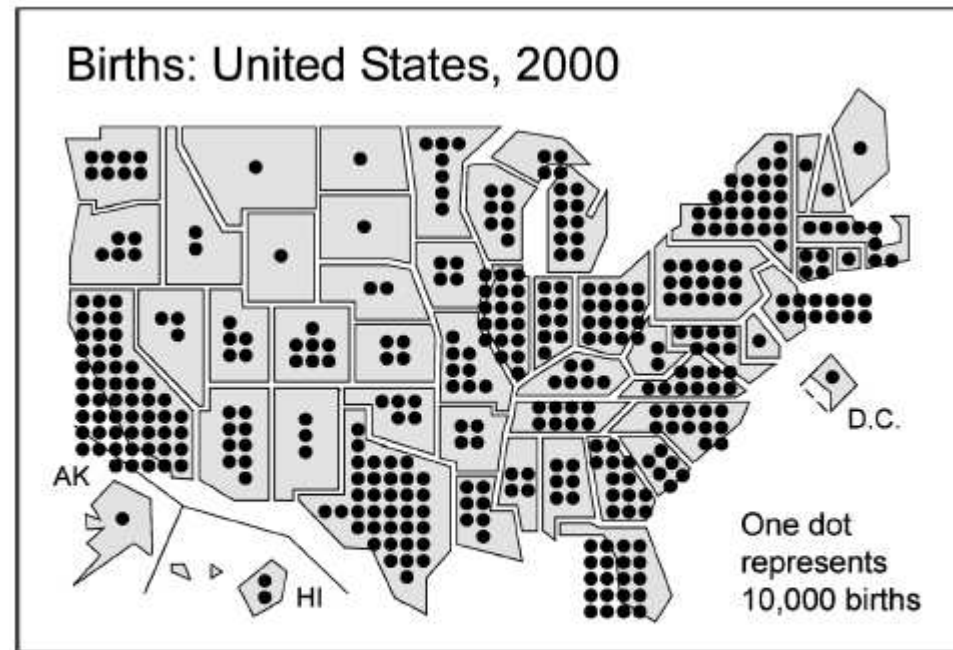


FIG. 8. *The bigger-means-more metaphor of this dot-array map affords a more appropriate treatment of the count data in Figure 7.*



## How Maps Can Mislead

- ✦ Choropleth maps and the impact of different class breaks

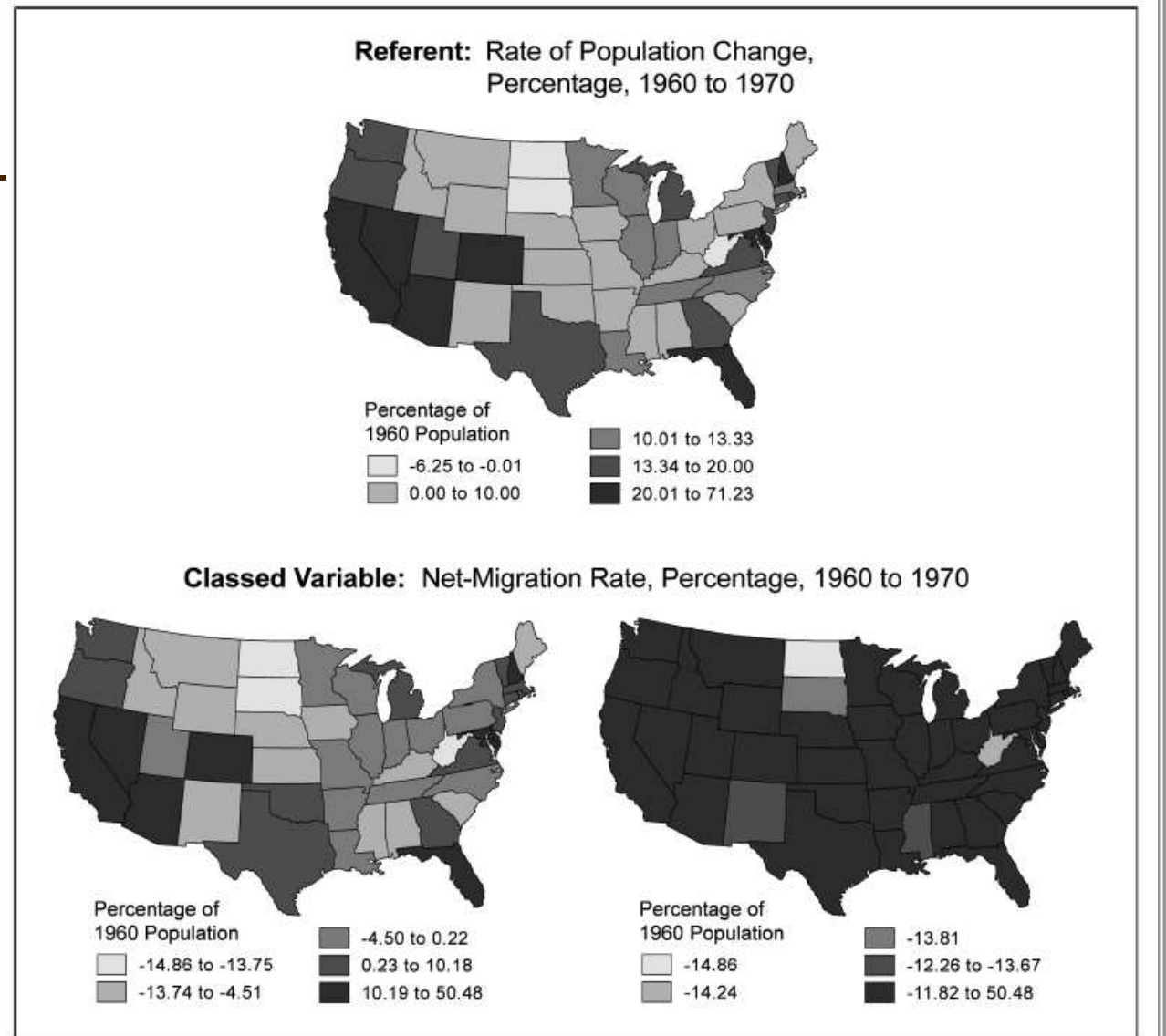


FIG. 9. The two lower maps are different representations of the same data. An optimization algorithm found cut-points intended to yield displays that look very similar (lower left) and very dissimilar (lower right) to the map at the top. Cut-points for the upper map include 0.0, which separates gains from losses, and 13.3, the national rate.

# Maps and Politics/Propaganda

- ✳ Long history of governments using maps to influence citizens, to promote certain agendas, make impressions...

A propaganda map is used for the intent of threat, an agent of control, exploitation, and to manipulate and/or emphasize. The propaganda is a tool for power.

This propaganda map was used by the United Kingdom to show what Germany's secret goals were to taking over Europe. This was a way to get all the people of surrounding countries that were threatened by this portrayal.

[www.bl.uk/popups/10.html](http://www.bl.uk/popups/10.html)









# Maps and Politics/Propaganda

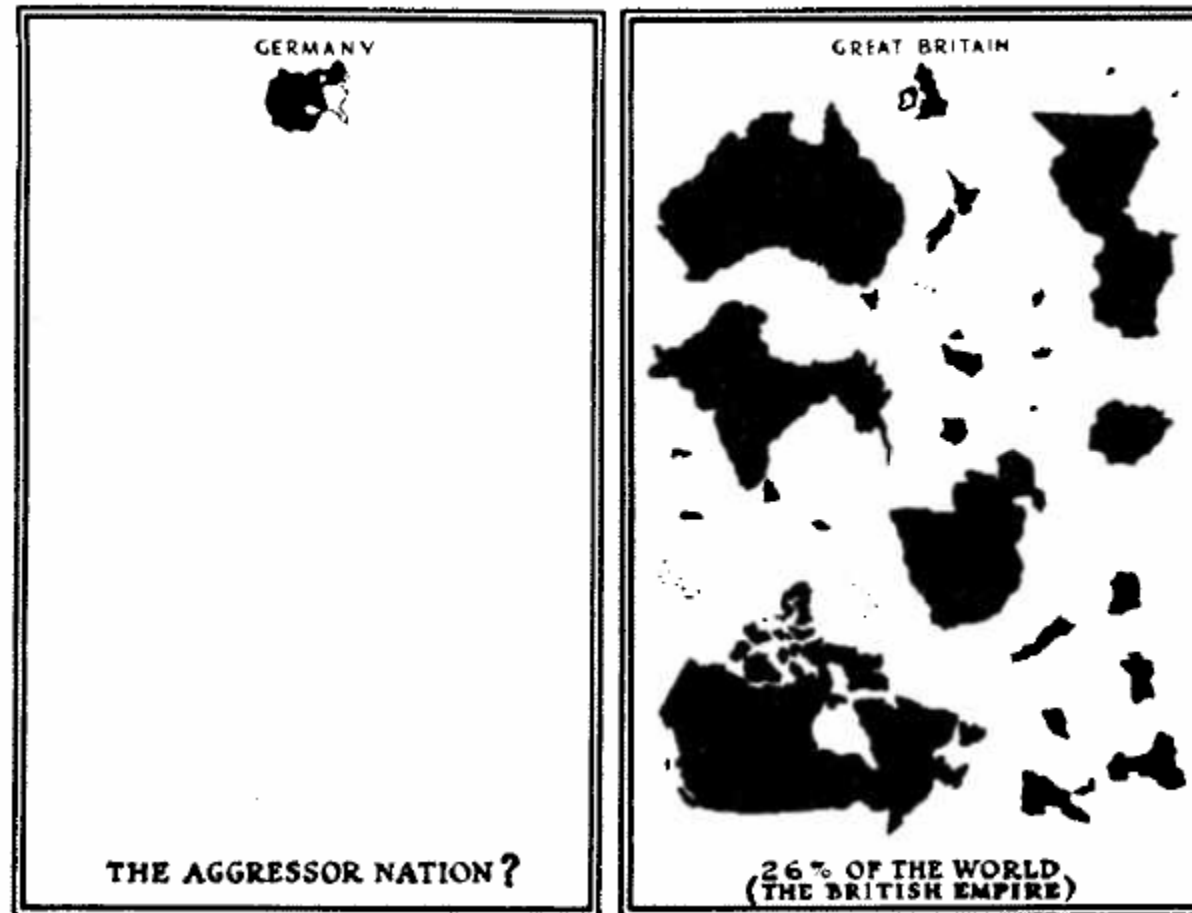


<http://bibliodyssey.blogspot.com/2008/08/dogs-of-war.html>



# *Maps and Politics/Propaganda*

## A STUDY IN EMPIRES

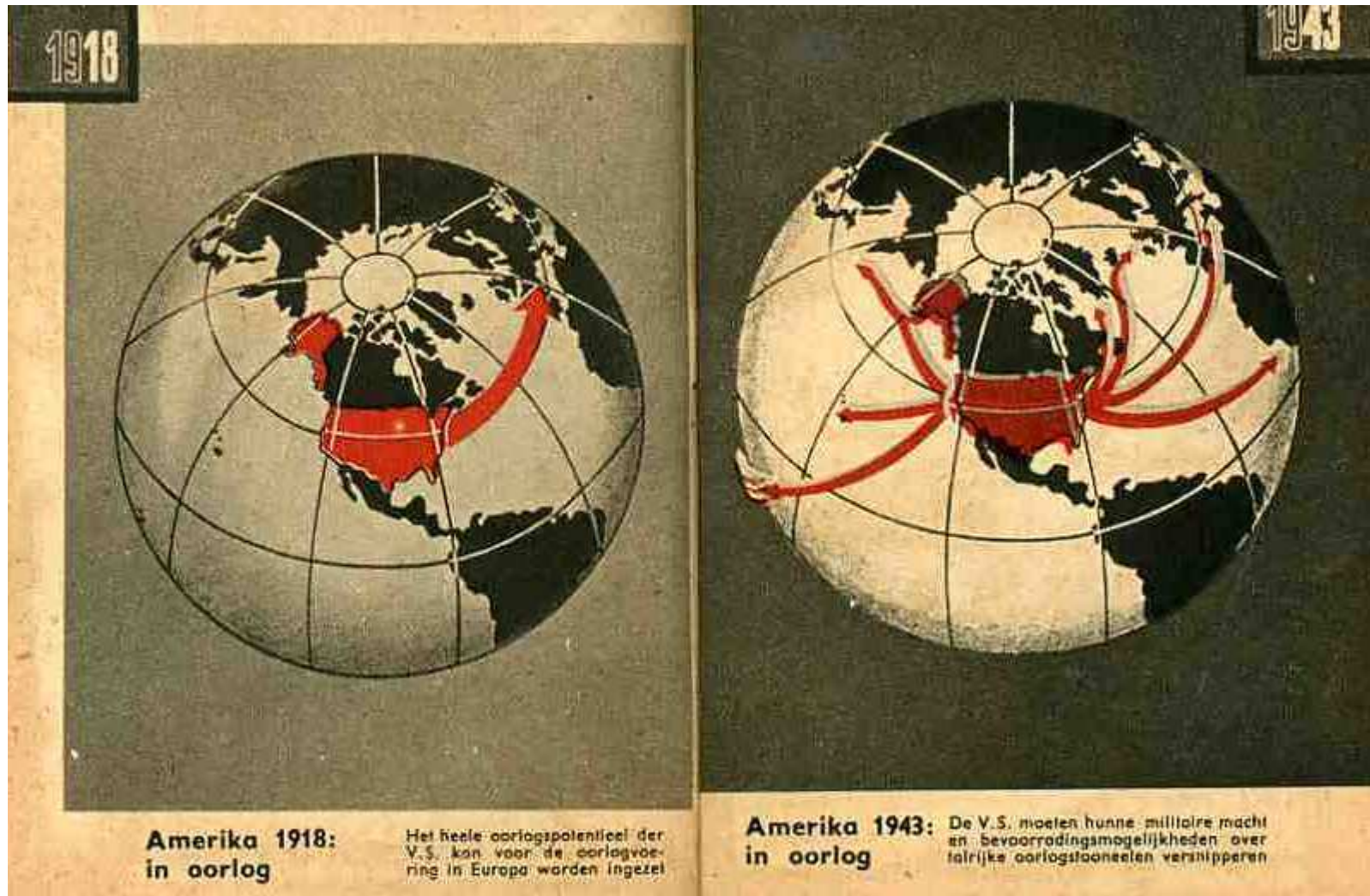


# Maps and Politics/Propaganda





# Maps and Politics/Propaganda



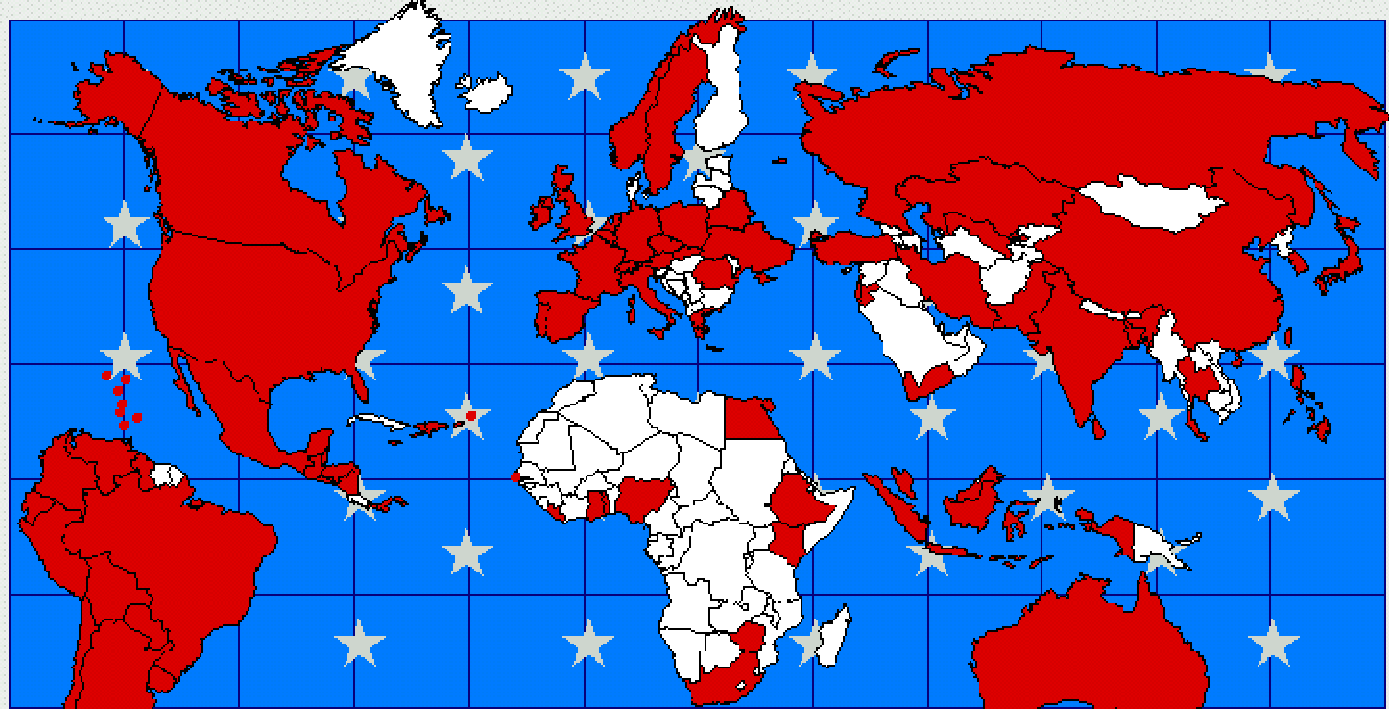






# Maps and Politics/Propaganda

## Atrocity against Humanity at the WORLD Trade Center



Nation Values  
as of  
11 Nov 2001  
Compiled from  
Various Sources



3,010 Citizens from 07 Nations  
perished due to Terrorist attacks  
upon the USA on Sep: 11 2001.  
(as of 15 Aug 2002)

Map by Personalized Map Company  
[www.nymaps.com](http://www.nymaps.com)

# *Maps and Politics/Propaganda*

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# Maps and Politics/ Propaganda

Also see:

<http://news.nationalgeographic.com/2016/10/propaganda-war-maps-gallery/>

<https://www.brainpickings.org/2012/04/17/magnificent-maps-cartography-as-power-propaganda-and-art/>



**Did you know** that a single presidential ballot from a voter in Wyoming has **347% more weight** than a ballot in Florida? Because of the **electoral college** system, votes are far from equal. Depending on how low your state's population is, your vote is worth more. The **least populated** states, such as Wyoming (pop. 500,000), are allotted a minimum of 3 votes. Whereas Tennessee (pop. 5,900,000) is allotted only 11 votes despite having over 10 times the population.

With the electoral college system, American votes are far from equal. Isn't it time for **direct presidential elections**, where **one vote is one vote**?

# Maps and Politics/ Propaganda

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figure 7.4, Argentinian postage stamps have touted that nation's claims not only to the Falkland Islands and the British-held islands to their east but also to Antarctica. Like all official maps of Argentina, these postage stamps deny the legitimacy of British occupation with their Spanish label "Islas Malvinas." Postage stamps bearing maps are also useful propaganda tools for emergent nations and ambitious revolutionary movements.

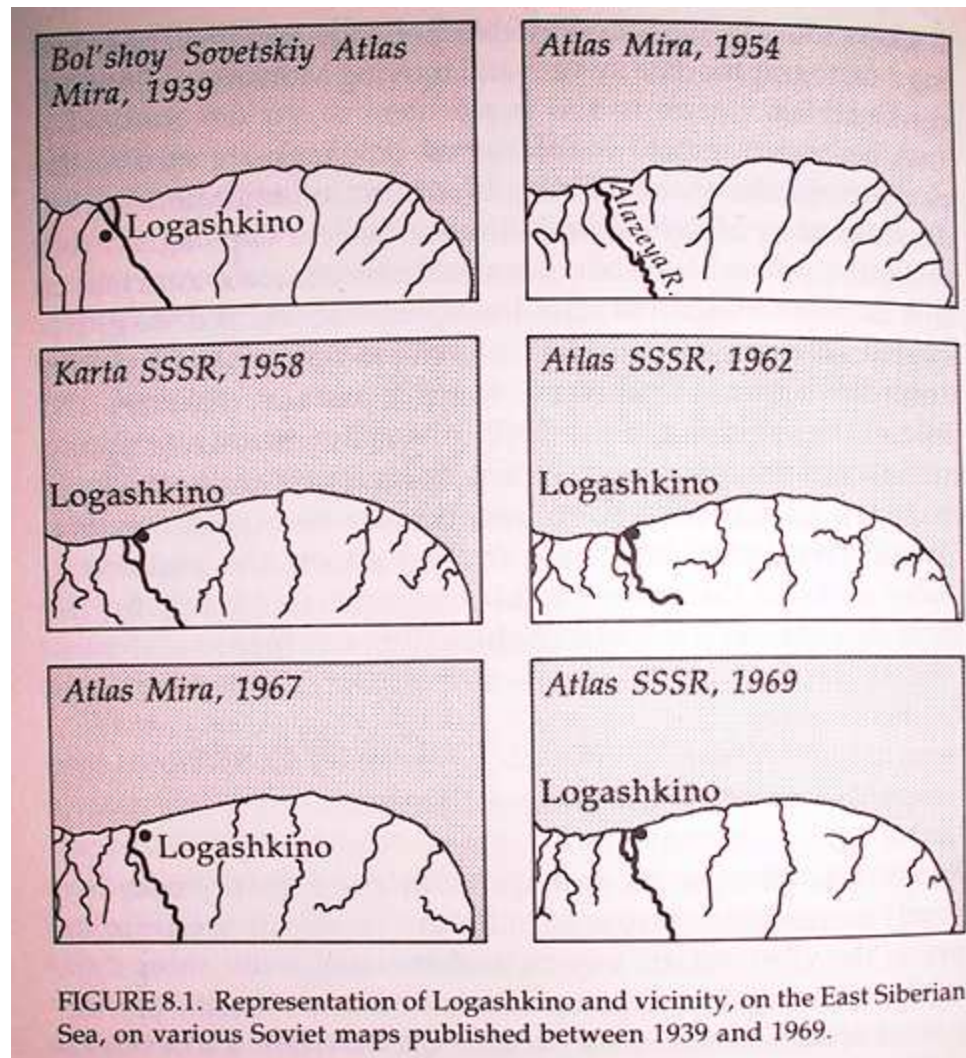


FIGURE 7.4. Subtle and not-so-subtle cartographic propaganda on Argentinian postage stamps.



# Maps and Politics/Propaganda

**Soviet  
cartographic  
disinformation  
-- maps  
deliberately in  
error to conceal  
secrets or fool  
the enemy**



# Gerrymandering

- ✦ The way a political party can manipulate electoral boundaries for political gain

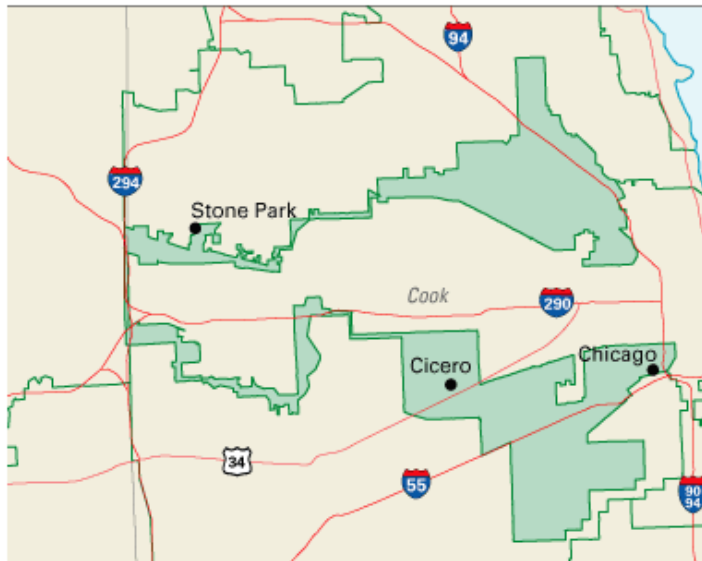
The state Senate district satirized in this cartoon (originally published in the Boston Centinel in 1812) was created by the Massachusetts legislature to favor the incumbent Democratic-Republican party candidates backed by Governor Elbridge Gerry over the Federalists in 1812.





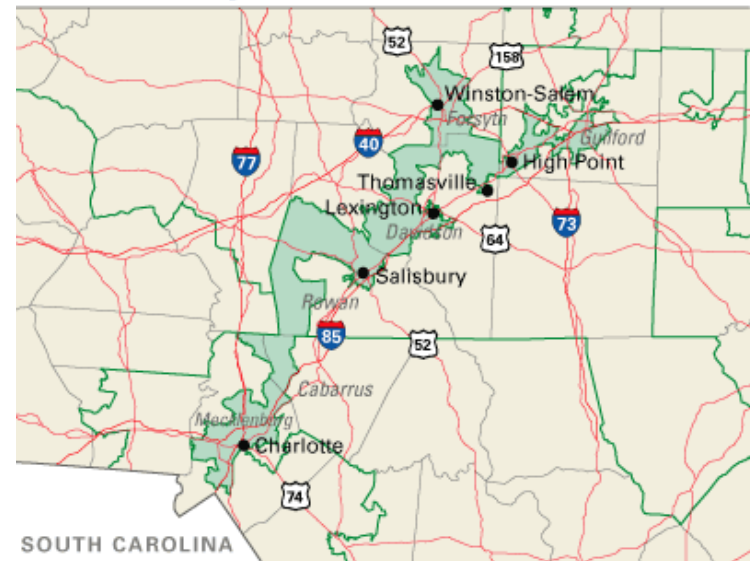
# Gerrymandering

*Congressional District 4*



**Illinois's 4th congressional district packs two Hispanic areas while remaining contiguous by narrowly tracing Interstate 294.**

*Congressional District 12*



**North Carolina's 12th congressional district, which is predominantly African-American and liberal.**

# Gerrymandering

## Congressional District 23



California's 23rd congressional district is confined to a narrow strip of coast, another example of the “packing” style of districting.

This district was designed to provide for a safe seat for the Democratic Representative



# Trap Streets

- ✦ Non-existent streets included on a map in order to catch plagiarism among cartographic competitors

