

Visual Communications

The art of showing complex data and messages effectively

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today

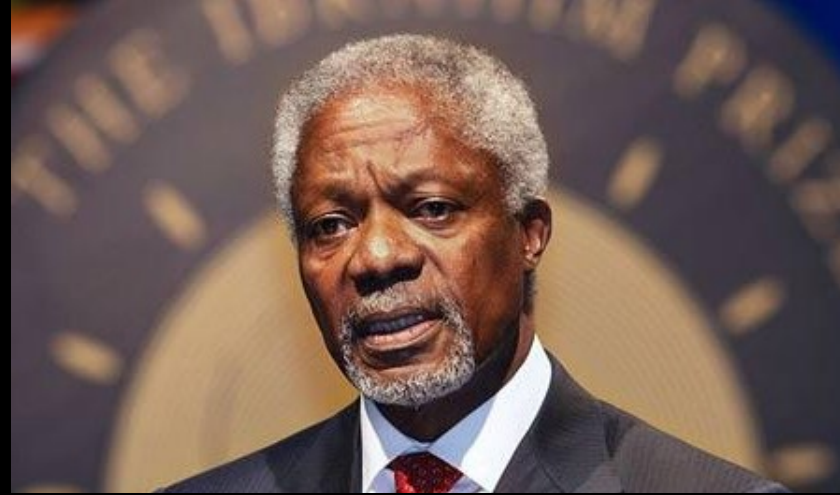
1. Principles of data presentation
2. A practical guide to GIS mapping

today

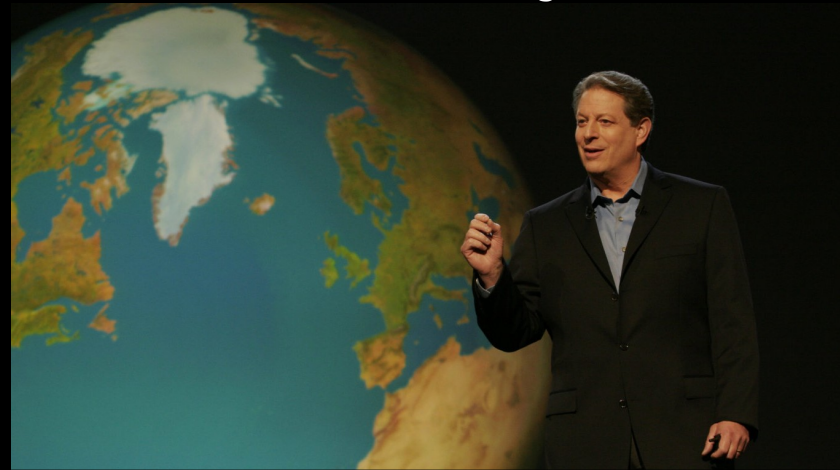
1. Principles of data presentation
2. A practical guide to GIS mapping



Clients and Projects



Kofi Annan, Africa Progress Panel



Al Gore, Generation IM

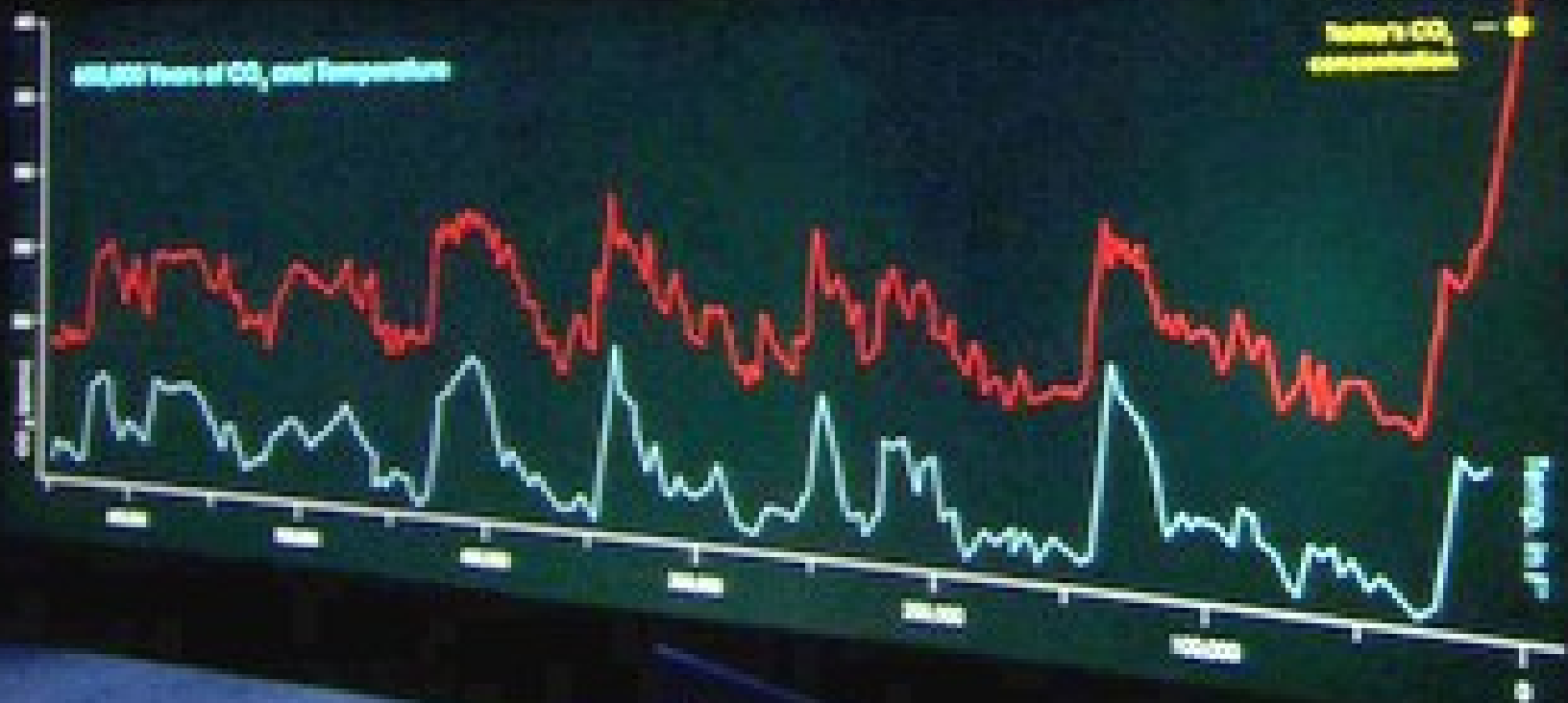


Sarah and Gordon Brown Foundation

Why data visualisation matters

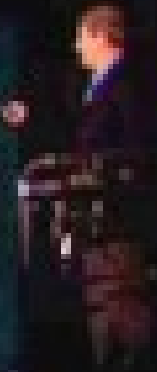
When was the last time you saw
a good presentation?

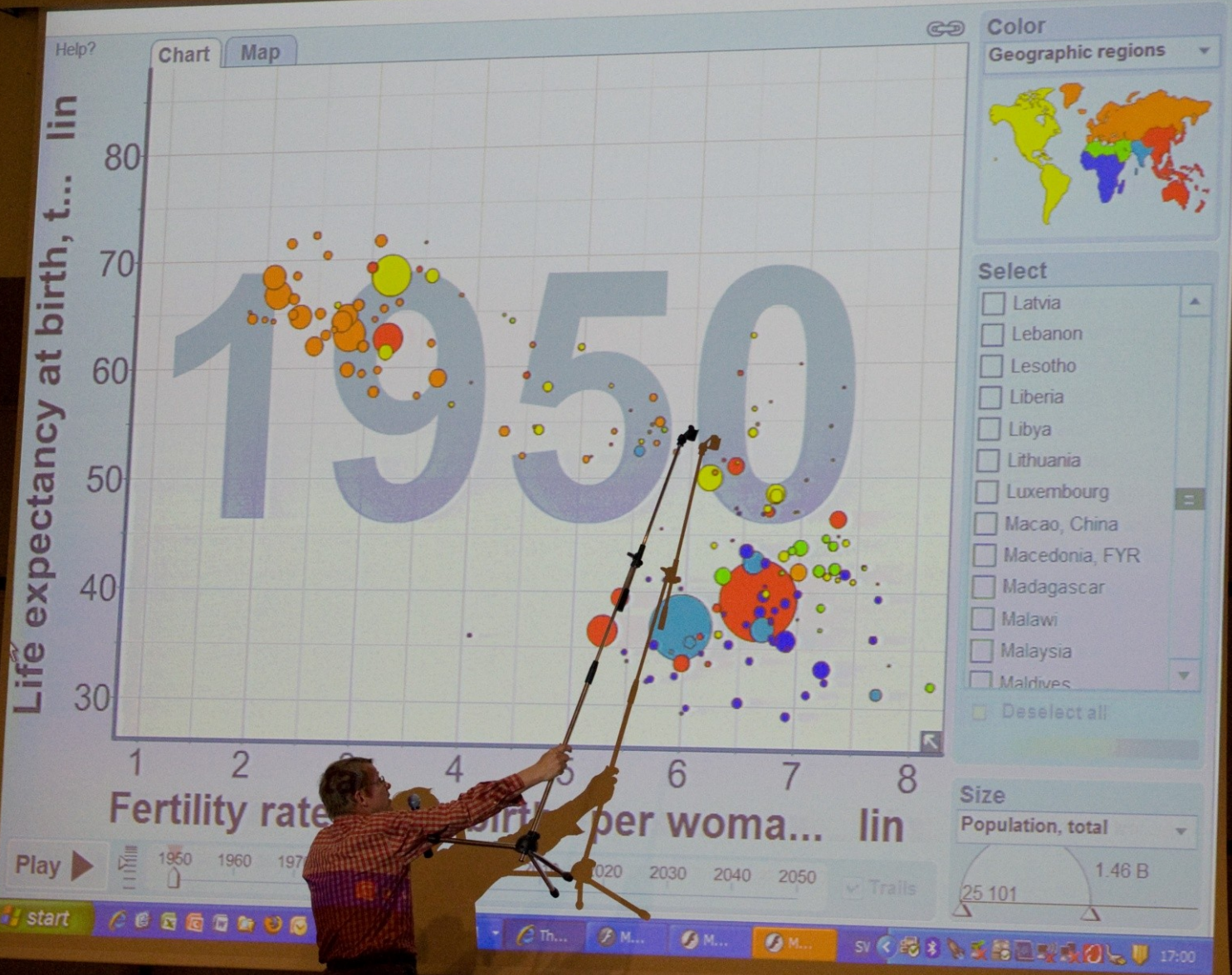
(with statistics that made sense)



Today's CO₂ concentration

Today's CO₂ concentration

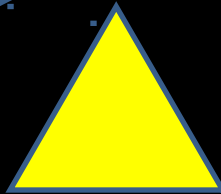
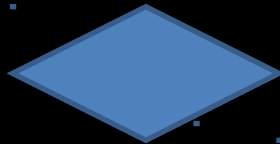
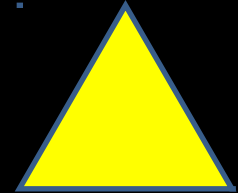
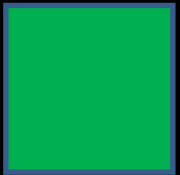
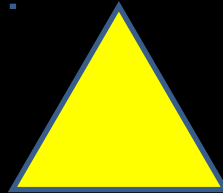
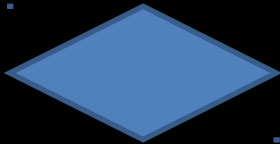
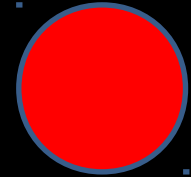
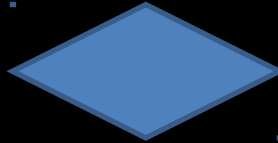
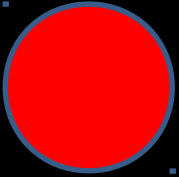
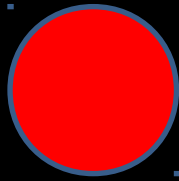




What these presentations
have in common...

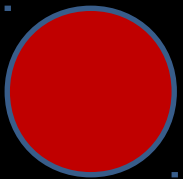
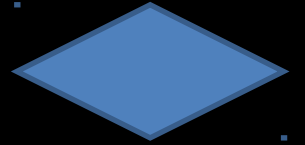
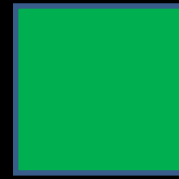
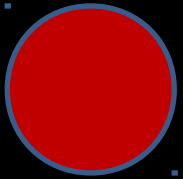
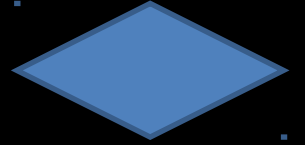
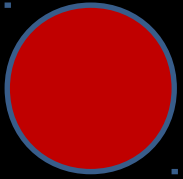
In general, we are **visual**
learners

Concentrate!



Now draw what you just saw...

How about now...

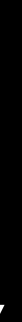


We tend to recognise patterns
and find relationships.

This helps us **remember**

we didn't evolve to process **data**

Invention
of
writing
and
numbers



336,000 BC

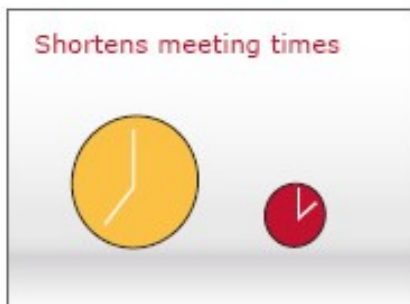
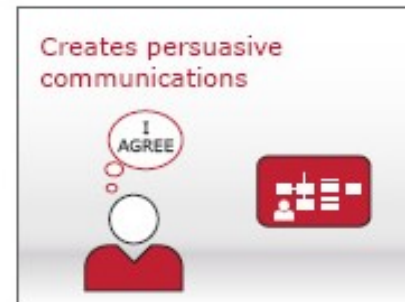
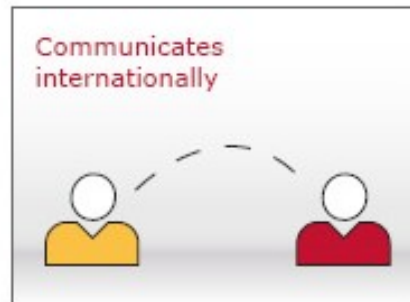
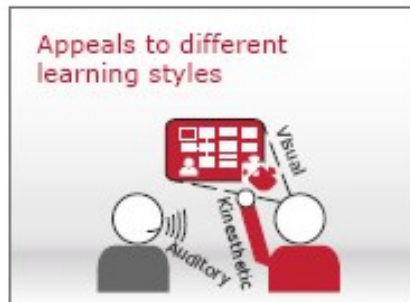
4,000 BC

[timeline of human evolution]

So there is a strong case to go
visual

So there is a strong case to go visual

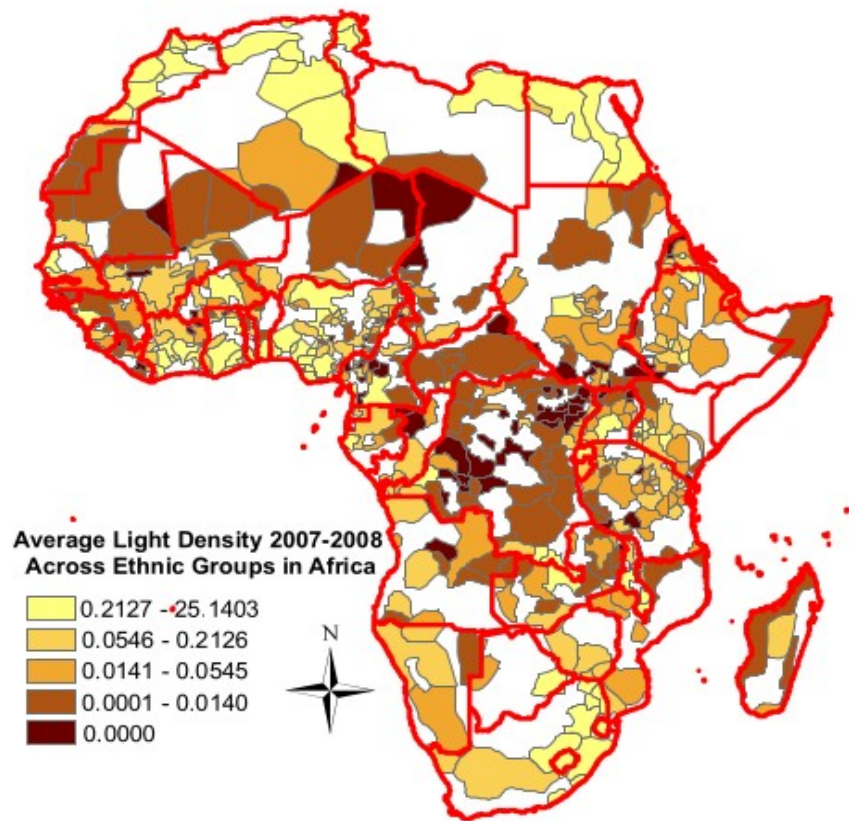
What are the benefits of visual communication?



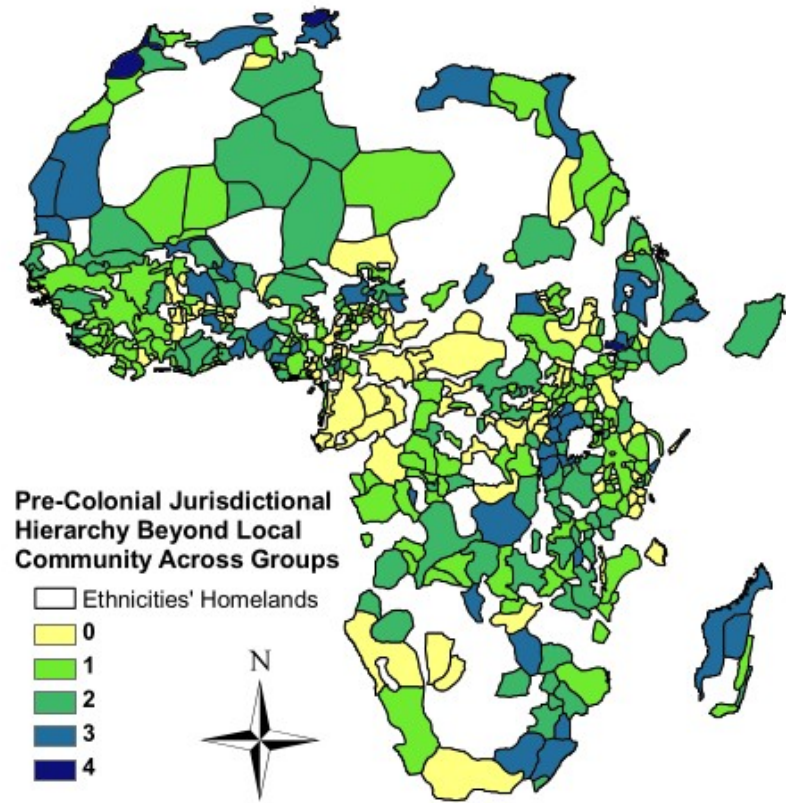
benefits of visual display

1. Getting a sense of the data
2. Getting understood by others
3. Getting noticed
4. Getting published

Publication in top science journals (Science, Nature) often requires an **advanced visual infographic** and the same is increasingly true in the social sciences.



(A)



(B)

Source: Michalopoulos and Papaioannou (2013) "Precolonial Ethnic Institutions and Contemporary African Development", *Econometrica*

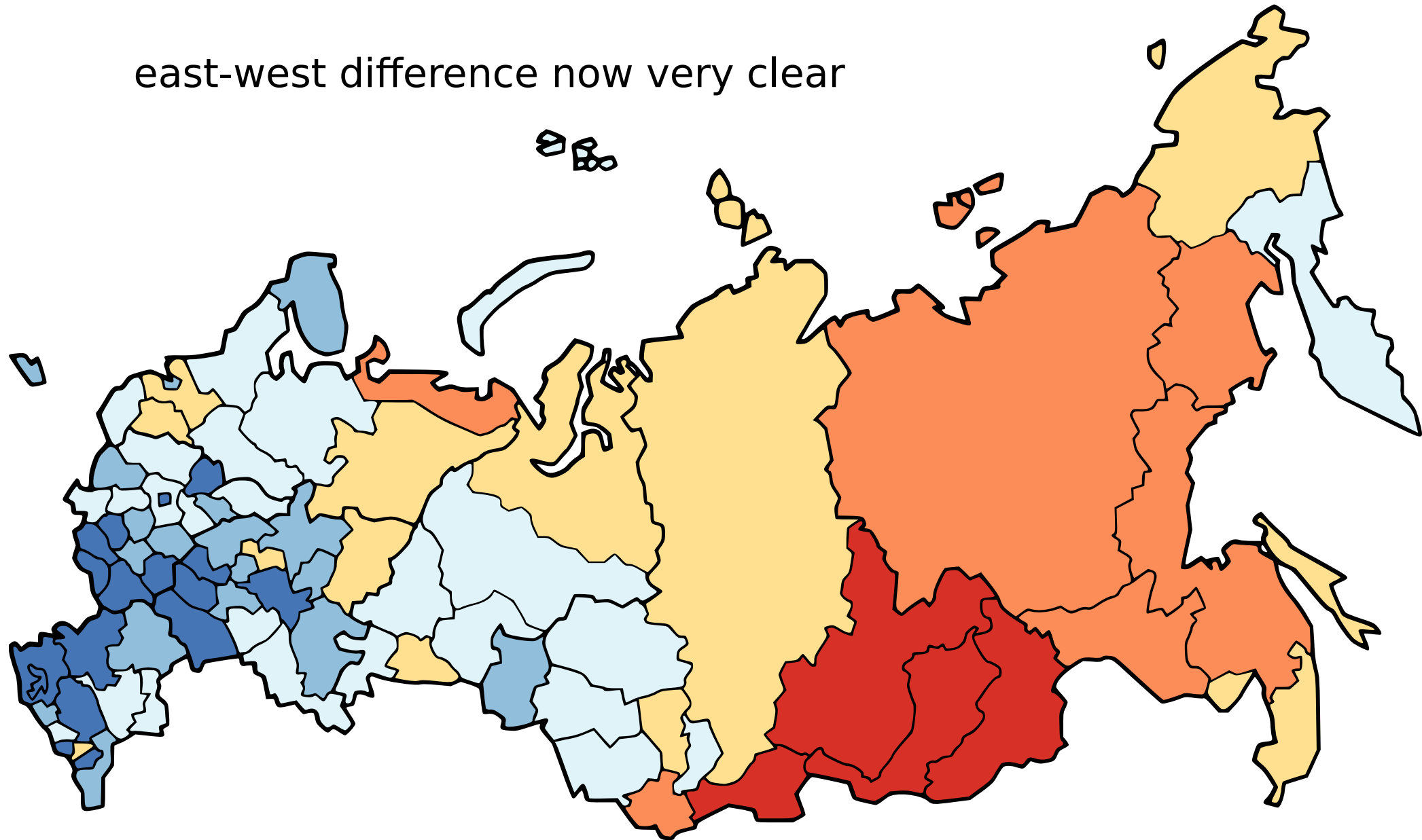
Data visualisation also has value during the
analysis stage

- Let's suppose we have a table of data (homicide rates in provinces of Russia)

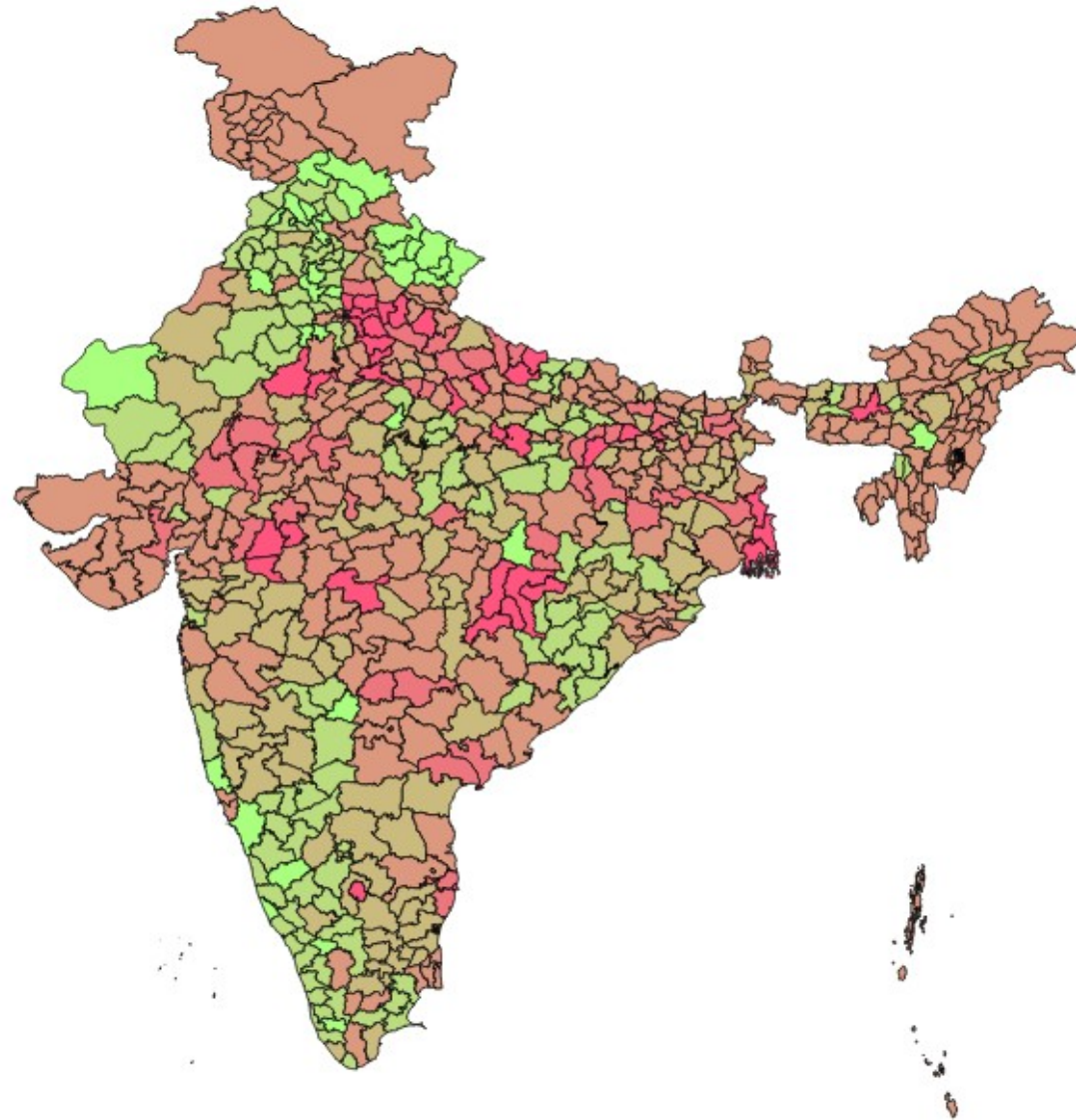
RU-AD	6.132182603
RU-AL	21.29719264
RU-ALT	10.92263136
RU-AMU	18.36192317
RU-ARK	13.13963927
RU-AST	10.6888361
RU-BA	9.897099634
RU-BEL	5.481239804
RU-BRY	10.1944793
RU-BU	26.12631146
RU-CE	7.998745295
RU-CHE	13.57062764
RU-CHU	17.85714286
RU-CU	8.156737305
RU-DA	9.928221641
RU-IN	14.69879518
RU-IRK	22.32381894
RU-IVA	10.46084252
...	...

Russia, homicide rate

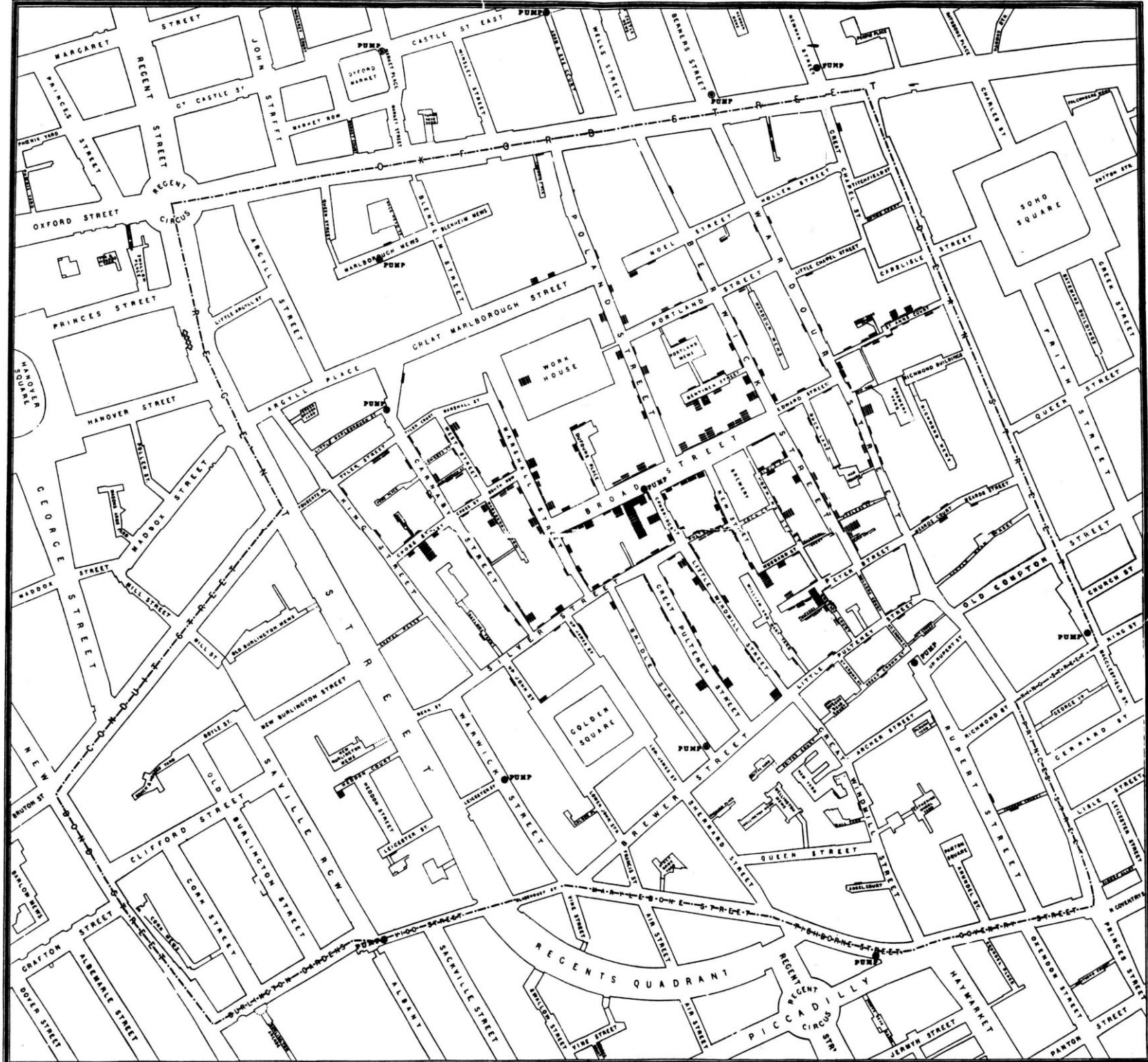
east-west difference now very clear

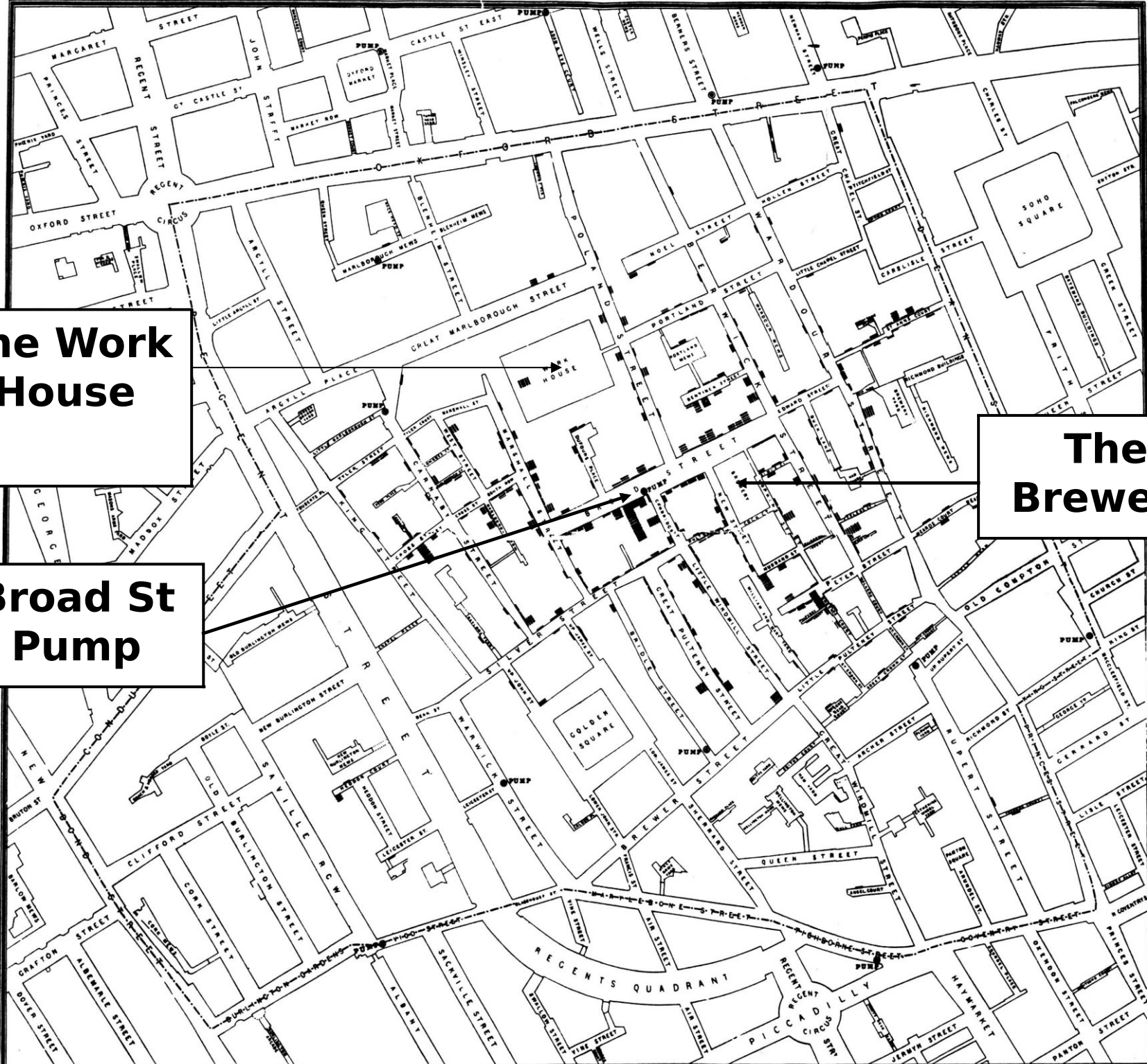


Similarly for India...



visualisation is essential for inductive reasoning





The Work House

The Brewery

Broad St Pump



The Pump Today in London – a Memorial to John Snow

benefits of visual display

1. Getting a sense of the data
2. Getting understood by others
3. Getting noticed
4. Getting published

**How not to
display data**

TABLES STORE DATA, NOT PRESENT IT

Motivation

Tables are natural containers for data. Whenever information is presented, chances are excellent that it is communicated by means of a table. In many cases, however, when this information is complex (and the table, therefore, is large) a tabular presentation is difficult to parse visually and patterns in the tabulated data remain opaque.

In other words - a useful container isn't automatically a useful presenter. The table presents individual data points very well and patterns that they compose very poorly.

TYPES OF CONTAINERS



for eggs

Table 1. Number of homopeptide repeats and RCPs in GENPEPT, Eukaryotes, and Prokaryotes

	GENPEPT		Eukaryote		Prokaryote		Other (viruses/environmental sequences)	
	Repeats	Proteins	Repeats	Proteins	Repeats	Proteins	Repeats	Proteins
Alanine	6132	5045	5465	4425	251	250	416	370
Valine	149	117	94	83	9	9	46	27
Leucine	1638	1692	1446	1426	70	70	122	106
Isoleucine	57	56	34	33	3	3	20	20
Proline	4837	3931	4157	3333	217	184	463	414
Methionine	27	22	19	18	0	0	8	4
Phenylalanine	196	186	175	172	1	1	20	13
Tryptophan	3	3	3	3	0	0	0	0
Glycine	5981	5020	5902	4168	310	281	669	571
Serine	6383	5463	5424	4742	378	258	581	463
Threonine	2997	2415	2492	1984	63	59	442	372
Cysteine	64	52	38	38	0	0	26	14
Asparagine	7126	3731	6962	3597	31	29	133	105
Glutamine	8334	5699	8022	5464	52	51	260	184
Tyrosine	56	51	39	38	4	4	13	9
Aspartic Acid	1835	1707	1554	1451	34	34	247	222
Glutamic Acid	4779	4302	4334	3912	67	61	378	329
Lysine	2081	1926	1920	1774	25	25	136	127
Arginine	751	714	462	443	69	57	229	214
Histidine	1140	1061	1049	971	32	32	59	58
Total	54,566	37,355	48,691	32,628	1607	1388	4268	3339

Faux, N. G. et al. Functional insights from the distribution and role of homopeptide repeat-containing proteins. *Genome Res* 15, 537-51(2005).

for data

Figure If your data are eggs, then the table is the egg crate, which keeps data ordered, separated and easily accessible. But, eggs aren't served out of egg crates ... perhaps data shouldn't be served out of a table either.

The purpose of a table is...

- To show the audience that you know how to run a regression?

OR

- To showcase your findings?

Problems with Regression Tables in Particular

- Too much irrelevant information
- Difficulty of reading the effect sizes ('is a significant result really significant?')
- Easier to interpret standard errors when displayed visually
- Unable to identify individual cases (are there leverage points?)
- Masks heteroskedasticity in the data
- Ultimately can leave more questions than answers

The purpose of a table

- If the purpose is to show a relationship between two variables, then ... the best thing is to show the relationship between those variables.
- For example, a post-regression residual plot.
- If you have a treatment and control group, then just show the difference in means and the standard error around the estimates. Such a (simple) graphic is almost mandatory in many disciplines (hard sciences)

**Don't distract the
viewer**

Just Another Illustration Why Data Visualizations Need Help

October 12th, 2010

As I thumb through my latest edition of BusinessWeek, I see many illustrations where the data visualization looks like the one below. Also, it seems that with each new week come worse charts and graphs. Looking at the one below, the 3-D effect adds absolutely no value and makes this chart pretty much useless.

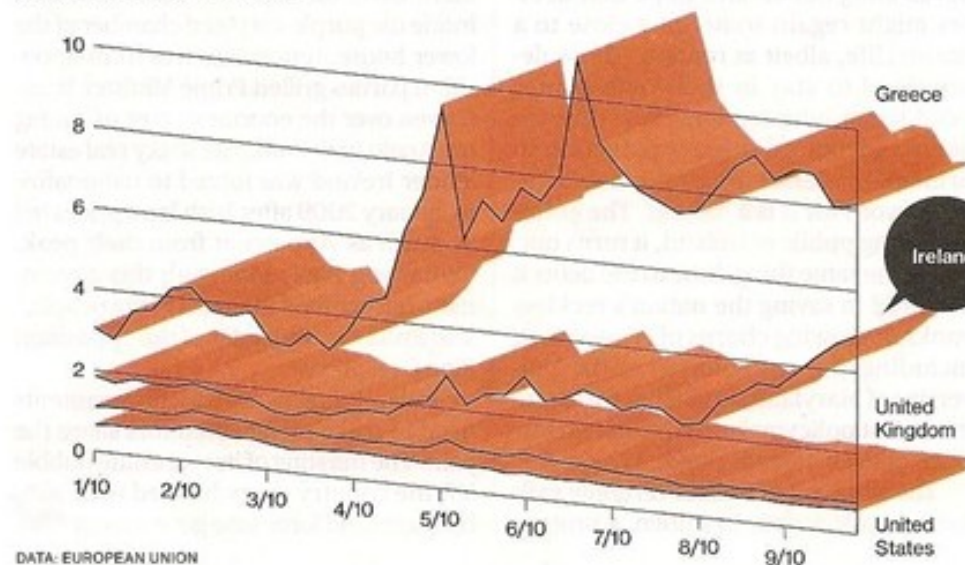
4

tweets

retweet

Ireland Is Catching Up with Greece

Annual cost of insuring national debt against default for five years, as a percentage of the face value of the debt.



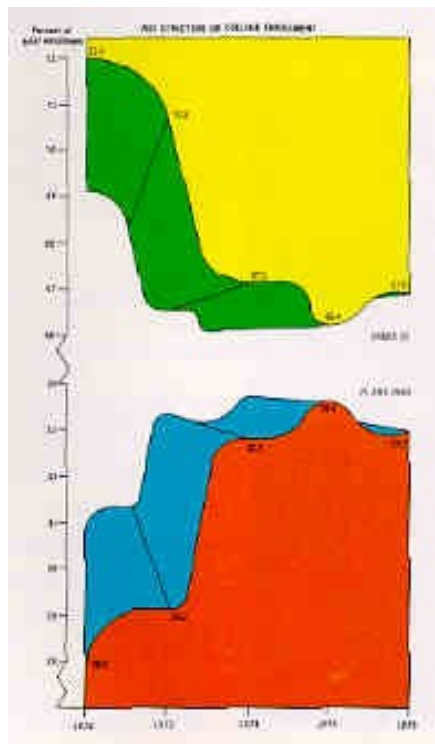
[BusinessWeek, Oct 4-10]

I am pulling for the new management to do a better job, but I'm not very hopeful. Want to make this chart better? Simply remove the third dimension and make it a simple, plain old line graph. If I had to guess, I'd say this might just be a case where the functionality lets me create it in the software, so it must be good, right? Wrong. Maybe Stephen Few is right in that great data visualizations start with well designed software that do not let the creator choose an option like this.

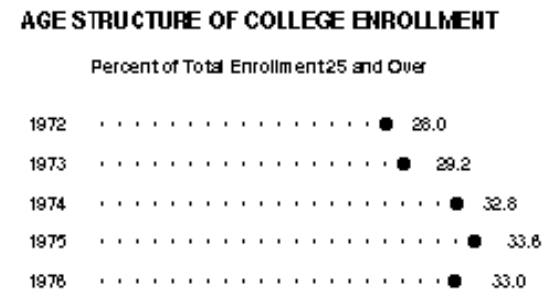
What do you think? Blame it on poorly designed software or uneducated designers?

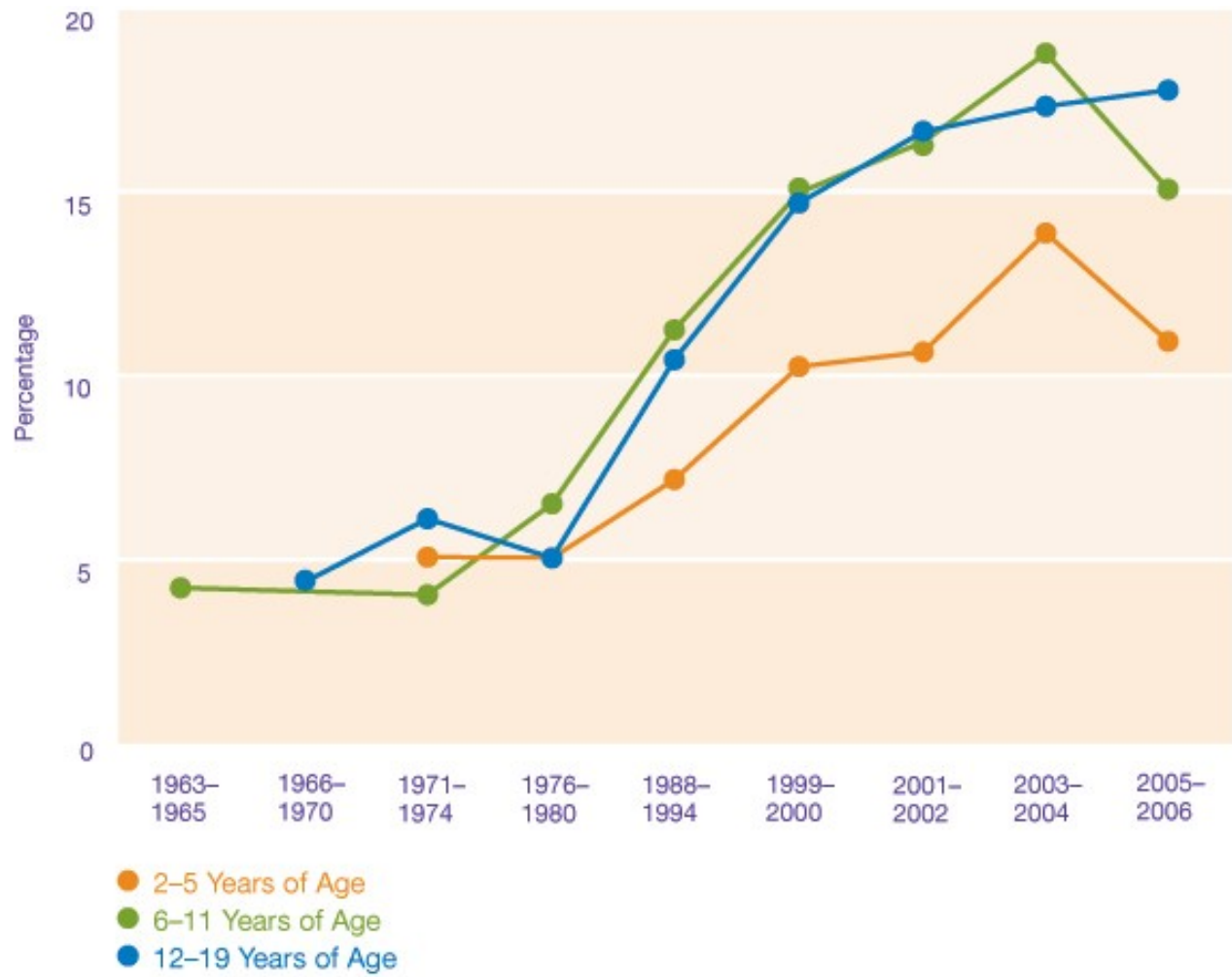
As a substitute for substance, one can try lots of color, 3D effects, or disguised redundancy. This graph uses all three techniques, to display just five numbers. Note the clever use of mirror-imaging -- the top series is just (100 - the bottom series) and the interesting use curved lines, front and back to avoid the appearance that there's a lot less here than meets the eye.

Tufte (1983, p.118) says, "*This may well be the worst graphic ever to find its way into print.*"



Alternative version:





When Graphic Design Goes Badly

The most general standards of charting data are thus the following:

- Present meaningful data.
- Define the data unambiguously.
- Do not distort the data.
- Present the data efficiently.

To see what happens when these rules are violated, consider figure 3, taken from Robert Putnam's *Bowling Alone* (where it is labeled figure 47), a work that contains many good and bad examples of graphical data display (and unfortunately, no tables at all). In just one chart, Putnam violates the three fundamental rules of data presentation: the chart does not depict meaningful data; the data it does depict are ambiguous, and the chart design is seriously inefficient. One can't accuse Putnam of distorting the data only because his main conclusions are not derived from the data presented in the chart.

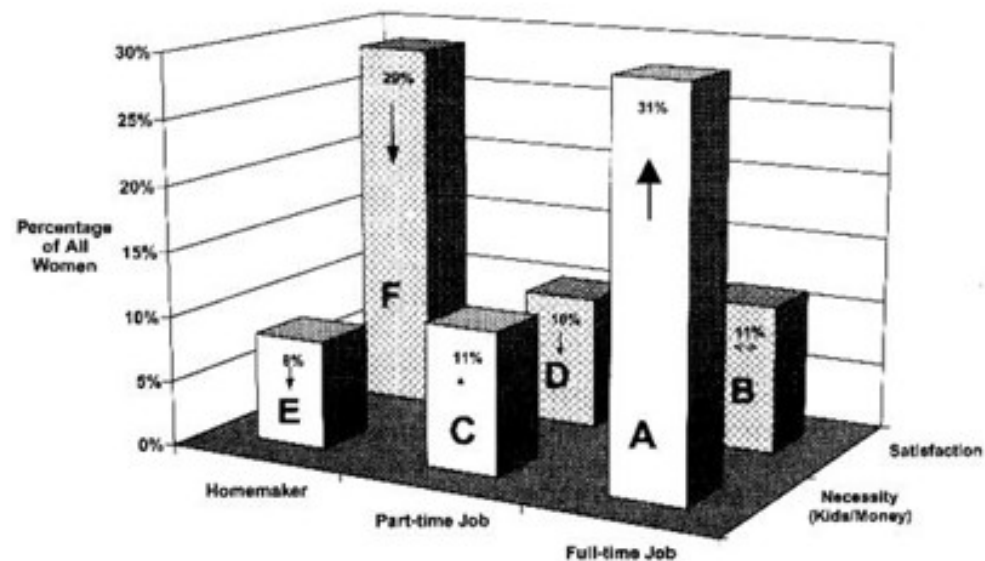
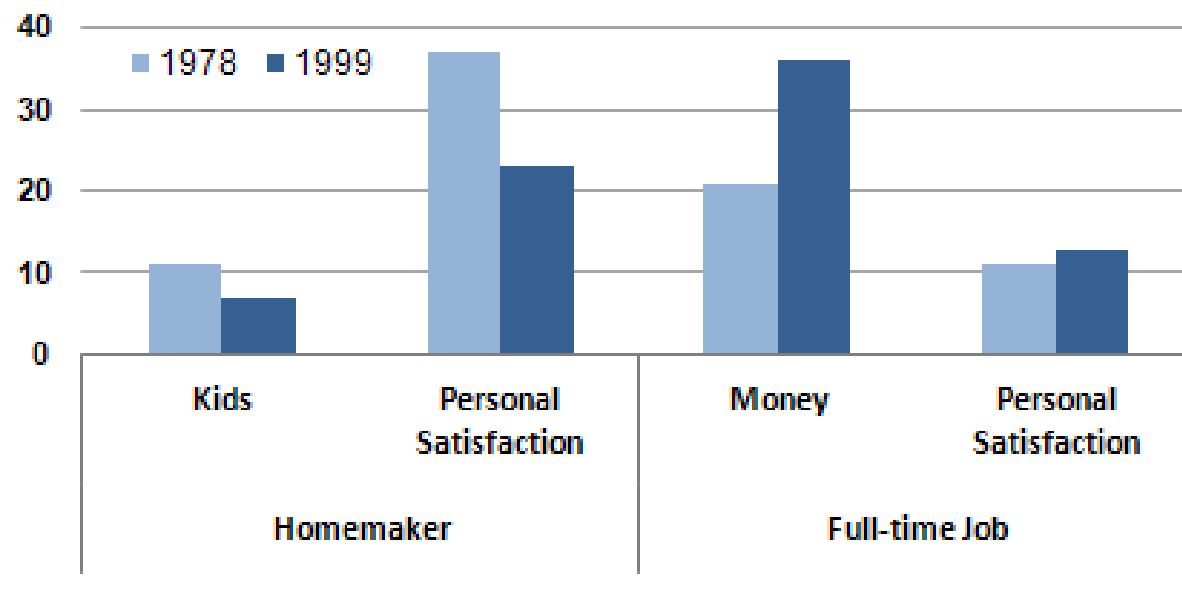


Figure 47: Working by Choice and by Necessity Among American Women, 1978-1999

Figure 3: Very bad graphical display

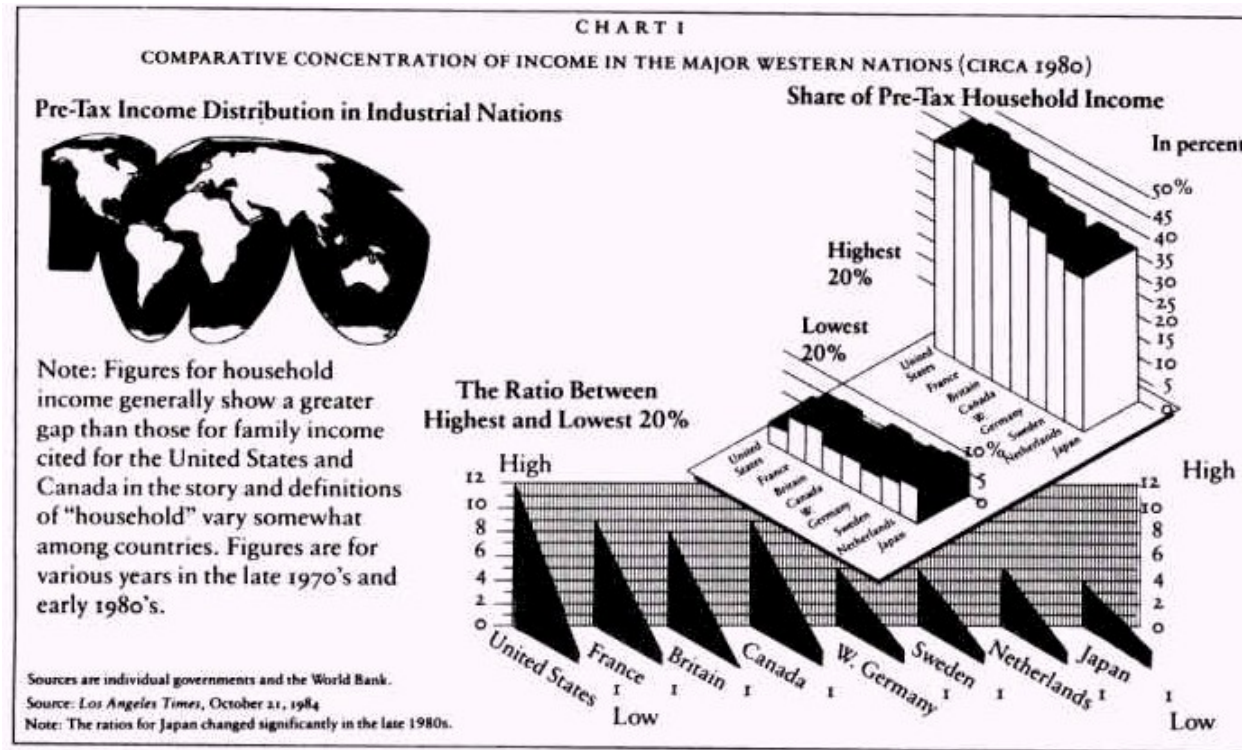
Of these, let's consider the inefficiency first: the first thing you notice about the chart is that the graphical elements are represented in three dimensions. On both efficiency and truthfulness this is unfortunate; the 3-D effect is entirely unnecessary and in this case serves to distort the visual representation of the data. Had not the data labels been shown on the top of each bar, it would not be readily apparent that column A is in fact bigger than column F, or that C is the same size as B. In addition the chart suffers from what might be called "numbering inefficiency": Putnam uses 13 numbers to represent 6 data points. Eliminating the 3-D, as shown in figure 4, offers a more exact representation of the data with a lot less ink.

Reasons Women Work or Stay at Home, 1978-1999
(percent of all women)

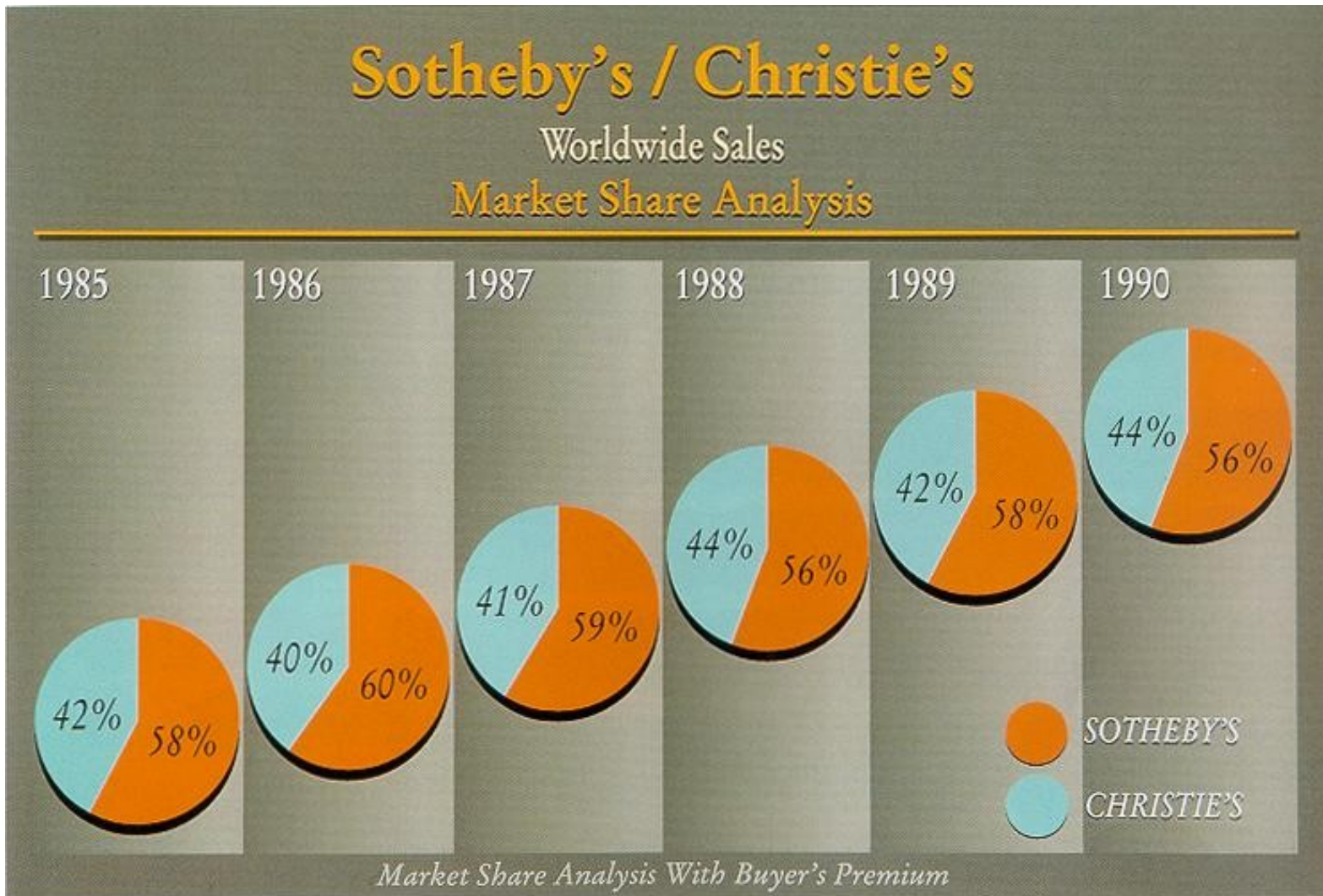


Note the extraneous features of this in this graphic:

- A completely irrelevant map of the world.
- Two entirely different kinds of 3-D charts displayed at two different perspectives.
- Country names are repeated three times.
- To display 24 numeric data points, 28 numbers are used to define the scales.
- The countries are sorted in no apparent order (not even alphabetically).
- Note the use of the letter " I " to separate the countries on the bottom chart.

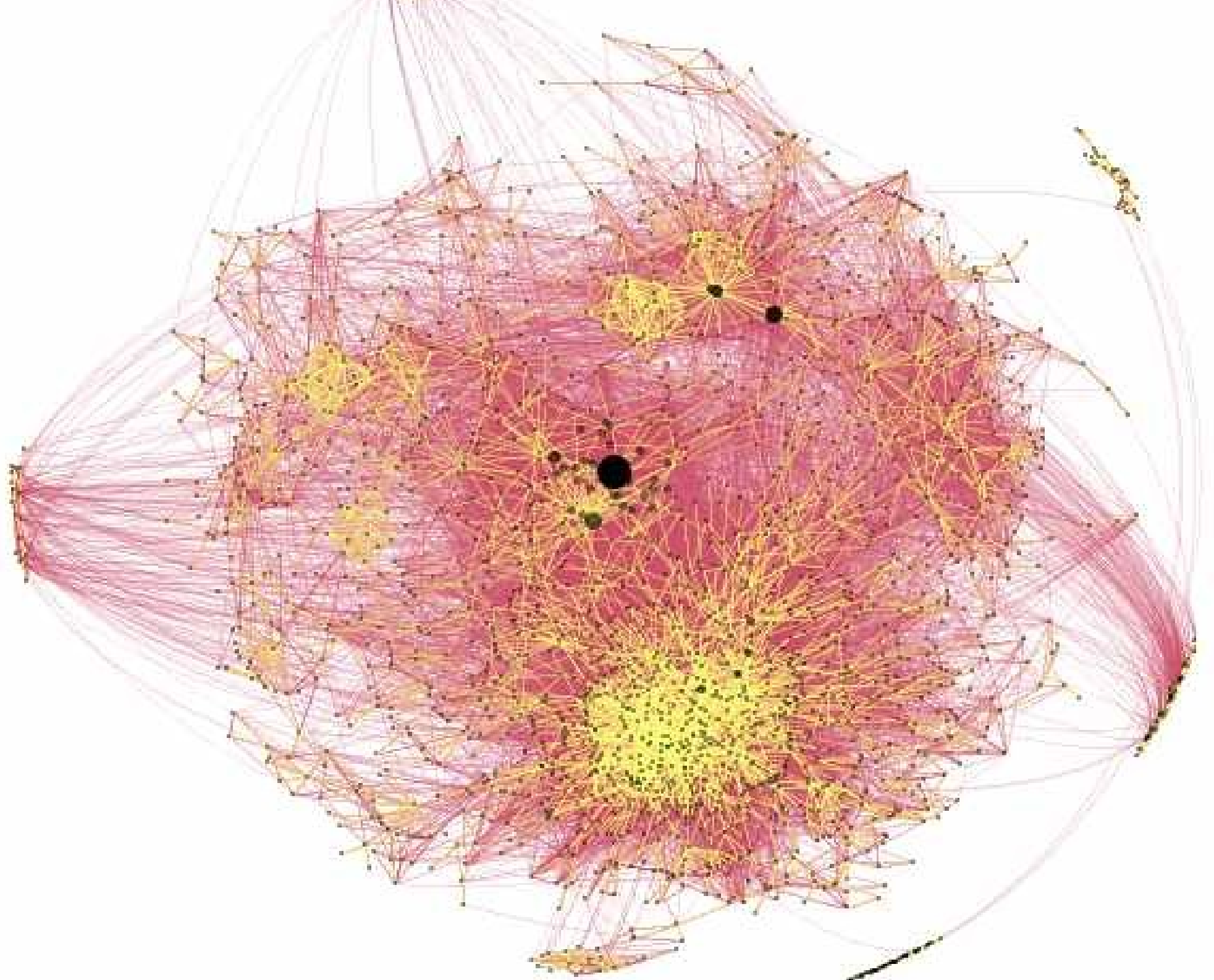


This image, from the graphic design book, *Diagraphics II*, attempts to show the relative market shares of Sotheby's vs. Christies over time.



So, this example shows the use of several tricks to show that *time* is increasing over time.

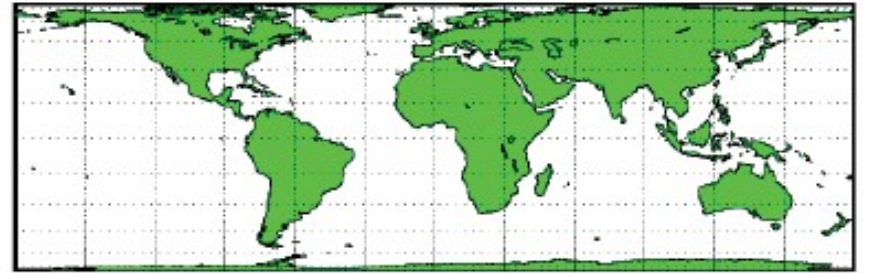
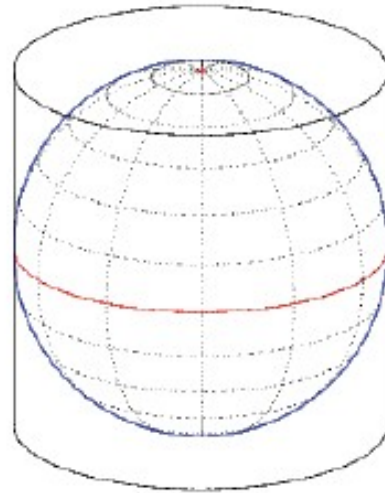
Principles of Infographic Design



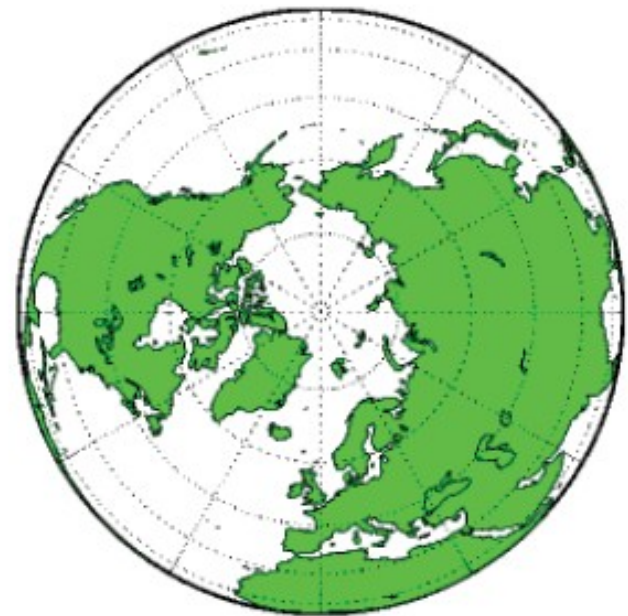
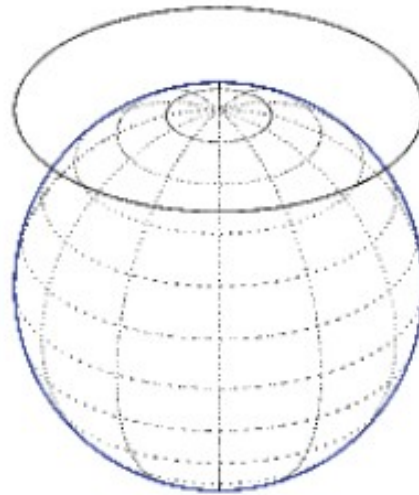
'a species understands just enough of the constant and calculable to base a scheme of behaviour upon it' - Nietzsche

Map projections

Cylindrical



Azimuthal





reality is already quite complex

a graphic is by definition

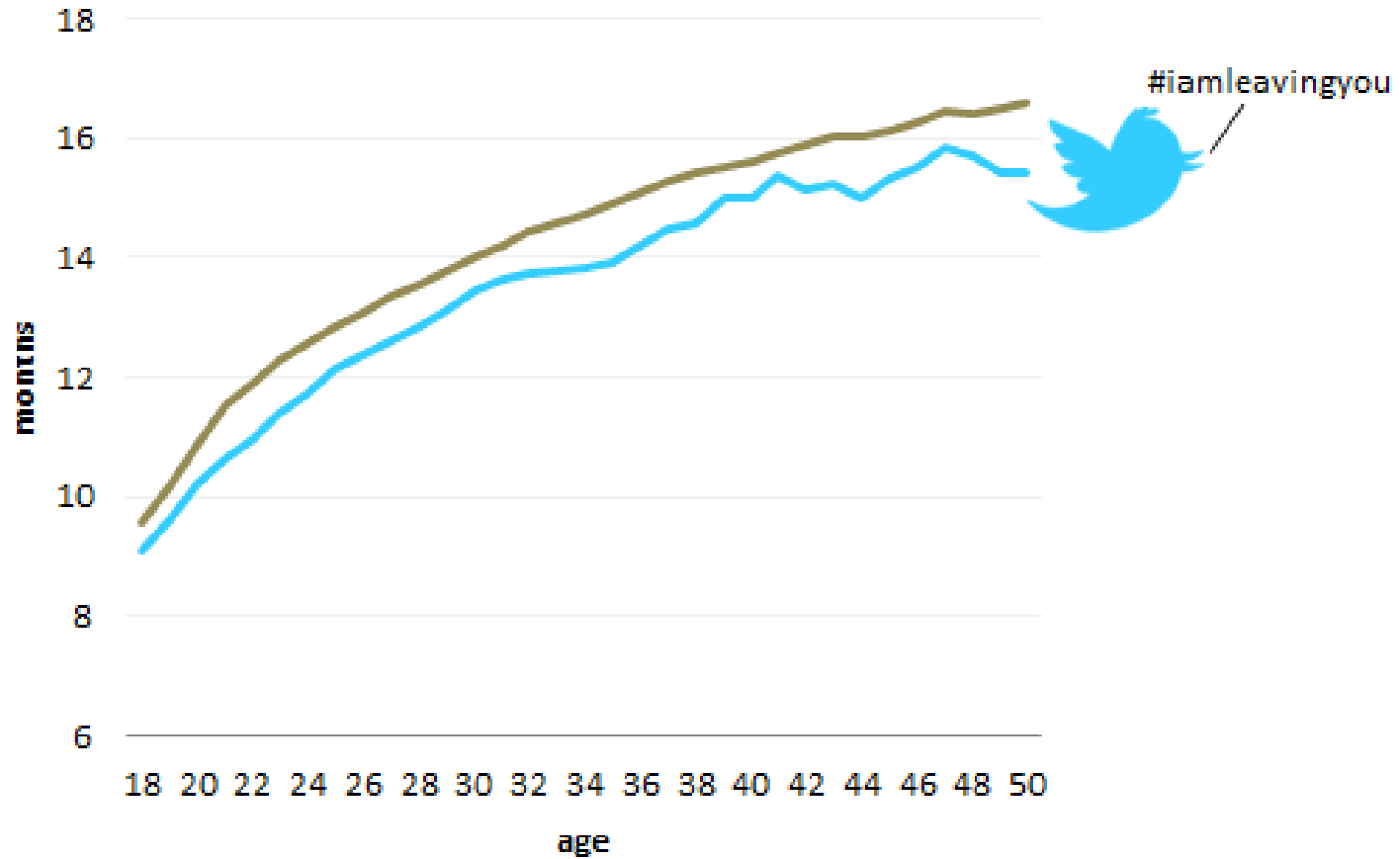
a simplification of reality, so:

show what you want to show

and nothing else

How Long Do Your Relationships Usually Last?

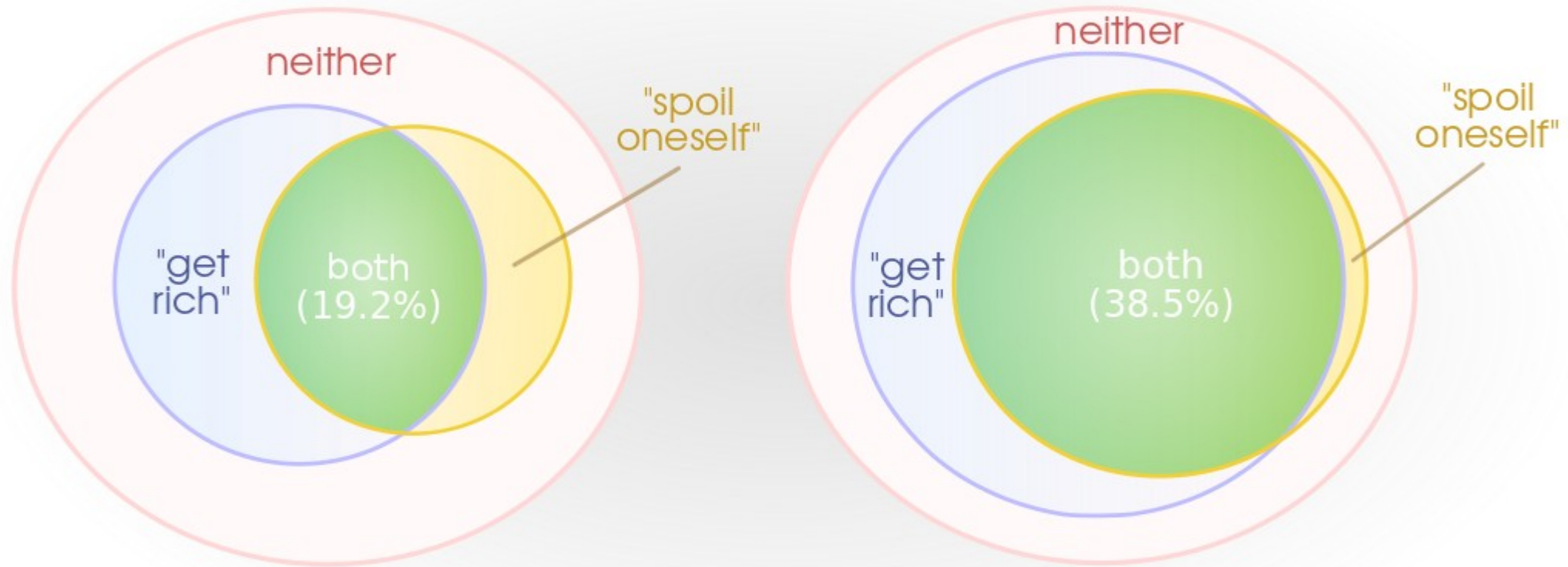
people who use twitter every day vs. everyone else



source: 833,987 OkCupid users

Overlapping priorities

Percentage of Chinese who say they are a person for whom it is important to...



Born before one-child policy

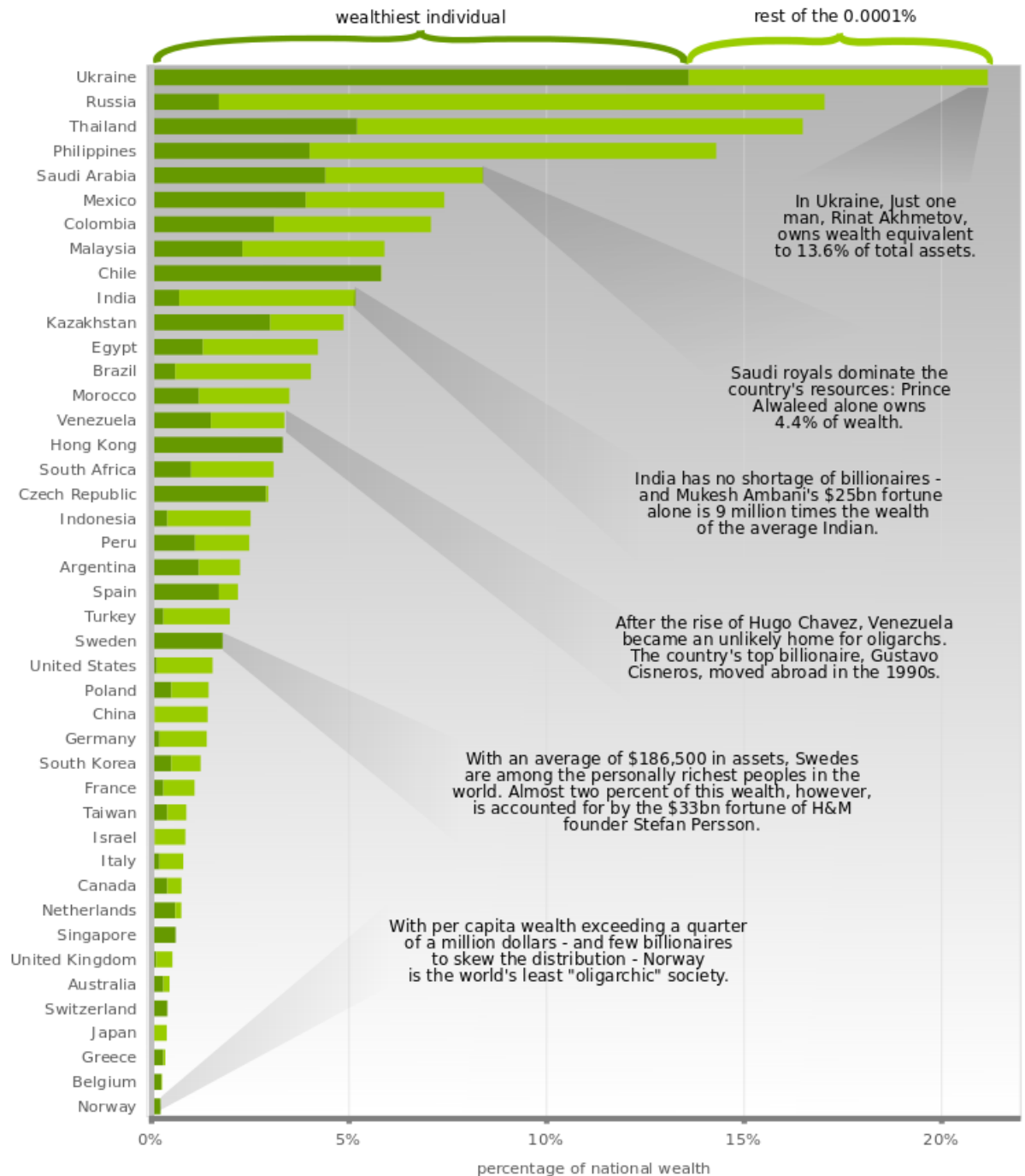
Born under one-child policy

Data source:

World Values Surveys, 2010-2013: www.worldvaluessurvey.org.

Percentage of respondents who said that a person for whom it was important "to have a good time" and "to be rich was 'very much' or 'somewhat like me'"

“Oligarchy Index”





Principles of data graphics design [Tufte]

Above all else show the data

Maximize the data-ink ratio

Erase non-data-ink

Erase redundant data-ink

Revise and edit

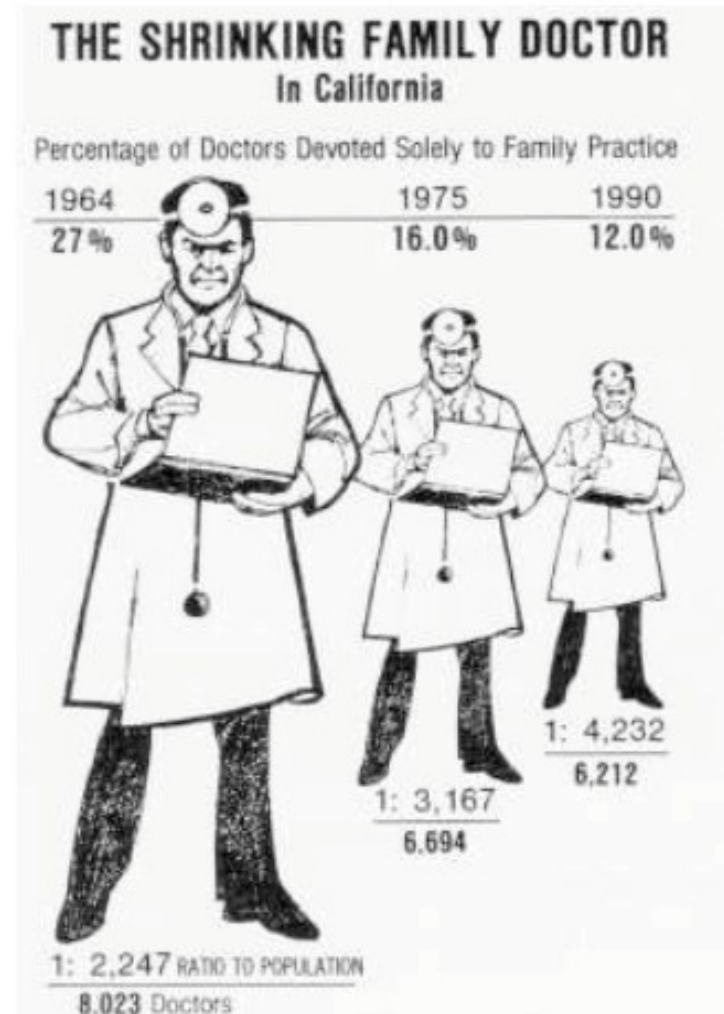
The Lie Factor

size of graphic
size of data

Can be used to exaggerate
differences or similarities
→ deceptive graphics

Use it when evaluating your
own designs

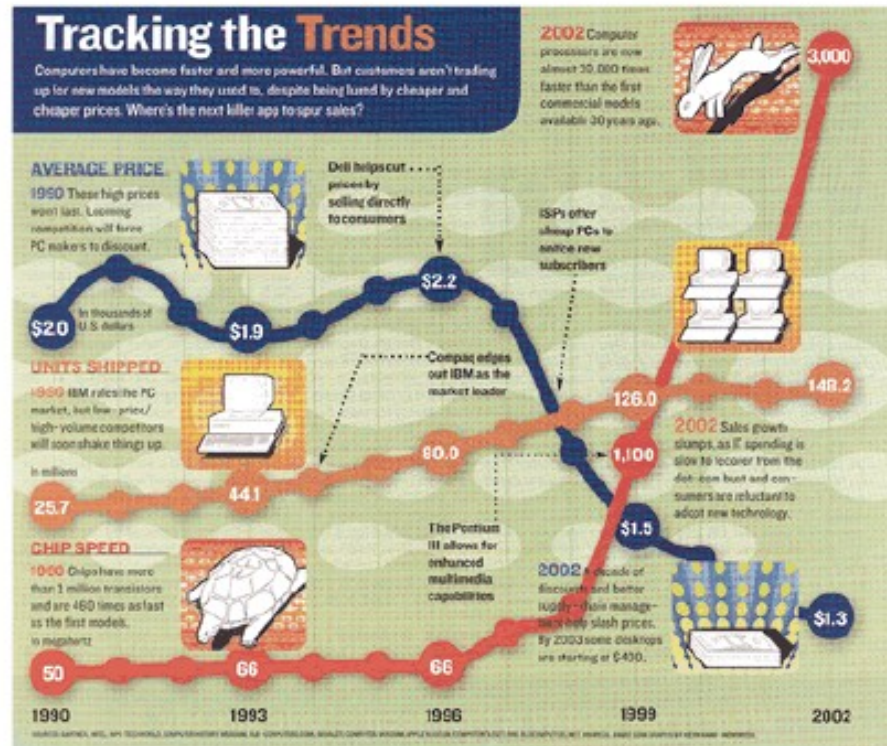
Minimize it



“The shrinking family doctor in California”,
Los Angeles Times, p. 3, August 5, 1979

Chartjunk

Decorative elements that
provide no information
provide distractions



Stephen Few, "Common Mistakes in Data Presentation", August 7, 2004
<http://intelligent-enterprise.informationweek.com>

Chart Junk Considered Useful After All

Robert Kosara; April 22, 2010 Criticism Design Representation Visual Communication



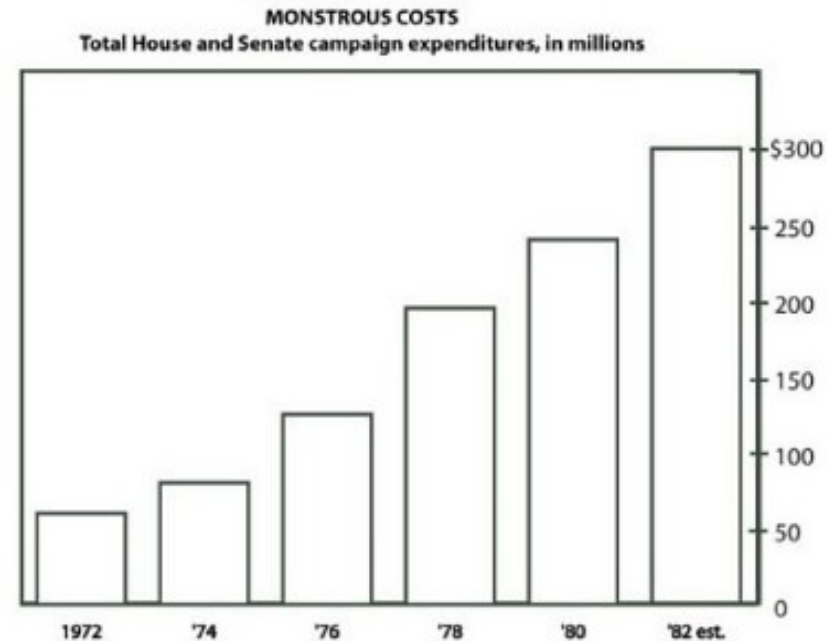
There is almost universal agreement that any extraneous elements in a chart or visualization, elements that do not represent numbers, are detrimental to understanding the data. A paper that was presented at CHI recently described a study to figure out just how bad all this chart junk really was. As it turns out, it's actually rather helpful.

The Study

Quick show of hands: which chart is better, this one:

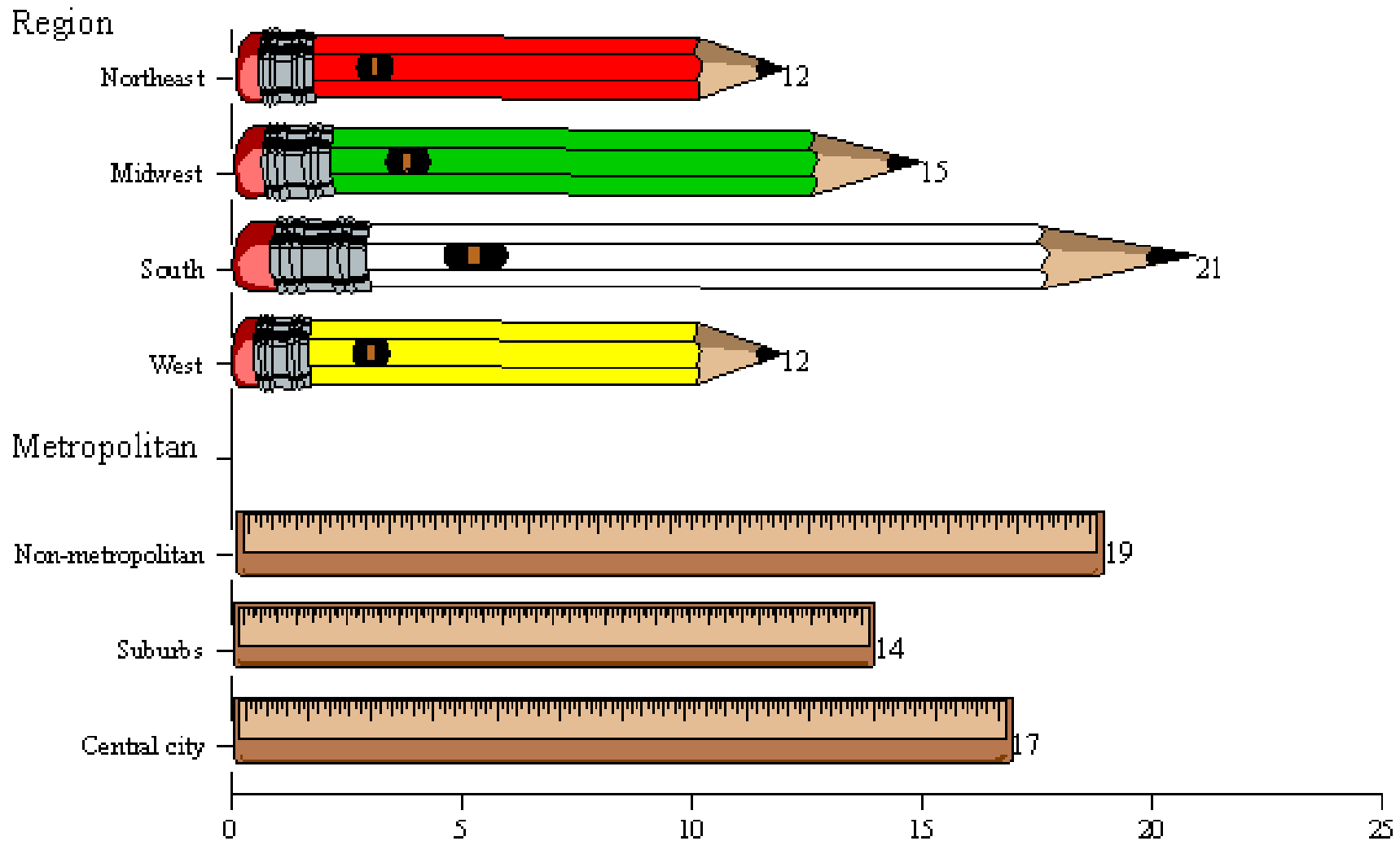


Or this one:



If you subscribe to the Tufte school of thinking, the first chart probably made you cringe. But imagine somebody who just looks at this chart on a newspaper page for a few seconds before reading another article. Which chart is more likely to get its message across?

9. Children 12-17 Years Old Who Have Repeated Grades by Residential Characteristics (Percent of children repeating grades)



Survey of Income and Program Participation (SIPP), US Census Bureau, April 1998

**striking visual
communication
('getting noticed')**

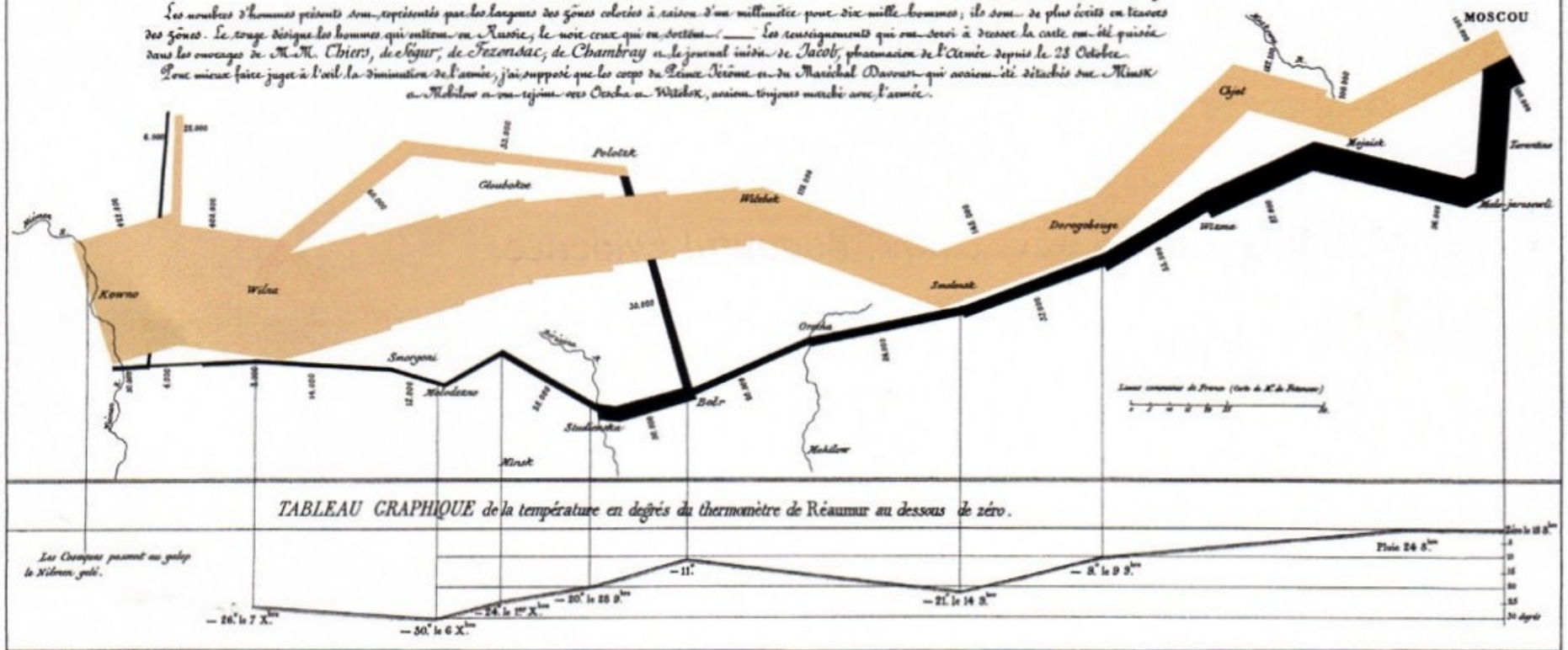
Carte Figurative des pertes successives en hommes de l'Armée Française dans la Campagne de Russie 1812-1813.

Dessiné par M. Minard, Inspecteur Général des Ponts et Chaussées en retraite.

Paris, le 20 Novembre 1869.

Les nombres d'hommes présents sont représentés par les longueurs des zones colorées à raison d'un millimètre pour six mille hommes; ils sont de plus écrits en toutes lettres dans les ouvrages de M. M. Chiers, de Fozendac, de Chambrey et le journal inédit de Jacob, pharmacien de l'Armée depuis le 23 Octobre.

Pour mieux faire juger à l'œil la diminution de l'armée, j'ai supposé que les corps de Leine-Nièrne et du Maréchal Davoust qui avaient été détachés sur Minsk et Mohilew n'en rejoignent pas Orscha et Witebsk, ainsi qu'ils marchent avec l'armée.

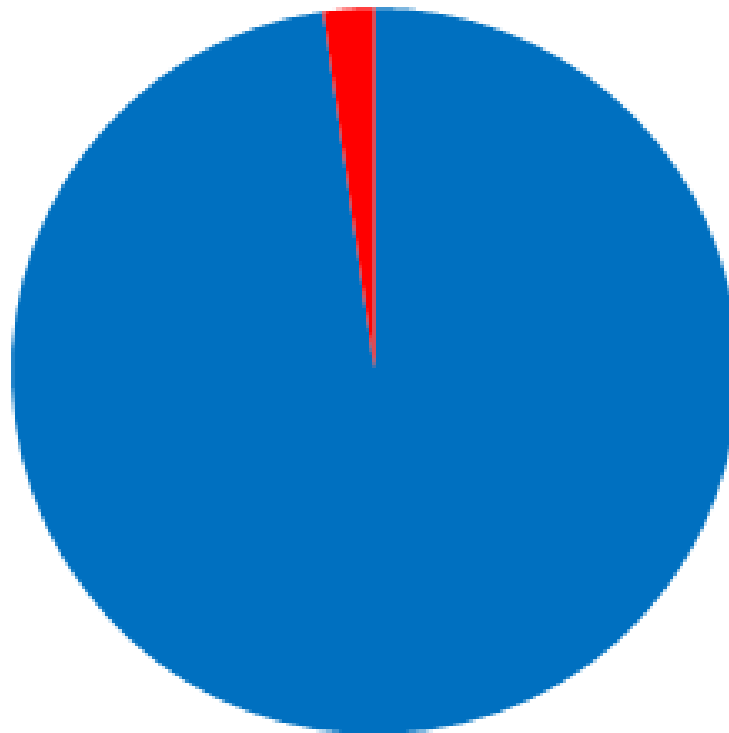


Along par Raynier, à Paris 27° Marie 27° 07" à Paris.

Imp. Lib. Raynier et Desnoes.

This map drawn by Charles Joseph Minard portrays the losses suffered by Napoleon's army in the Russian campaign of 1812. Beginning at the left on the Polish-Russian border near the Niemen, the thick band shows the size of the army (422,000 men) as it invaded Russia. The width of the band indicates the size of the army at each position. In September, the army reached Moscow with 100,000 men. The path of Napoleon's retreat from Moscow in the bitterly cold winter is depicted by the dark lower band, which is tied to temperature and time scales. The remains of the Grande Armée struggled out of Russia with 10,000 men. Minard's graphic tells a rich, coherent story with its multivariate data, far more enlightening than just a single number bouncing along over time. Six variables are plotted: the size of the army, its location on a two-dimensional surface, direction of the army's movement, and temperature on various dates during the retreat from Moscow. It may well be the best statistical graphic ever drawn. Napoleon's March poster \$14 postpaid; English/French version \$18 postpaid.

Frenchmen



■ **totally screwed**

■ **only somewhat screwed**

General guidelines for graphing data

Maximize the data density

Minimize the data-ink ratio

Minimize the lie factor

Be mindful of the visual metaphor

Show data in context

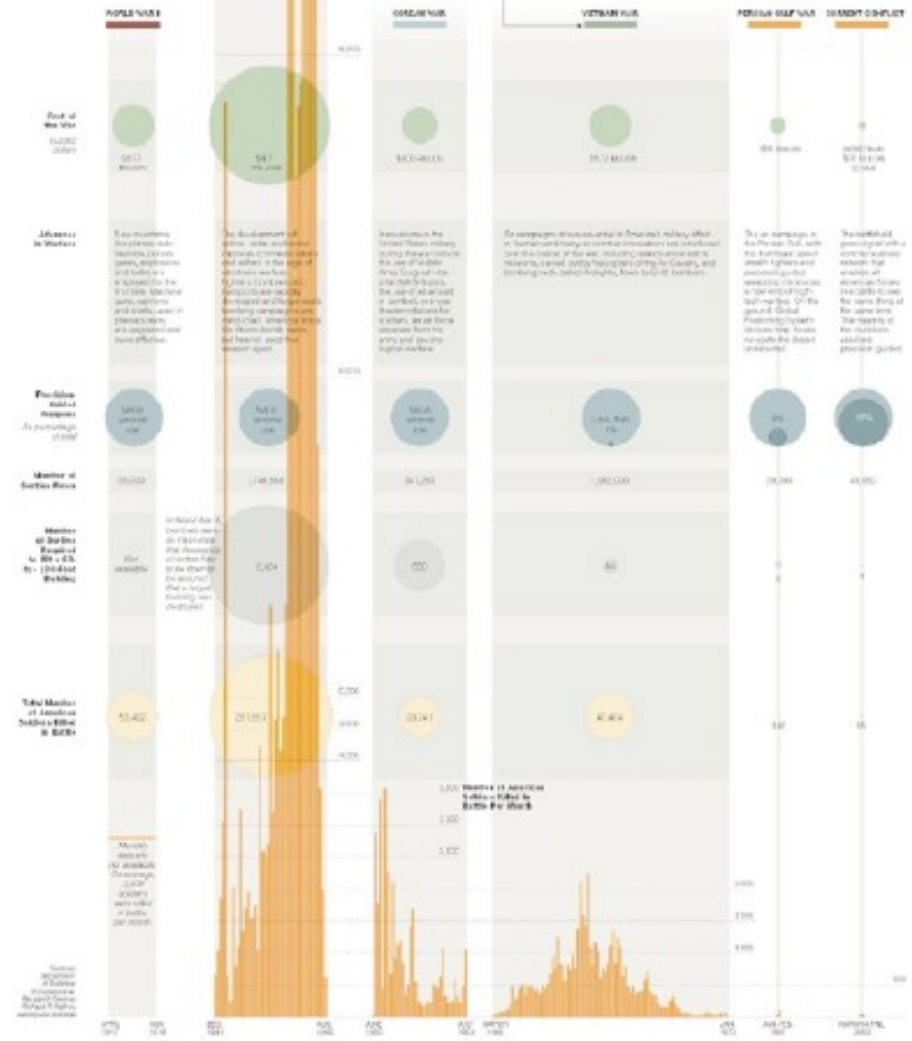
Label well

**In Perspective:
America's Conflicts**

The recent conflict in Iraq represents a new era of global warfare. How do military technologies and ideas change the way America fights its wars, the effect on the political and economic scene, and the role of...



**Where
The Wars
Were Fought**
Color indicates
theater of the conflict.
Size of circle indicates
number of soldiers.



M. Ericson, New York Times
via Hanspeter Pfister, Harvard

The True Size of Africa

A small contribution in the fight against rampant *Immappancy*, by Kai Krause

Graphic layout for visualization only (some countries are cut and rotated)
But the conclusions are very accurate: refer to table below for exact data

COUNTRY	AREA x 1000 km ²
China	9.597
USA	9.629
India	3.287
Mexico	1.964
Peru	1.285
France	633
Spain	506
Papua New Guinea	462
Sweden	441
Japan	378
Germany	357
Norway	324
Italy	301
New Zealand	270
United Kingdom	243
Nepal	147
Bangladesh	144
Greece	132
TOTAL	30.102
AFRICA	30.221

In addition to the well known social issues of *illiteracy* and *innumeracy*, there also should be such a concept as "*immappancy*", meaning *insufficient geographical knowledge*.

A survey with random American schoolkids let them guess the population and land area of their country. Not entirely unexpected, but still rather unsettling, the majority chose "*1-2 billion*" and "*largest in the world*", respectively.

Even with Asian and European college students, geographical estimates were often off by factors of 2-3. This is partly due to the highly distorted nature of the predominantly used mapping projections (such as *Mercator*).

A particularly extreme example is the worldwide misjudgement of the true size of *Africa*. This single image tries to embody the massive scale, which is larger than the *USA*, *China*, *India*, *Japan* and *all of Europe*..... combined!

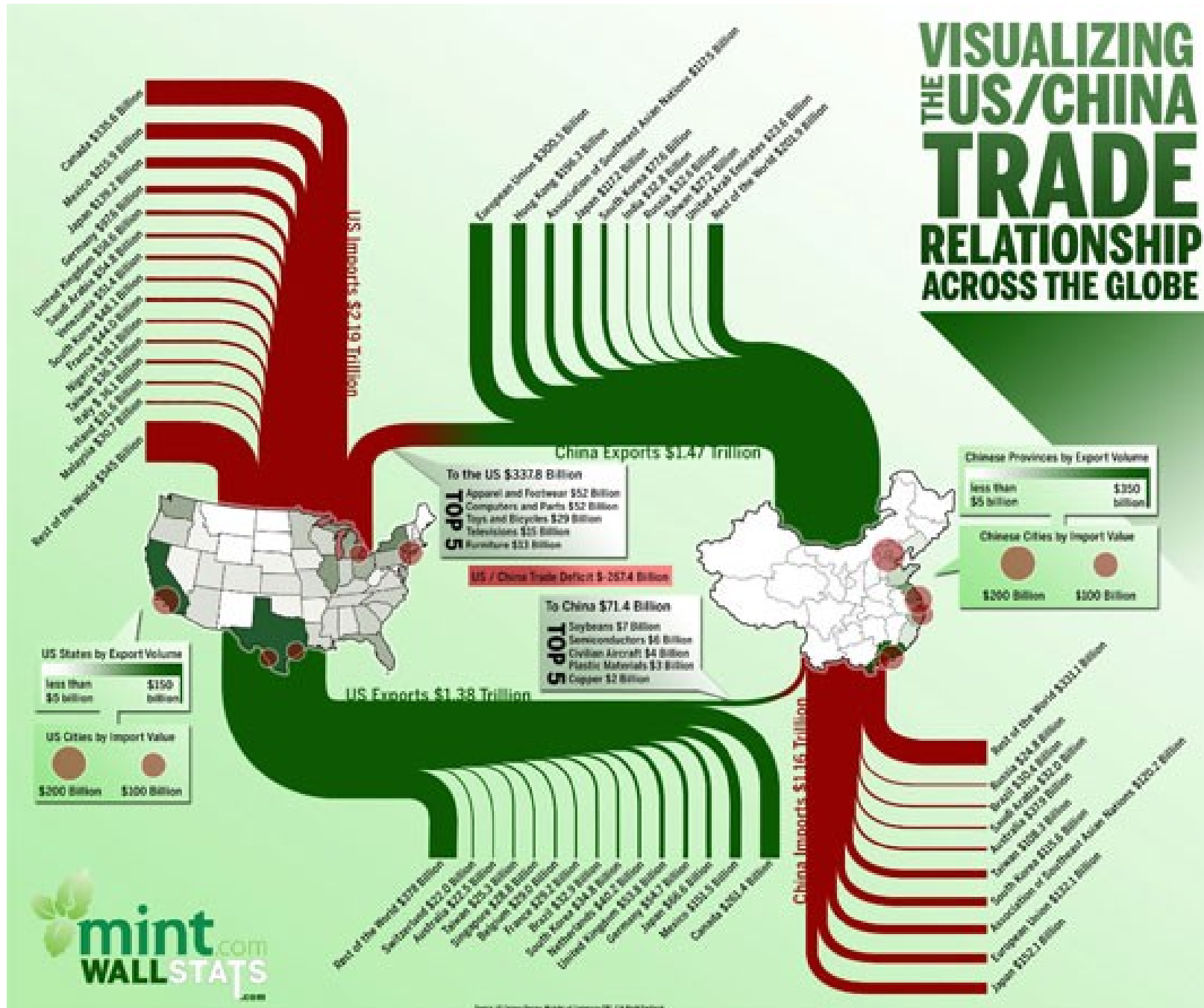
Top 100 Countries

Area in square kilometers, Percentage of World Total
Sources: Britannica, Wikipedia, Almanac 2010

	AREA km ²	%	
1	Russia	17.098.242	11,50
2	Canada	9.984.670	6,70
3	China	9.596.961	6,40
4	United States	9.629.091	6,40
5	Brazil	8.514.877	5,70
6	Australia	7.692.024	5,20
7	India	3.287.263	2,30
8	Argentina	2.780.400	2,00
9	Kazakhstan	2.724.900	1,80
10	Sudan	2.505.813	1,70
11	Algeria	2.381.741	1,60
12	Congo	2.344.858	1,60
13	Greenland	2.166.086	1,50
14	Saudi Arabia	2.149.690	1,40
15	Mexico	1.964.375	1,30
16	Indonesia	1.860.360	1,30
17	Libya	1.759.540	1,20
18	Iran	1.628.750	1,10
19	Mongolia	1.564.100	1,10
20	Peru	1.285.216	0,86
21	Chad	1.284.000	0,86
22	Niger	1.267.000	0,85
23	Angola	1.246.700	0,85
24	Mali	1.240.192	0,83
25	South Africa	1.221.037	0,82
26	Colombia	1.141.748	0,76
27	Ethiopia	1.104.300	0,74
28	Bolivia	1.098.581	0,74
29	Mauritania	1.025.520	0,69
30	Egypt	1.002.000	0,67
31	Tanzania	945.087	0,63
32	Nigeria	923.768	0,62
33	Venezuela	912.050	0,61
34	Namibia	824.116	0,55
35	Mozambique	801.590	0,54
36	Pakistan	796.095	0,53
37	Turkey	783.562	0,53
38	Chile	756.102	0,51
39	Zambia	752.612	0,51
40	Myanmar	676.578	0,45
41	Afghanistan	652.090	0,44
42	Somalia	637.657	0,43
43	France	632.834	0,43
44	C. African Rep	622.984	0,42
45	Ukraine	603.500	0,41
46	Madagascar	587.041	0,39
47	Botswana	582.000	0,39
48	Kenya	580.367	0,39
49	Yemen	527.968	0,35
50	Thailand	513.120	0,34
51	Spain	505.992	0,34
52	Turkmenistan	488.100	0,33
53	Cameroon	475.442	0,32
54	Papua New Guinea	462.840	0,31
55	Uzbekistan	447.400	0,30
56	Morocco	446.550	0,30
57	Sweden	441.370	0,30
58	Iraq	438.317	0,29
59	Paraguay	406.752	0,27
60	Zimbabwe	390.757	0,26
61	Japan	377.930	0,25
62	Germany	357.114	0,24
63	Rep o.t. Congo	342.000	0,23
64	Finland	338.419	0,23
65	Vietnam	331.212	0,22
66	Malaysia	330.803	0,22
67	Norway	323.802	0,22
68	Côte d'Ivoire	322.463	0,22
69	Poland	312.685	0,21
70	Oman	309.500	0,21
71	Italy	301.336	0,20
72	Philippines	300.000	0,20
73	Burkina Faso	274.222	0,18
74	New Zealand	270.467	0,18
75	Gabon	267.668	0,18
76	Western Sahara	266.000	0,18
77	Ecuador	256.369	0,20
78	Guinea	245.857	0,17
79	United Kingdom	242.900	0,16
80	Uganda	241.038	0,16
81	Ghana	238.539	0,16
82	Romania	238.391	0,16
83	Laos	236.800	0,16
84	Guyana	214.969	0,14
85	Belarus	207.600	0,14
86	Kyrgyzstan	199.951	0,13
87	Senegal	196.722	0,13
88	Syria	185.180	0,12
89	Cambodia	181.035	0,12
90	Uruguay	176.215	0,12
91	Suriname	163.820	0,11
92	Tunisia	163.610	0,11
93	Nepal	147.181	0,10
94	Bangladesh	143.998	0,10
95	Tajikistan	143.100	0,10
96	Greece	131.957	0,09
97	Nicaragua	130.373	0,09
98	North Korea	120.538	0,08
99	Malawi	118.484	0,08
100	Eritrea	117.600	0,08
TOP 100 TOTAL	132.632.524	89,34	

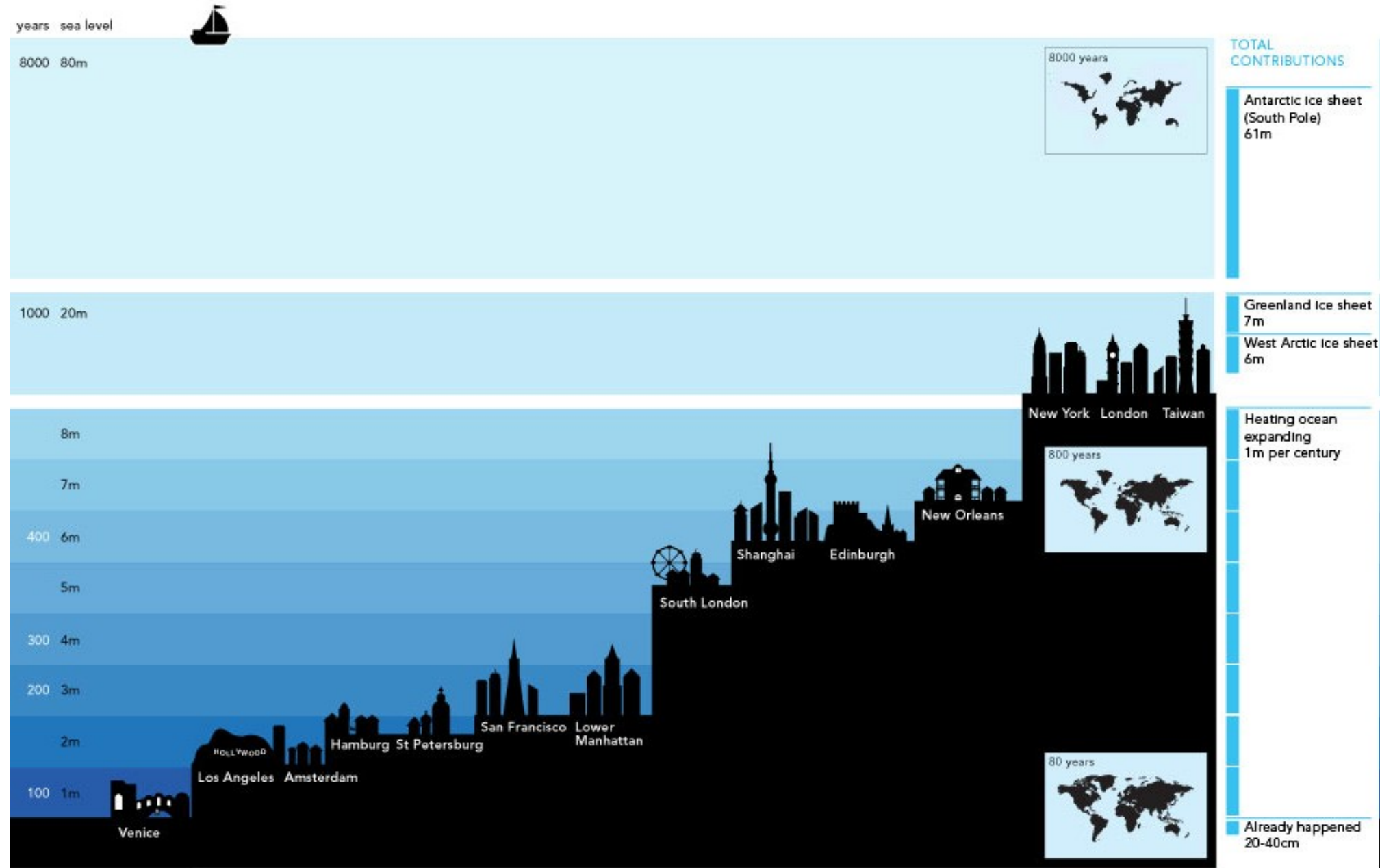


VISUALIZING THE US/CHINA TRADE RELATIONSHIP ACROSS THE GLOBE



When Sea Levels Attack!

Which cities will flood when?



David McCandless // v1.0 // Jan 2010
 Illustrations: Laura Sullivan & Joe Swainson

InformationIsBeautiful.net

note:
 Heights above sea level
 vary across cities.
 Lowest points used.

source: IPCC, NASA,
 NewScientist.com,
 Potsdam Institute,
 Sea Level Explorer

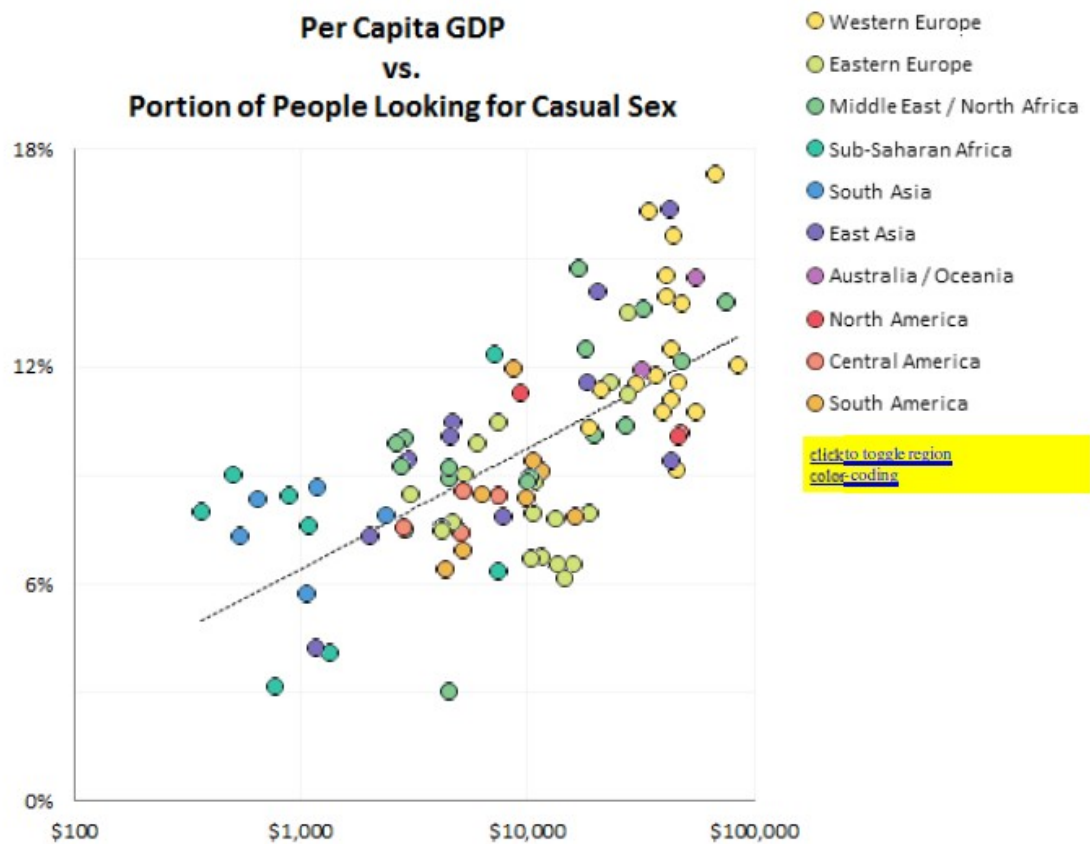
Find Ways to 'Layer' Data

What if there are too many variables/dimensions?

In order to add extra dimensions to data, we can find ways to layer using colours, size, and time

This helps remove text

**Per Capita GDP
vs.
Portion of People Looking for Casual Sex**



source: 1,701,312 OkCupid users. GDP per capita data from the IMF. $R^2 = .47$ for the best-fit line.

Largest Cities by Population, 1500-2012

Year 2012

1	Shanghai, China	17,836,133
2	Karachi, Pakistan	12,991,000
3	Mumbai, India	12,478,447
4	Dhaka, Bangladesh	11,875,000
5	Beijing, China	11,716,000
6	Moscow, Russia	11,514,300
7	Istanbul, Turkey	11,369,613
8	São Paulo, Brazil	11,244,369
9	Tianjin, China	11,090,314
10	Guangzhou, China	11,070,654

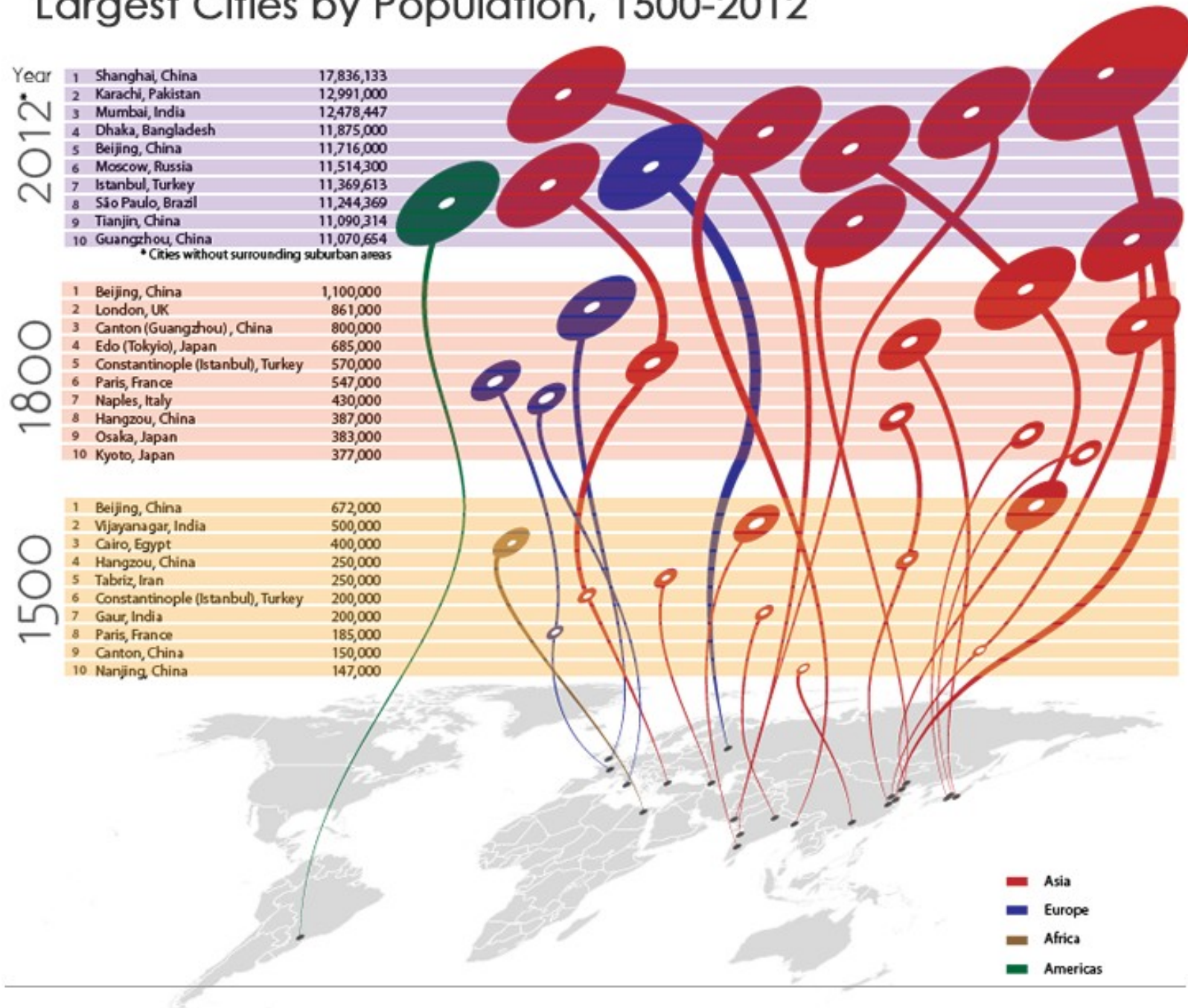
* Cities without surrounding suburban areas

Year 1800

1	Beijing, China	1,100,000
2	London, UK	861,000
3	Canton (Guangzhou), China	800,000
4	Edo (Tokyo), Japan	685,000
5	Constantinople (Istanbul), Turkey	570,000
6	Paris, France	547,000
7	Naples, Italy	430,000
8	Hangzhou, China	387,000
9	Osaka, Japan	383,000
10	Kyoto, Japan	377,000

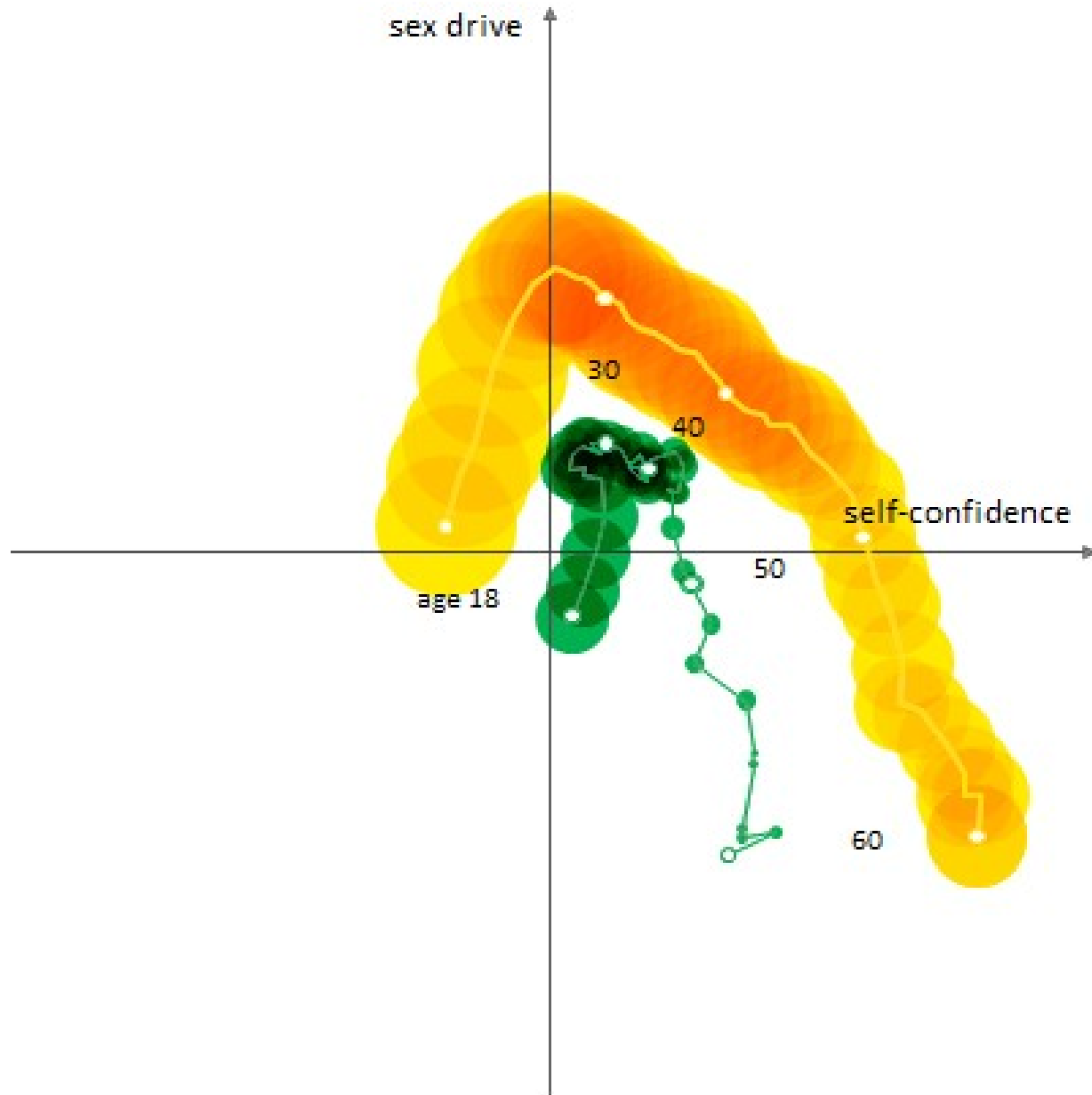
Year 1500

1	Beijing, China	672,000
2	Vijayanagar, India	500,000
3	Cairo, Egypt	400,000
4	Hangzhou, China	250,000
5	Tabriz, Iran	250,000
6	Constantinople (Istanbul), Turkey	200,000
7	Gaur, India	200,000
8	Paris, France	185,000
9	Canton, China	150,000
10	Nanjing, China	147,000

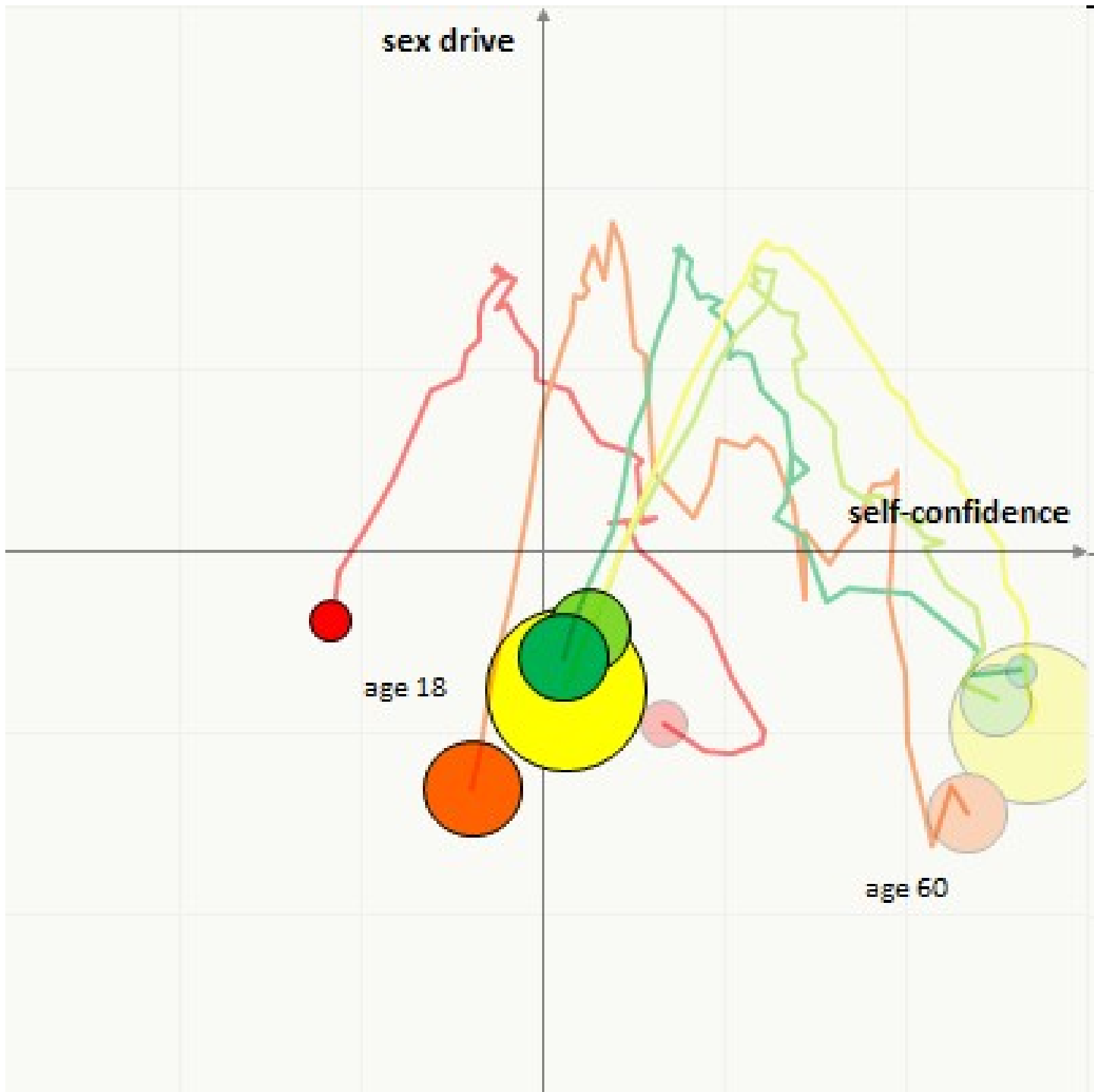


Data source:
 Chandler, T. (1987) Four Thousand Years of Urban Growth: An Historical Census, Lewiston, NY: Edwin Mellen Press
 Geohive Statistics (2012) <http://www.geohive.com>

curvy women vs. skinny women

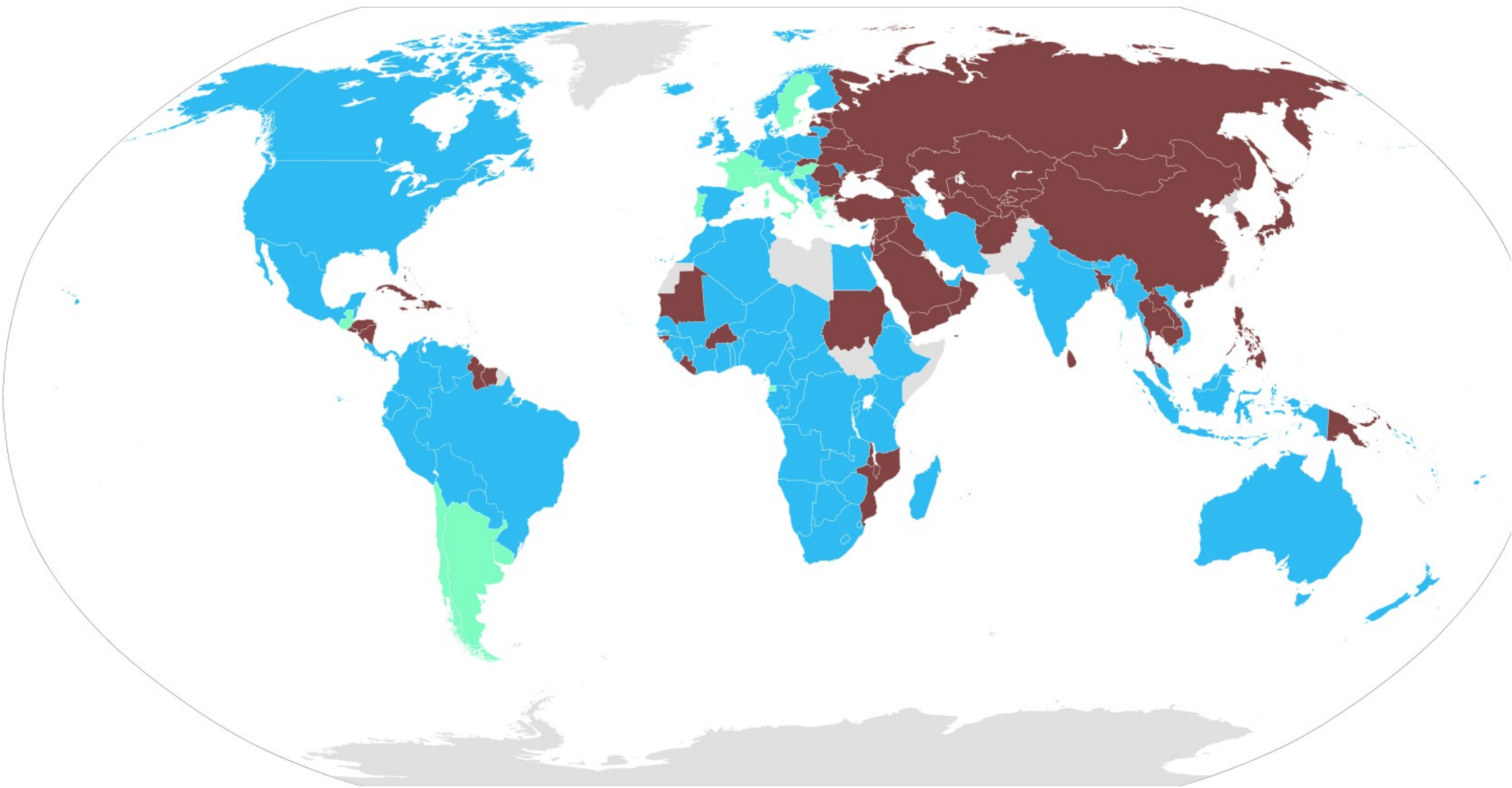


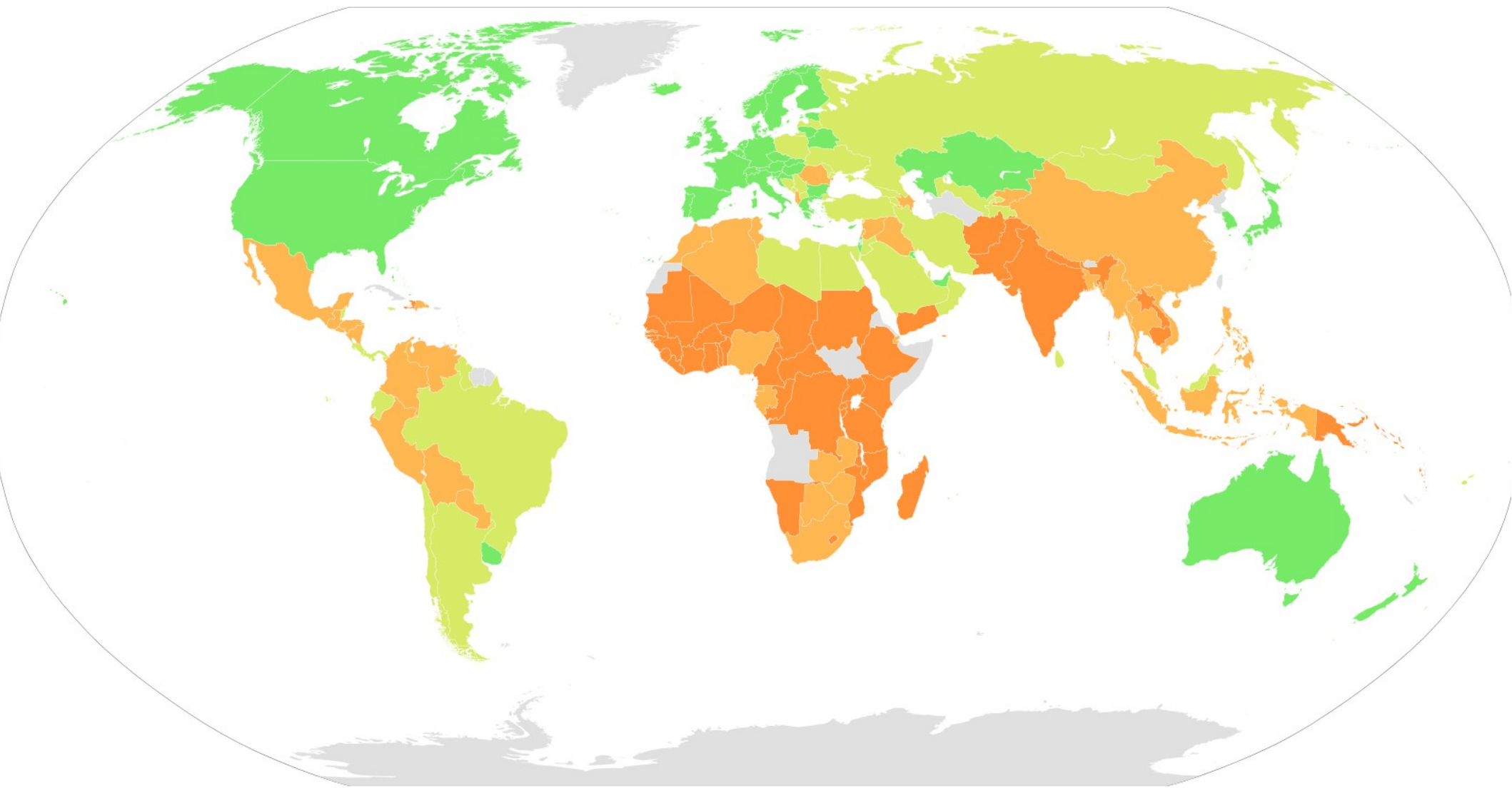
source: 1,394,835 OkCupid users

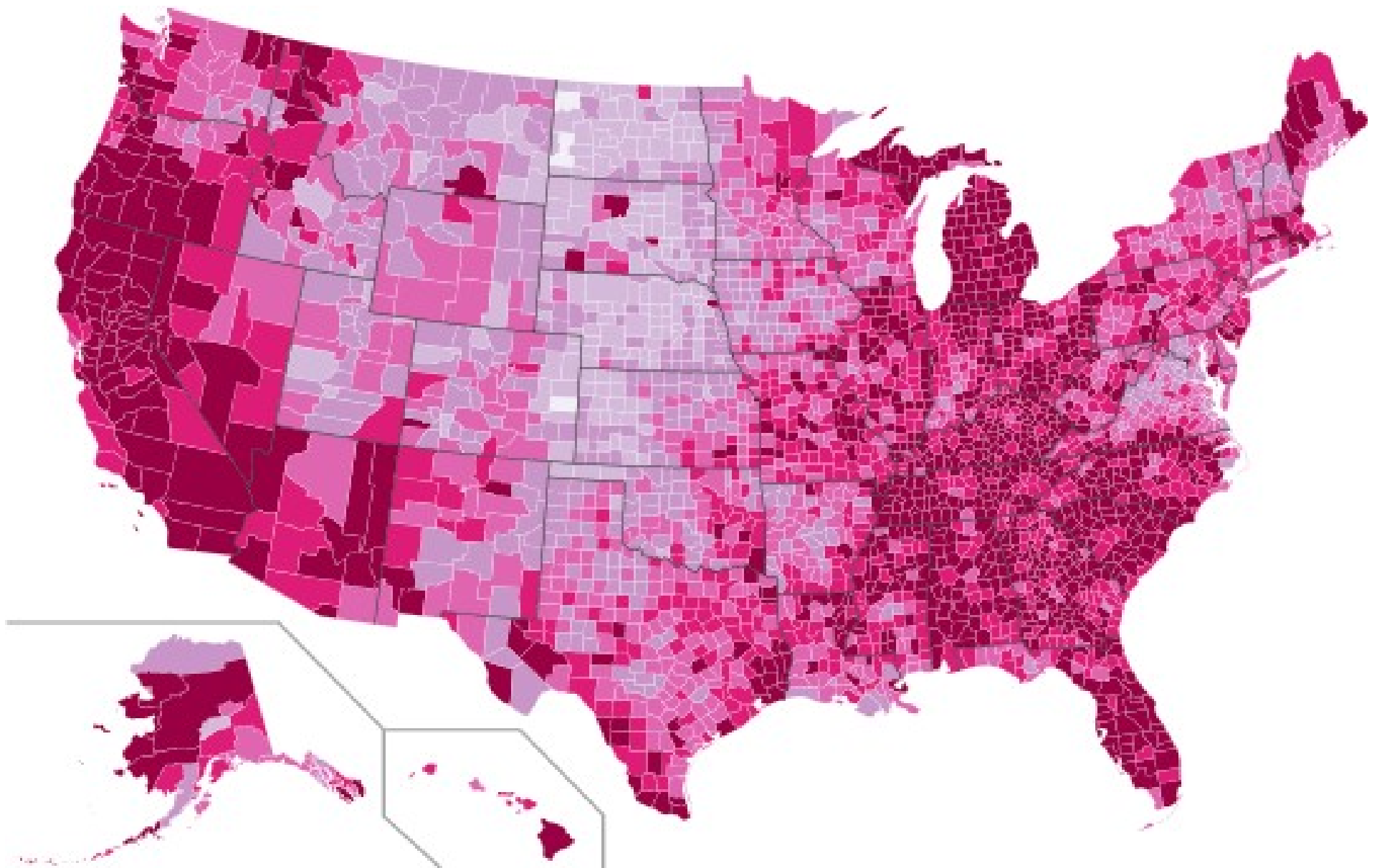


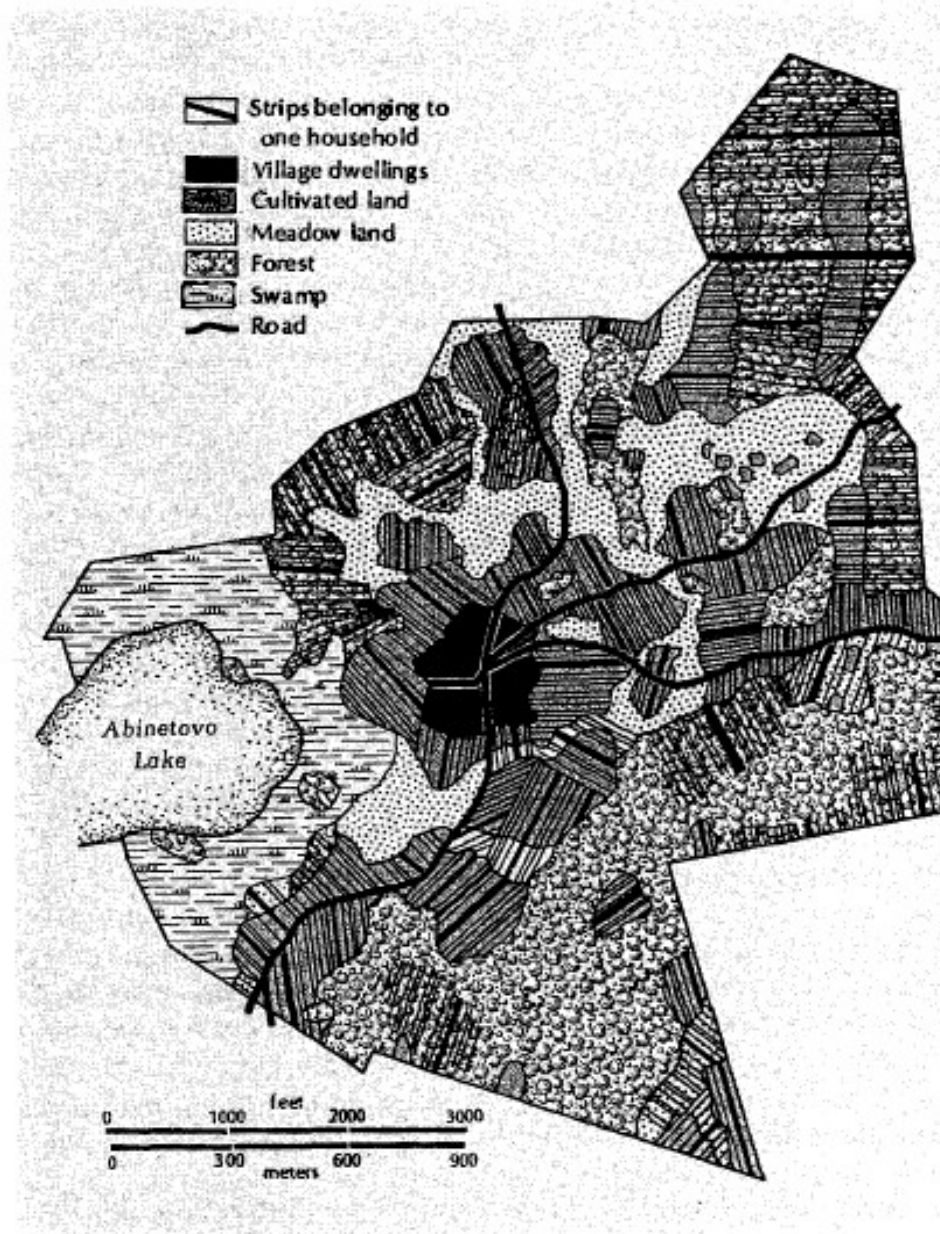
**Find shortcuts to
visualisation**

e.g. automated mapping software

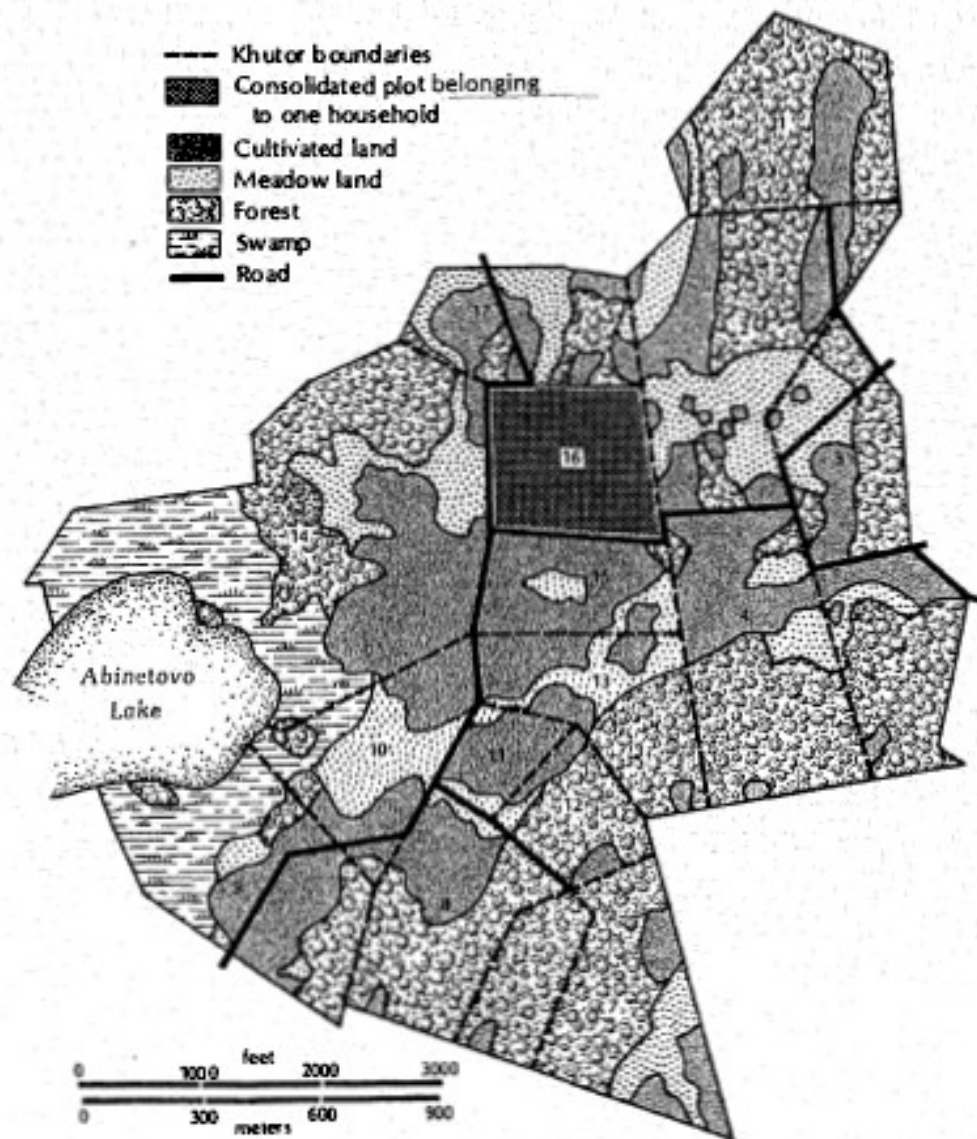






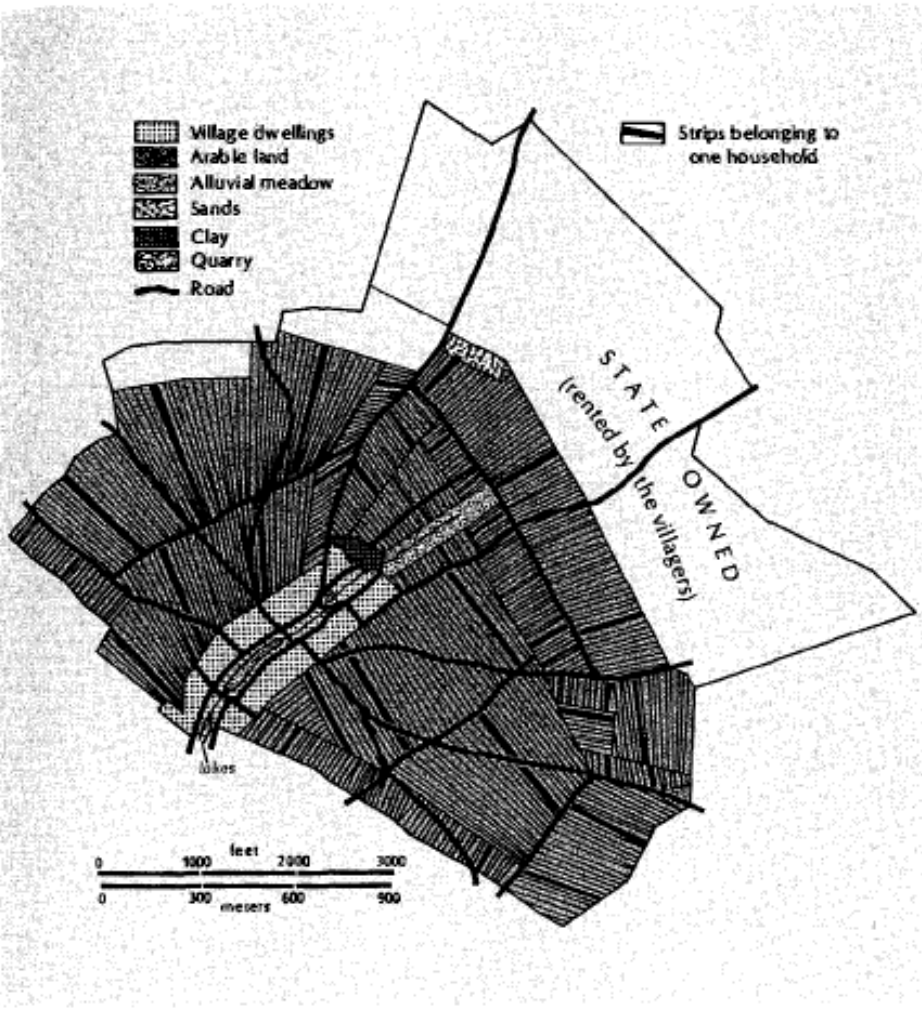


3. Novoselok village before the Stolypin Reform

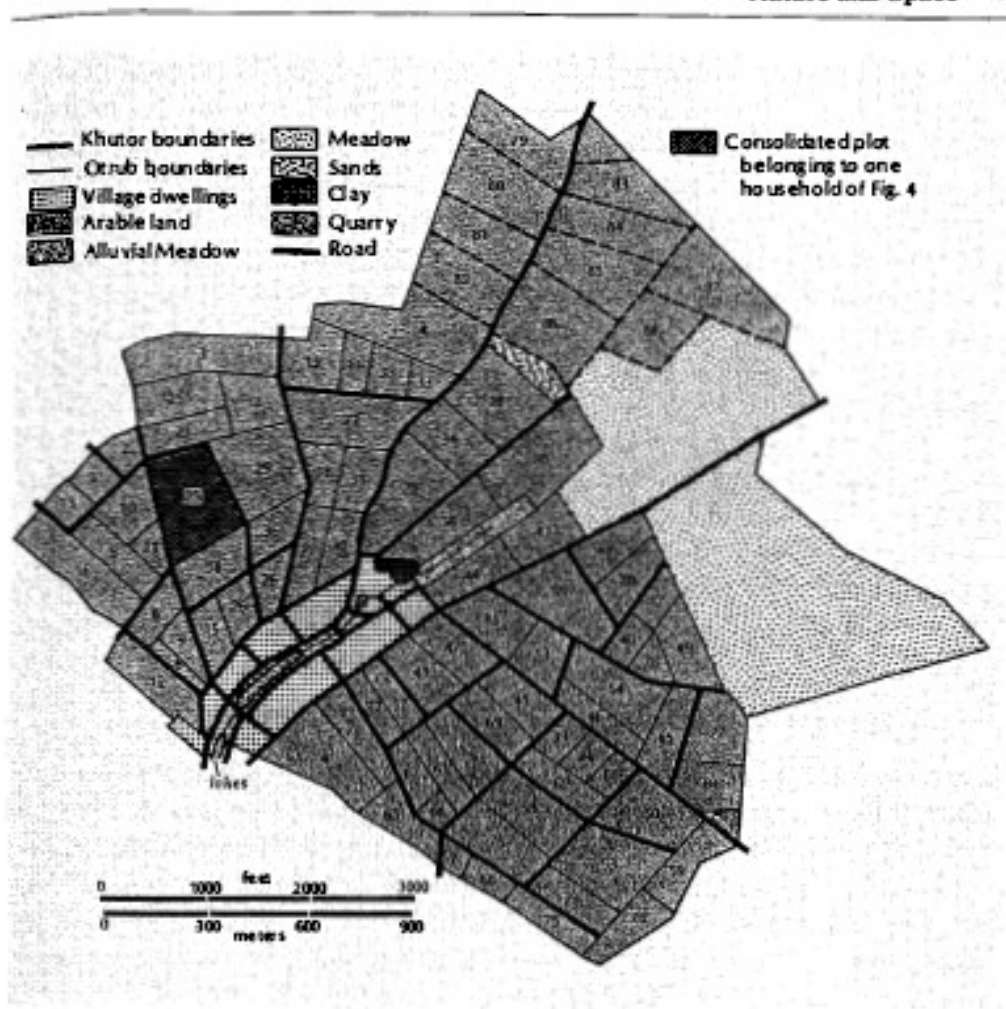


5. Novoselok village after the Stolypin Reform

Source: James Scott, *Seeing Like a State* pp. 40-42



4. Khotynitsa village before the Stolypin Reform



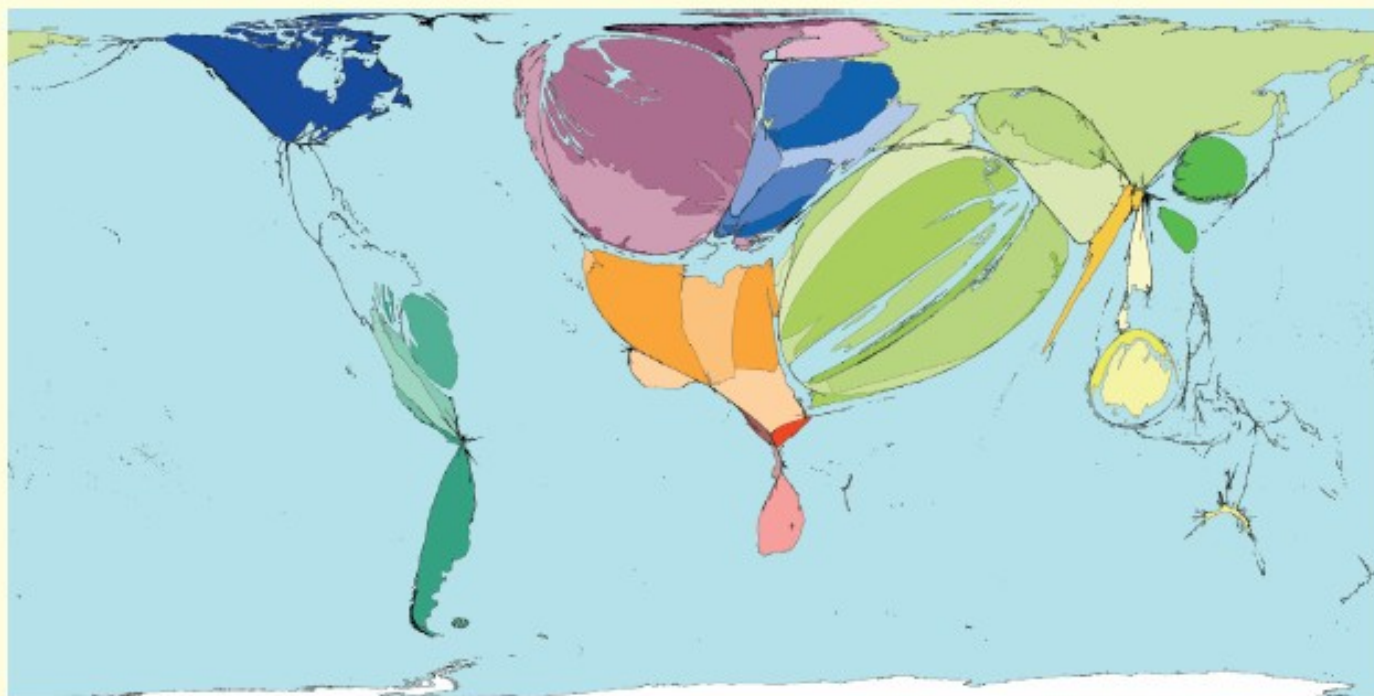
6. Khotynitsa village after the Stolypin Reform

Source: James Scott, *Seeing Like a State* pp. 41-43

The Rules

1. Focus on the **message**
2. Show the **data**, not the design
3. Eliminate **excess text**
4. Create multiple **layers** where needed
5. Minimise the **lie factor**
6. Find **shortcuts** to visualise data quickly

Refined Petroleum Exports



Petroleum refinement includes various steps: fractionation separates the hydrocarbon compounds within the crude petroleum; conversion changes the hydrocarbon structures; treatment to remove impurities and further separation processes; blending and formulating produces the finished products. The products of refinement include fuel oils, kerosene, gasoline and lubricating oils. Refined petroleum is 2.4% of worldwide earnings from exports.

The Middle East has the highest net refined petroleum exports (US\$), this region is where most extraction occurs and has the largest known oil reserves.

Territory size shows the proportion of worldwide net exports of refined petroleum (in US\$) that come from there. Net exports are exports minus imports. When imports are larger than exports the territory is not shown.



Land area

Technical notes

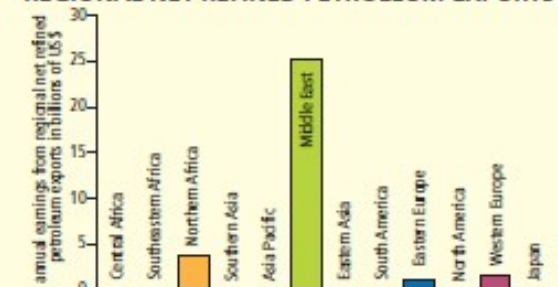
- Data source: United Nations Conference on Trade and Development, 2002.
- *There were no net refined petroleum exports recorded for 138 territories.
- Refined petroleum includes gasolines, kerosene, distillates, lubricating oils and diesel fuels.
- See website for further information.

MOST AND LEAST US\$ OF NET REFINED PETROLEUM EXPORTS

Rank	Territory	Value	Rank	Territory	Value
1	Bahrain	3160	53	Bosnia Herzegovina	4.07
2	Kuwait	1995	54	Kenya	3.66
3	United Arab Emirates	1285	55	Angola	3.44
4	Qatar	869	56	Australia	3.06
5	Trinidad & Tobago	853	57	Morocco	2.08
6	Netherlands	447	58	Peru	1.25
7	Singapore	380	59	India	0.48
8	Lithuania	278	60	Cameroon	0.20
9	Belgium	230	62	Democratic Republic of Congo	0.04
10	Libyan Arab Jamahiriya	225	61	Equatorial Guinea	0.04

US\$ worth of annual net refined petroleum exports per person living in that territory*

REGIONAL NET REFINED PETROLEUM EXPORTS



“The rapid economic growth of the 1960s was driven by expansion of energy-consuming industries based on lavish use of cheap Middle East oil.”

Yoko Kitazawa, 1990

This report was presented at the training methodological workshop
"Economic and Social Changes: values effects across Eurasia".

March 31 - April 6, 2015 – Turkey.

http://lcsr.hse.ru/en/seminar_m2015

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http://lcsr.hse.ru/seminar_m2015