Who is data visualization for?

Data Visualization: Perils and Promises

A suggestions for the use of Data Viz in education

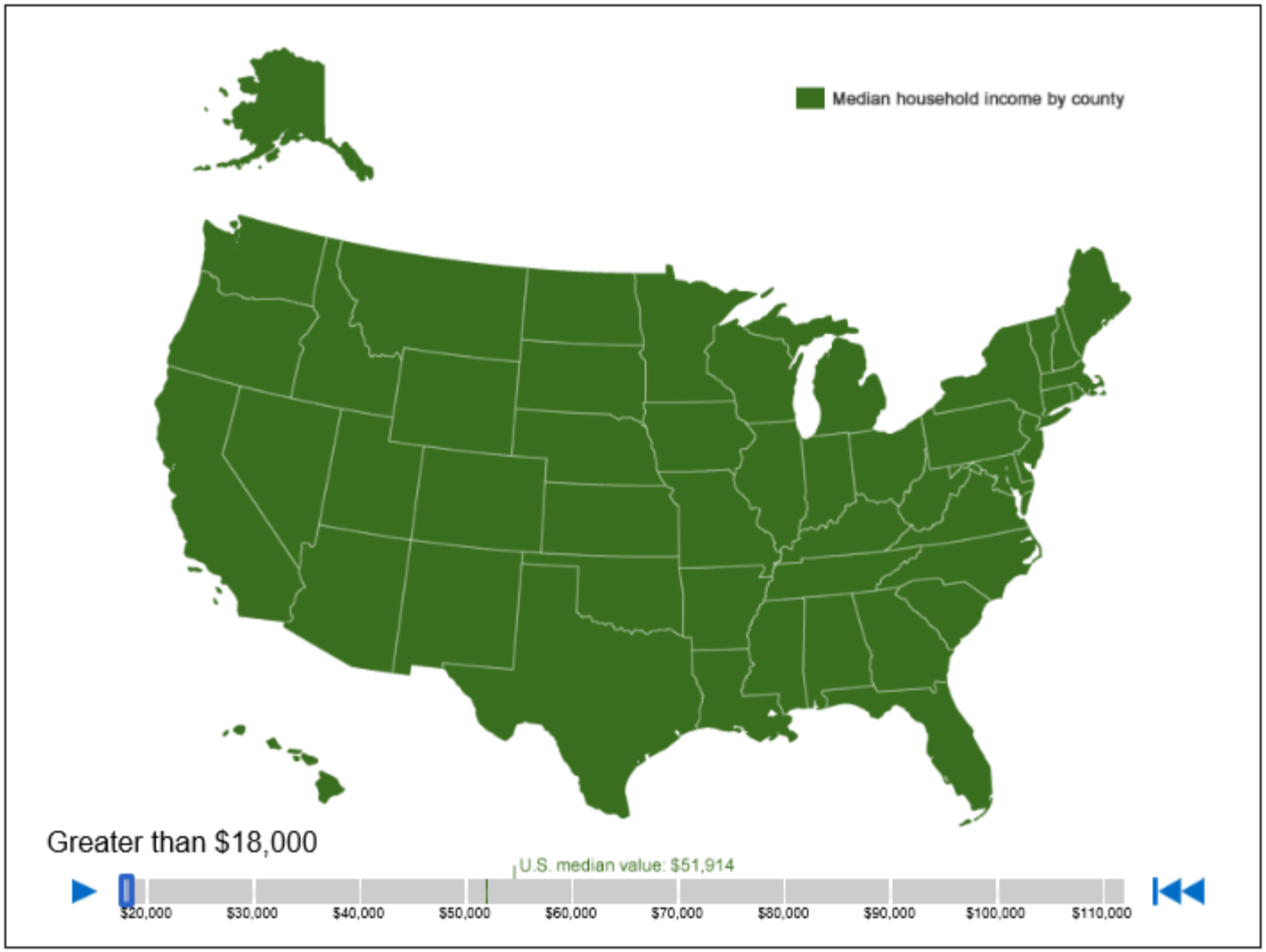
Eric Newburger

U S Census Bureau

United States Census Bureau

Islands of High Income

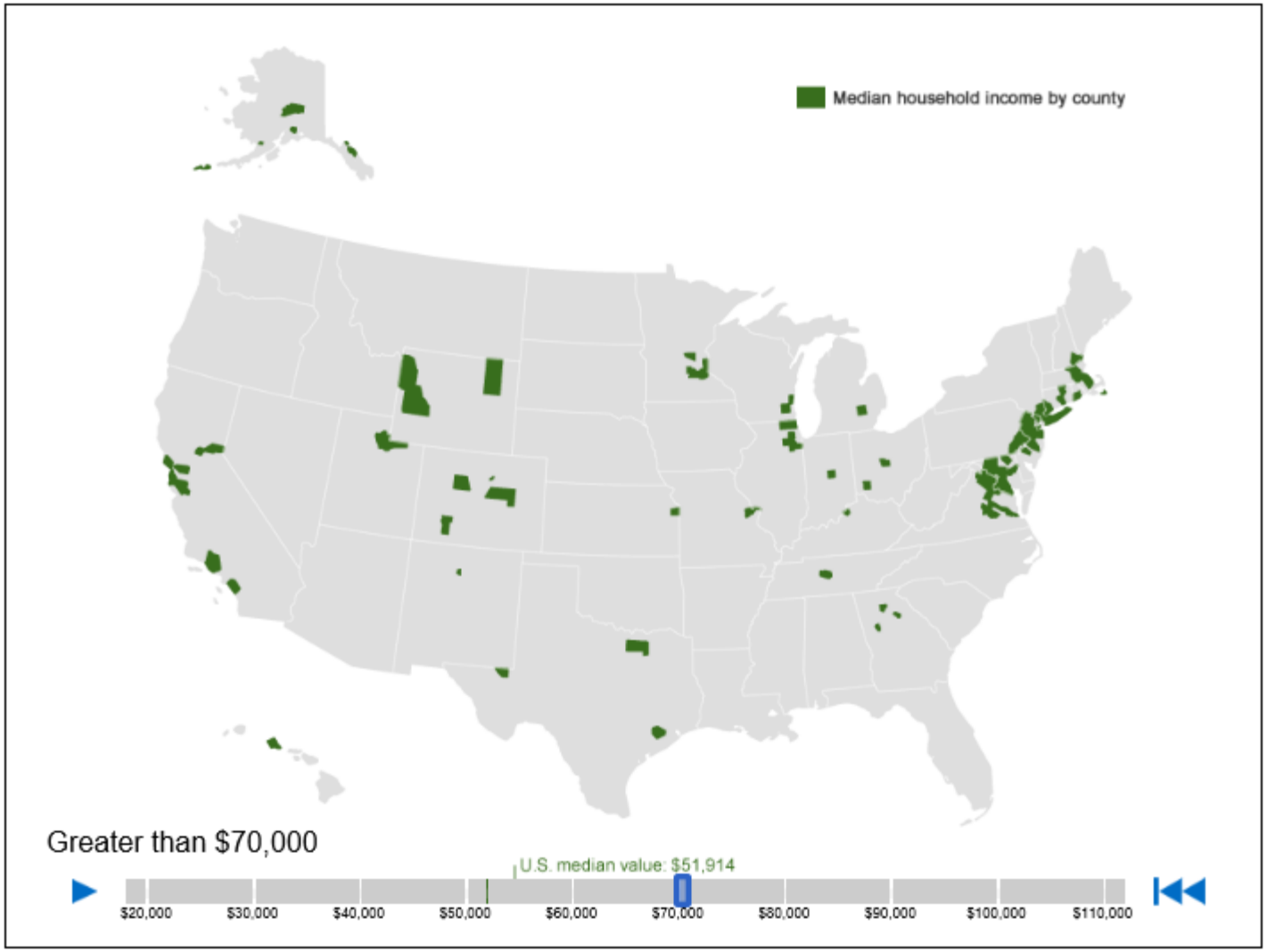
September 20, 2012



United States Census Bureau

Islands of High Income

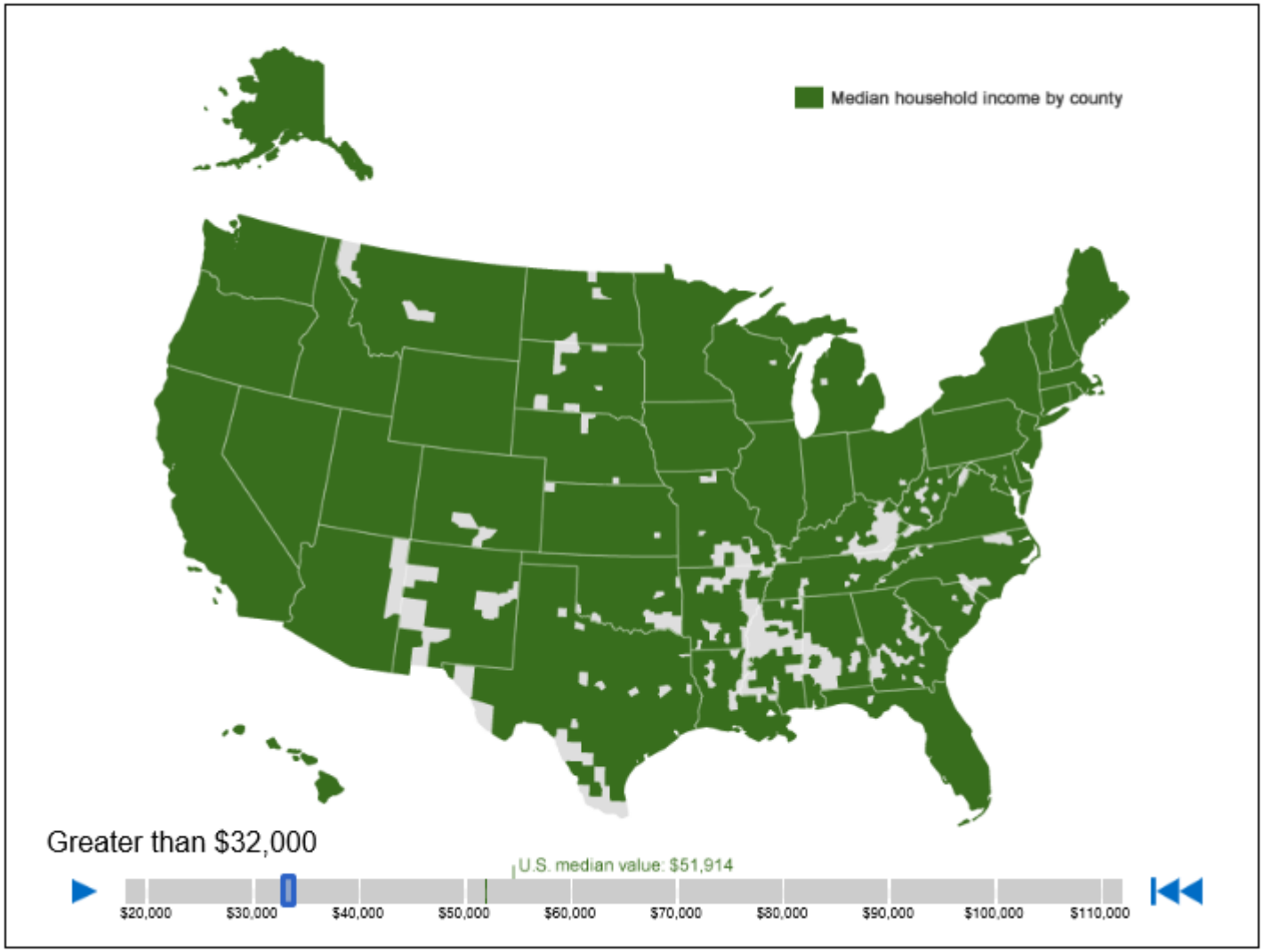
September 20, 2012



United States Census Bureau

Islands of High Income

September 20, 2012



United States Census Bureau

The Census Bureau's **Data Visualization Mission:**

To **increase the ratio of graphics to text** in Census Bureau publications, both online and in print;

To **open our datasets and analyses** to a broader public.

United States Census Bureau

STATISTICS2013.ORG INTERNATIONAL YEAR OF STATISTICS PARTICIPATING ORGANIZATION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(race, ancestry, tribe)
Industry Codes
(NAICS industry, ...)
Your source for population, housing, economic, and geographic information
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for
state, county or place (optional)
GO
topics
race/ancestry
industries
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STATISTICAL ATLAS

OF THE

UNITED STATES

BASED ON THE RESULTS OF THE

NINTH CENSUS 1870

WITH CONTRIBUTIONS FROM MANY EMINENT MEN OF SCIENCE
AND SEVERAL DEPARTMENTS OF THE GOVERNMENT.

COMPILED UNDER AUTHORITY OF CONGRESS

BY

FRANCIS A. WALKER, M.A.

SUPERINTENDENT OF THE 9TH CENSUS,

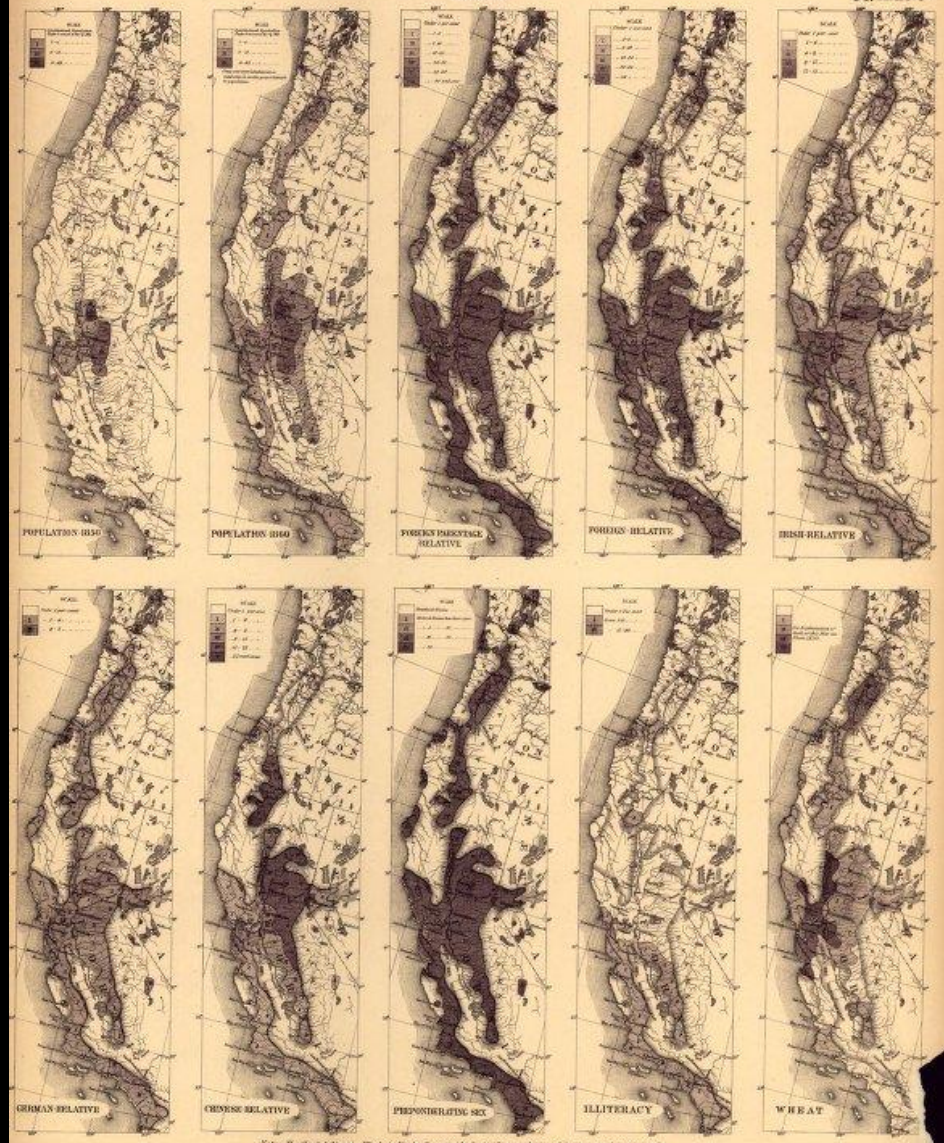
PROFESSOR OF POLITICAL ECONOMY AND HISTORY,
SHEFFIELD SCIENTIFIC SCHOOL OF YALE COLLEGE.

JULIUS BIEN, LITH.

1874.

MAPS
OF THE
PACIFIC COAST
EXHIBITING VARIOUS SUBJECTS.
Compiled from the Statistics of the Eighth and Ninth Censuses
OF THE UNITED STATES
by
S.A.GALPIN.

Pl. XXXVI[b]



Note: The Shaded Lines in Black indicate the extreme limit of a population of 2 or more to the square mile.
The shading points towards the regions which have a population of less than 2 to the square mile.

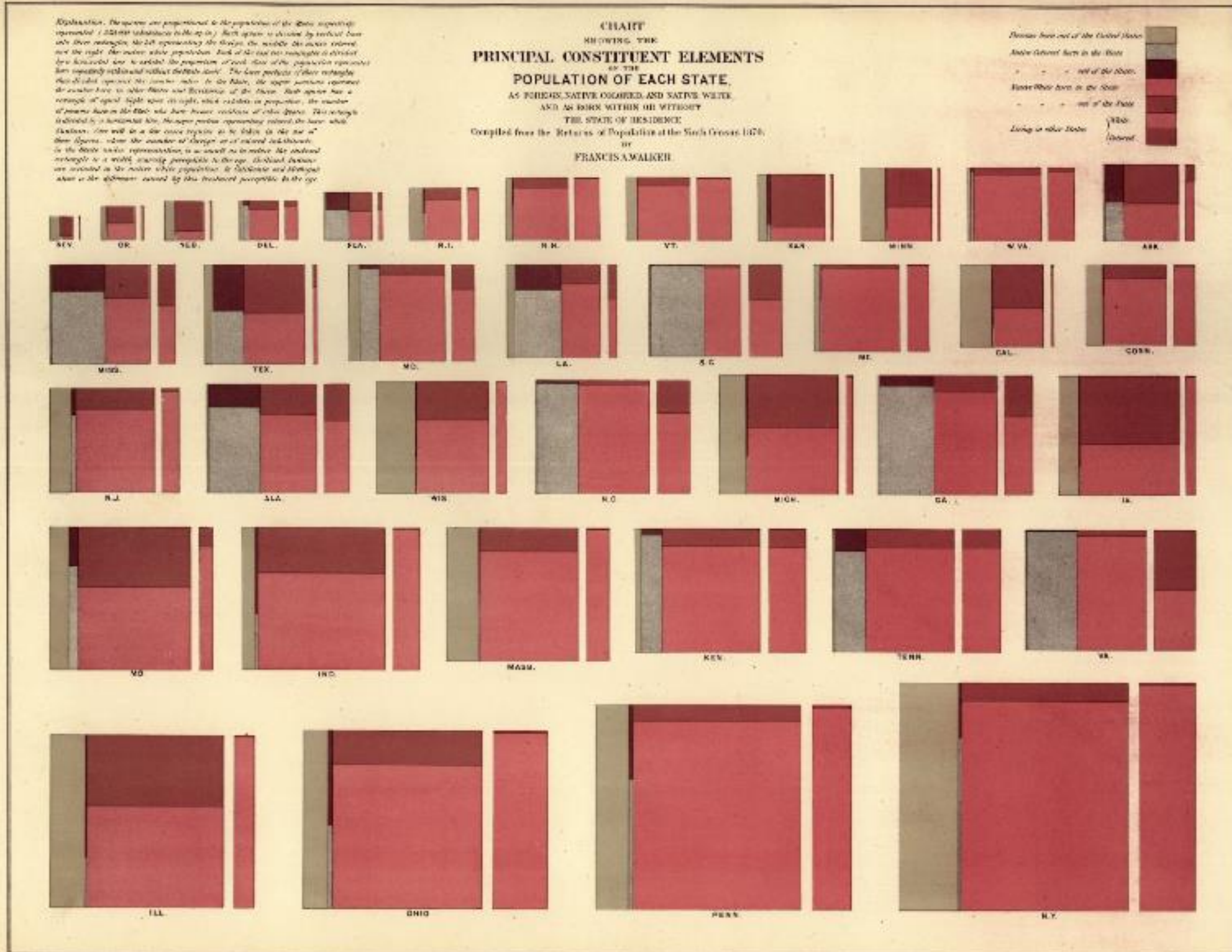


CHART
SHOWING THE
PRINCIPAL CONSTITUENT ELEMENTS
OF THE
POPULATION OF EACH STATE,
AS FOREIGN, NATIVE COLORED, AND NATIVE WHITE,
AND AS BORN WITHIN OR WITHOUT
THE STATE OF RESIDENCE.
Compiled from the Returns of Population at the Ninth Census 1870.
BY
FRANCIS A. WALKER.
NEV.
OR.
NEB.
DEL.
FLA.
R.I.
N.H.
VT.
KAN.
MINN.
W.VA.
ARK.
MISS.
TEX.
MD.
LA.
S.C.
ME.
CAL.
CONN.
N.J.
ALA.
WIS.
N.C.
MICH.
GA.
IA.
MO.
IND.
MASS.
KEN.
TENN.
VA.
ILL.
OHIO
PENN.
N.Y.

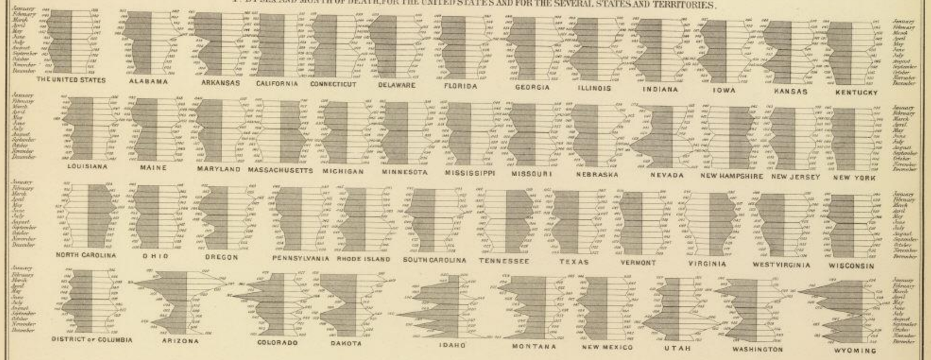
PL.XX

In the construction of the sets of diagrams numbered 1 and 2, the total number of deaths occurring during the year, reported in the census, is reduced to thousandths, and the number of thousandths within each month is represented by the distance measured on the horizontal lines, severally, from the perpendicular base line.

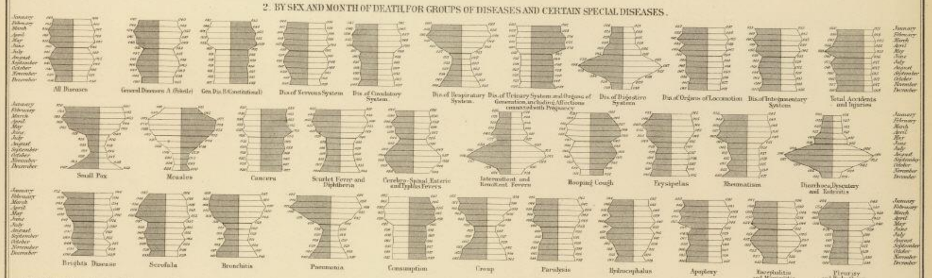
The males are on the left of the base line and the females on the right. The sex which preponderates is shaded.

CHART
SHOWING THE DISTRIBUTION
OF THE
DEATHS
OCCURRING DURING THE CENSUS YEAR ENDING JUNE 1ST
BY SEX AND MONTH OF DEATH AND ACCORDING TO RACE AND NATIONALITY,
compiled from the Returns of Mortality at the Ninth Census U. S. 1870.
BY
FRANCIS A. WALKER.

1. BY SEX AND MONTH OF DEATH, FOR THE UNITED STATES AND FOR THE SEVERAL STATES AND TERRITORIES.



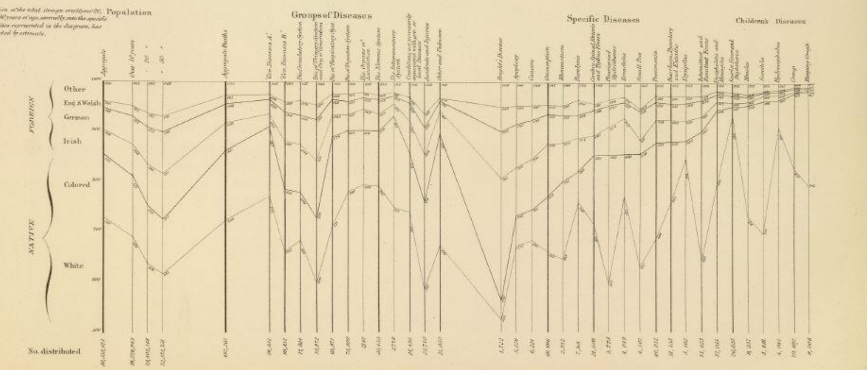
2. BY SEX AND MONTH OF DEATH, FOR GROUPS OF DISEASES AND CERTAIN SPECIAL DISEASES.



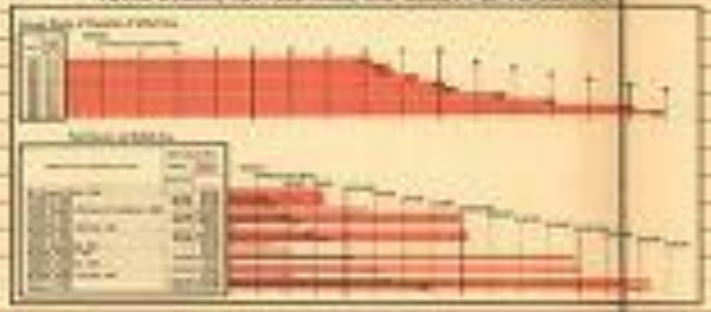
Note. In this diagram the vertical lines are supposed to be drawn downwards through a further distance of four inches, making them nearly twice the length at which they appear in the diagram as engraved.

The division of the total foreign over and over 20, and over 30 years of age, severally, into the specific nationalities represented in the diagram, has been effected by estimate.

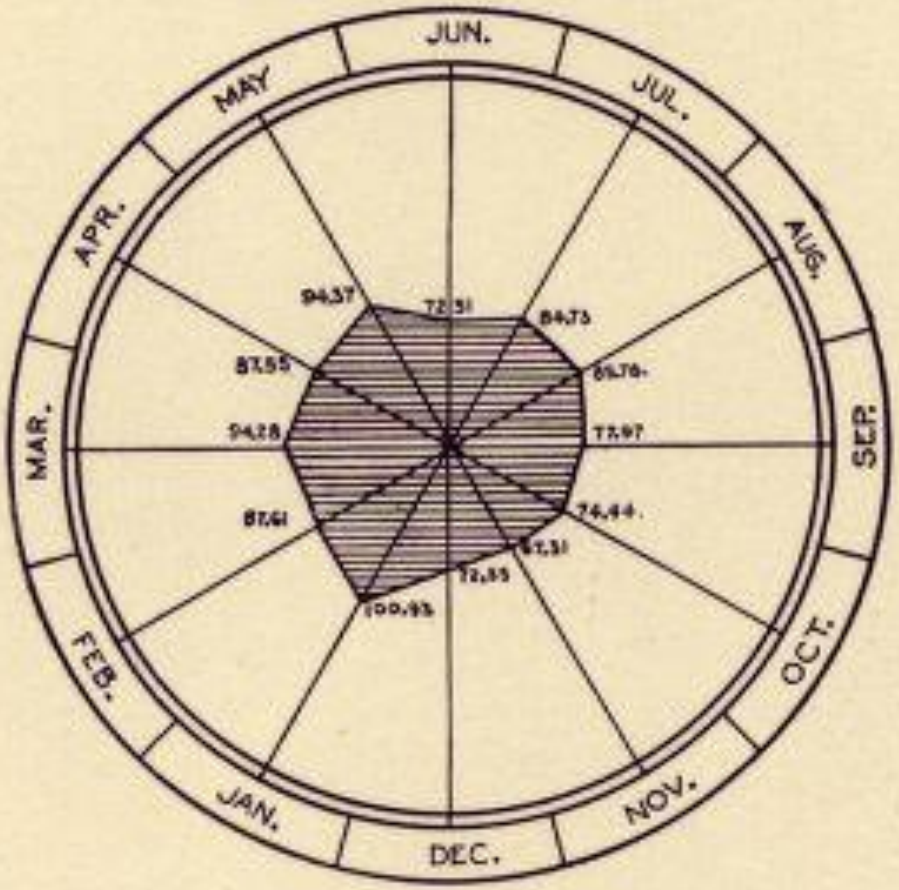
3. BY RACE AND NATIONALITY, FOR THE UNITED STATES.



RANK OF STATES IN POPULATION AT EACH UNITED STATES CENSUS.



225. Proportion of Deaths at all Ages, in Each Month, in the United States: 1890.



226. Proportion of Death Under 5 Years of Age in Each Month, in the United States: 1890.

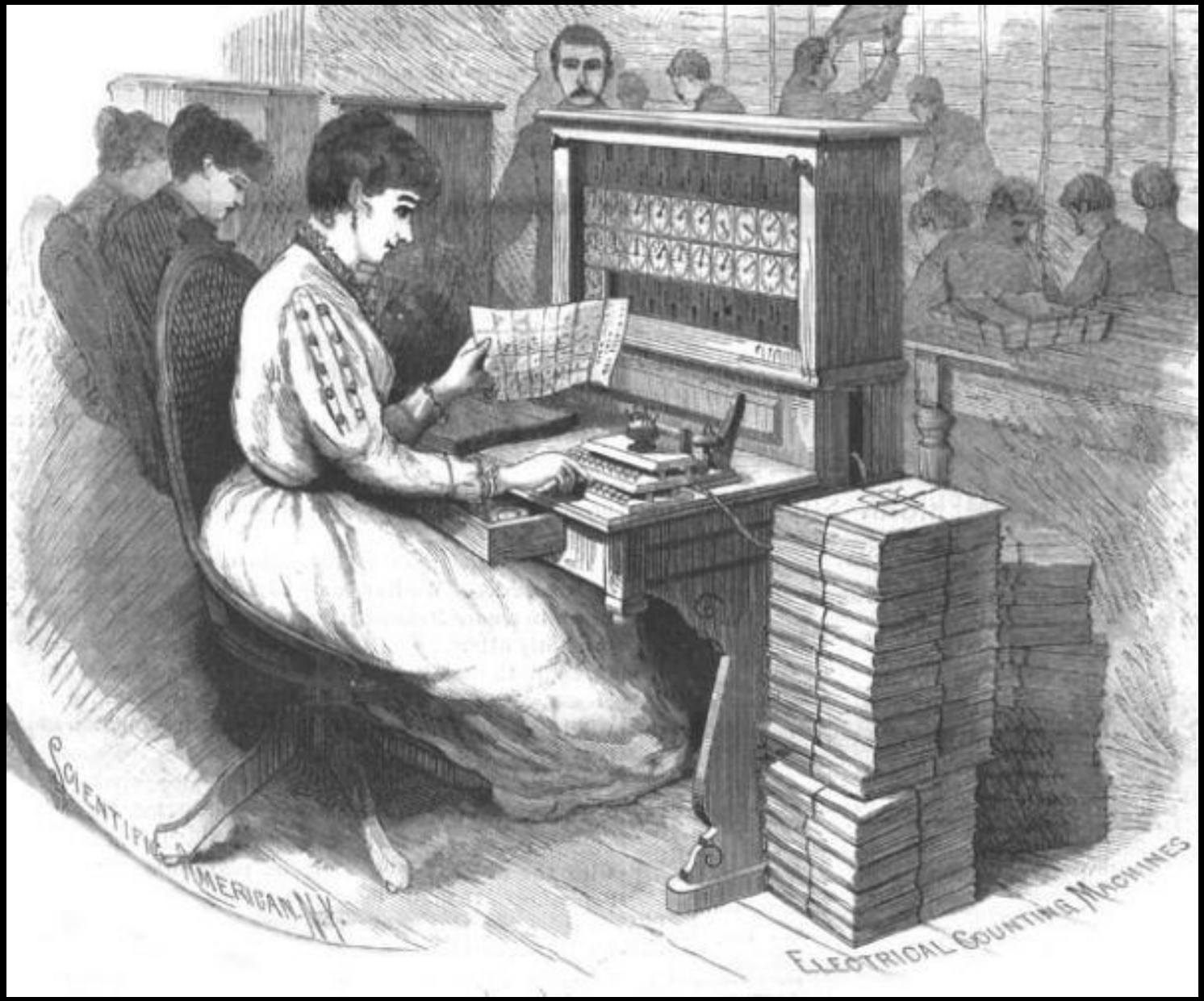

SCIENTIFIC AMERICAN N.Y.
ELECTRICAL COUNTING MACHINES

Table 743. **Establishments, Employees, and Payroll by Employment-Size Class and Industry: 2000 to 2006**

[**Establishments and employees in thousands (7,070.0 represents 7,070,000); payroll in billions of dollars**. See headnote, Table 742. Data for 2000 based on the North American Industry Classification System (NAICS), 1997; 2005 and 2006 data based on NAICS 2002. See text, this section]

Industry	NAICS code	2000, total	2005, total	2006					
				Total	Under 20 employees	20 to 99 employees	100 to 499 employees	500 to 999 employees	1,000 or more employees
Establishments, total [1]	(X)	**7,070.0**	**7,499.7**	**7,601.2**	**6,533.4**	**885.8**	**162.8**	**12.1**	**7.1**
Forestry, fishing & hunting, & ag support services	113–115	26.1	24.1	23.6	22.1	1.3	0.2	(Z)	(Z)
Mining	21	23.7	24.7	26.2	21.1	4.2	0.8	0.1	(Z)
Utilities	22	17.3	17.3	17.2	12.1	3.8	1.1	0.1	(Z)
Construction	23	709.6	787.7	802.3	729.2	64.1	8.5	0.5	0.2
Manufacturing	31–33	354.5	333.5	331.1	226.2	75.6	25.8	2.4	1.1
Wholesale trade	42	446.2	429.8	430.0	366.4	55.1	7.9	0.5	0.2
Retail trade	44–45	1,113.6	1,123.2	1,120.3	960.6	132.1	27.0	0.6	(Z)
Transportation and warehousing	48–49	190.0	211.2	215.1	179.2	28.6	6.3	0.6	0.3
Information	51	133.6	141.3	141.9	114.9	20.9	5.3	0.6	0.3
Finance and insurance	52	423.7	476.8	494.3	446.4	39.5	6.9	1.0	0.5
Real estate and rental and leasing	53	300.2	370.7	382.1	365.4	14.8	1.8	0.1	(Z)
Professional, scientific, and technical services	54	722.7	826.1	846.5	780.5	55.8	9.1	0.7	0.4
Management of companies and enterprises	55	47.4	47.6	48.3	31.9	11.0	4.3	0.6	0.4
Admin/support waste mgt/remediation services	56	351.5	369.5	378.3	314.7	45.5	15.9	1.4	0.9
Educational services	61	68.0	80.5	82.6	62.9	15.8	3.2	0.4	0.4
Health care and social assistance	62	658.6	746.6	762.5	646.1	91.4	21.3	1.7	1.9
Arts, entertainment, and recreation	71	103.8	121.8	123.0	103.5	16.4	2.8	0.2	0.1
Accommodation and food services	72	542.4	603.4	612.3	436.6	164.2	10.8	0.4	0.2
Other services [2]	81	723.3	740.0	736.4	686.7	45.7	3.9	0.2	0.1
Unclassified establishments	99	99.0	24.0	27.0	26.9	0.1	–	–	–
Employees, total [1]	(X)	**114,065**	**116,317**	**119,917**	**29,429**	**35,504**	**30,616**	**8,248**	**16,120**
Forestry, fishing & hunting, & ag support services	113–115	184	169	166	(NA)	(NA)	28	(NA)	(NA)
Mining	21	456	497	554	100	168	161	57	69
Utilities	22	655	633	614	65	168	225	85	72
Construction	23	6,573	6,781	7,339	2,749	2,487	1,532	298	273
Manufacturing	31–33	16,474	13,667	13,632	1,313	3,324	5,149	1,629	2,216
Wholesale trade	42	6,112	5,969	6,031	1,764	2,156	1,467	329	315
Retail trade	44–45	14,841	15,339	15,768	5,144	5,319	4,846	369	90
Transportation and warehousing	48–49	3,790	4,168	4,306	732	1,187	1,206	419	762
Information	51	3,546	3,403	3,396	514	886	1,044	405	547
Finance and insurance	52	5,963	6,432	6,647	1,957	1,524	1,391	666	1,109
Real estate and rental and leasing	53	1,942	2,144	2,217	1,195	559	324	82	57
Professional, scientific, and technical services	54	6,816	7,689	8,054	2,667	2,171	1,739	476	1,003
Management of companies and enterprises	55	2,874	2,856	2,916	174	495	922	446	879
Admin/support waste mgt/remediation services	56	9,138	9,280	10,004	1,233	1,999	3,161	981	2,629
Educational services	61	2,532	2,879	2,980	304	667	611	279	1,118
Health care and social assistance	62	14,109	16,025	16,451	3,402	3,670	3,954	1,222	4,204
Arts, entertainment, and recreation	71	1,741	1,936	1,974	394	686	525	141	228
Accommodation and food services	72	9,881	11,026	11,381	2,702	6,323	1,673	(NA)	(NA)
Other services [2]	81	5,293	5,391	5,459	2,916	1,665	657	(NA)	(NA)
Unclassified establishments	99	144	31	30	(NA)	(NA)	–	–	–
Annual payroll, total [1]	(X)	**3,879**	**4,483**	**4,792**	**1,021**	**1,260**	**1,264**	**401**	**848**
Forestry, fishing & hunting, & ag support services	113–115	5	5	5	(D)	(D)	1	(D)	(D)
Mining	21	22	31	37	6	10	12	4	5
Utilities	22	41	46	48	4	11	18	8	7
Construction	23	240	293	322	103	114	77	14	14
Manufacturing	31–33	644	601	620	48	133	224	79	136
Wholesale trade	42	270	309	323	85	110	80	23	25
Retail trade	44–45	303	348	368	113	127	115	9	3
Transportation and warehousing	48–49	126	154	166	27	44	46	16	33
Information	51	209	203	213	28	50	68	26	40
Finance and insurance	52	347	447	481	102	112	115	49	104
Real estate and rental and leasing	53	59	82	88	42	24	15	4	3
Professional, scientific, and technical services	54	362	456	497	136	140	123	34	64
Management of companies and enterprises	55	211	243	266	17	42	83	41	83
Admin/support waste mgt/remediation services	56	210	255	283	43	62	80	24	74
Educational services	61	62	83	88	7	17	19	7	39
Health care and social assistance	62	431	590	627	138	125	119	49	195
Arts, entertainment, and recreation	71	43	53	57	14	14	19	5	6
Accommodation and food services	72	126	156	167	39	81	28	(D)	(D)
Other services [2]	81	110	127	134	66	41	20	(D)	(D)
Unclassified establishments	99	4	1	1	(D)	(D)	–	–	–

– Represents zero. D Data withheld to avoid disclosure. NA Not available. X Not applicable. Z Less than 50 establishments. [1] Totals for 2000 include auxiliaries. Beginning 2005, cases previously classified under NAICS code 95 (auxiliaries) are coded in the operating NAICS sector of the establishment. [2] Except public administration.

Source: U.S. Census Bureau, "County Business Patterns"; <http://www.census.gov/econ/cbp/>.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POPULATION CHANGE | POPULATION DENSITY | APPORTIONMENT

United States Census Bureau

FULL SCREEN

Population Apportionment

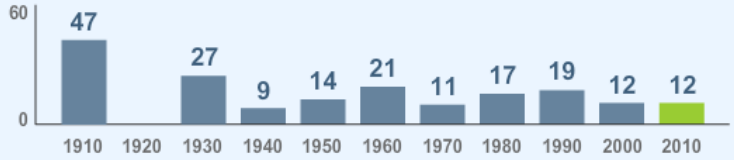
Apportionment is the process of dividing the 435 memberships, or seats, in the House of Representatives among the 50 states based on the population figures collected during the decennial census.

APPORTIONMENT IN 2010

UNITED STATES

710,767 People per representative

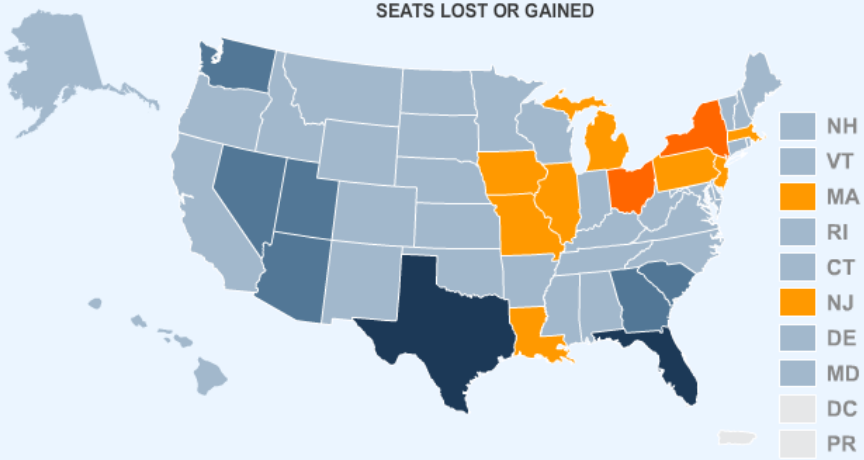
TOTAL SEATS REASSIGNED PER DECADE



LEGEND

-2 or more | -1 | 0 | +1 | +2 or more

SEATS LOST OR GAINED



Choose a Decennial Census Year: 1910 | 1920 | 1930 | 1940 | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 | 2010

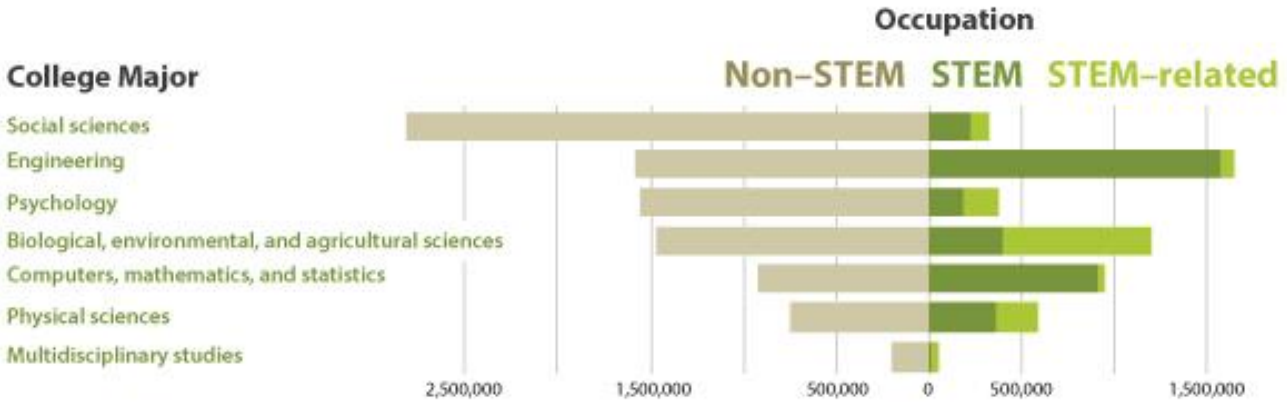
See footnotes below

STEM

Science, Technology, Engineering, and Mathematics (STEM)

Degree vs. Employment:

Some science and engineering graduates go into STEM fields, many don't



Source: U.S. Census Bureau, 2011 American Community Survey

United States Census Bureau

U.S. Department of Commerce
Economics and Statistics Administration
U.S. CENSUS BUREAU

United States Census Bureau

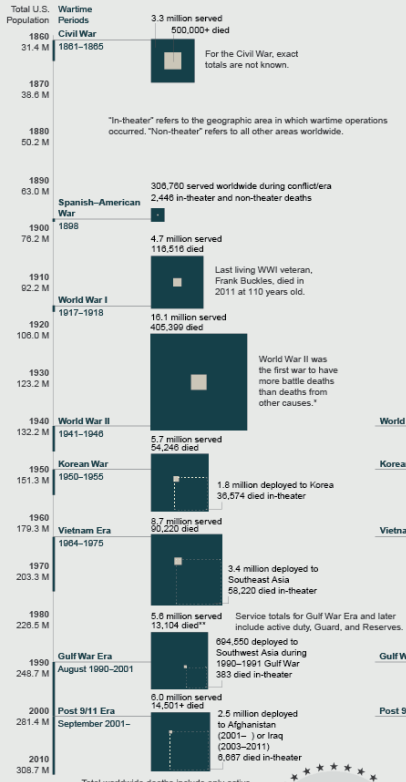
HOW DO WE KNOW?

MEMORIAL DAY

Honoring America's Wartime Veterans

Memorial Day, originally called Decoration Day, is a day of remembrance for those who died in service to their country. The holiday was officially proclaimed in 1868 to honor Union and Confederate soldiers and was expanded after World War I to honor those who died in all wars. Today, Memorial Day honors over one million men and women who have died in military service since the Civil War.

This infographic compiles statistics from the U.S. Census Bureau and Department of Defense to honor our men and women who have served in the U.S. Armed Forces. The U.S. Census Bureau gathers detailed information on living veterans from the American Community Survey (ACS). Federal, state, and community leaders, private businesses, nonprofits, and community organizations use ACS statistics to determine the programs, services, and infrastructure that serve the needs of our veterans. The Department of Defense, Defense Manpower Data Center provides statistics on the number of people who served and died in each of our nation's wars.



Wartime Periods Notes:

* Deaths include battle deaths (for "in-theater" only), accidents, illness, injury, or other causes.

** Death totals include only active duty between 1990 and 2001.

Wartime periods show official dates of U.S. involvement.

Population totals include the territories of Alaska and Hawaii from 1890 to 1950.

Congressional Medal of Honor

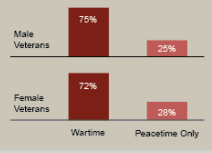
3,460 men and 1 woman have received the Medal of Honor, the highest award for valor in action against an enemy force

Wartime Veterans in 2011

Source: 2011 American Community Survey

16.1 MILLION

of the 21.6 million living veterans of the U.S. Armed Forces served worldwide on active duty during a period of war



	Number of Wartime Veterans	Percent Female	Median Age	Percent With a Service-Connected Disability***
World War II	1.8 million	4.4%	87 years	13.6%
Korean War	2.5 million	2.3%	80 years	12.2%
Vietnam Era	7.5 million	2.9%	64 years	20.2%
Gulf War Era	3.5 million	14.7%	43 years	27.2%
Post 9/11 Era	2.5 million	17.3%	32 years	26.7%

2011 ACS Notes:

Data from the ACS include the veteran population 18 years and older who live in the United States and Puerto Rico.

Periods of military service are not mutually exclusive. Veterans could have served in multiple periods.

*** "Service-connected" means the disability was a result of disease or injury incurred or aggravated during active military service.

The percentages of Gulf War and Post-9/11 veterans with a service-connected disability are not statistically different.

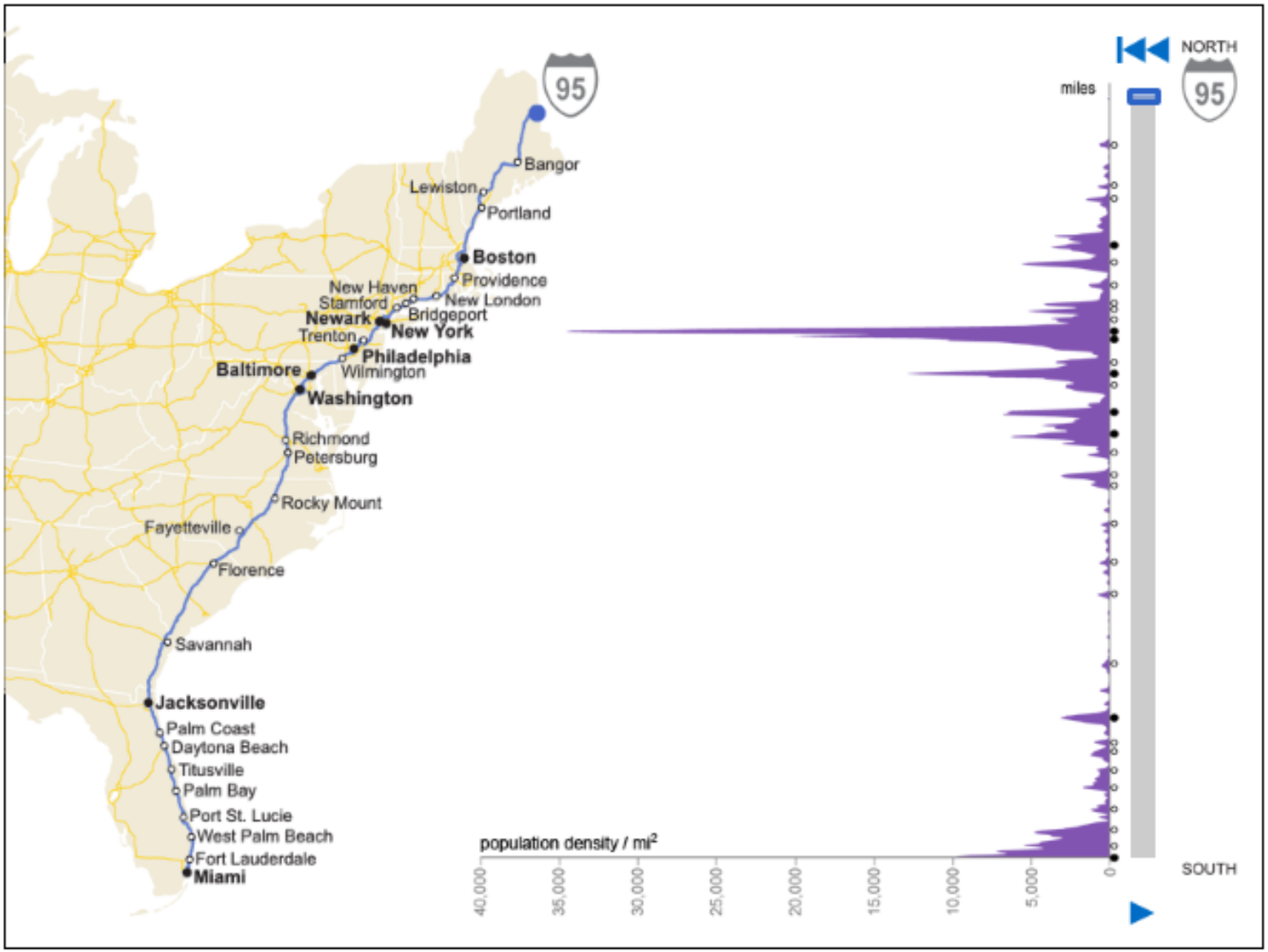
United States Census Bureau | U.S. Department of Commerce
Economics and Statistics Administration
U.S. CENSUS BUREAU

CENSUS.GOV
#HowDoWeKnow

Sources: U.S. Census Bureau, Department of Defense, Defense Manpower Data Center and Defense Casualty Analysis System; Department of Veterans Affairs, Office of Public Affairs.
For more information, visit www.census.gov/how/infographics/sources.html.

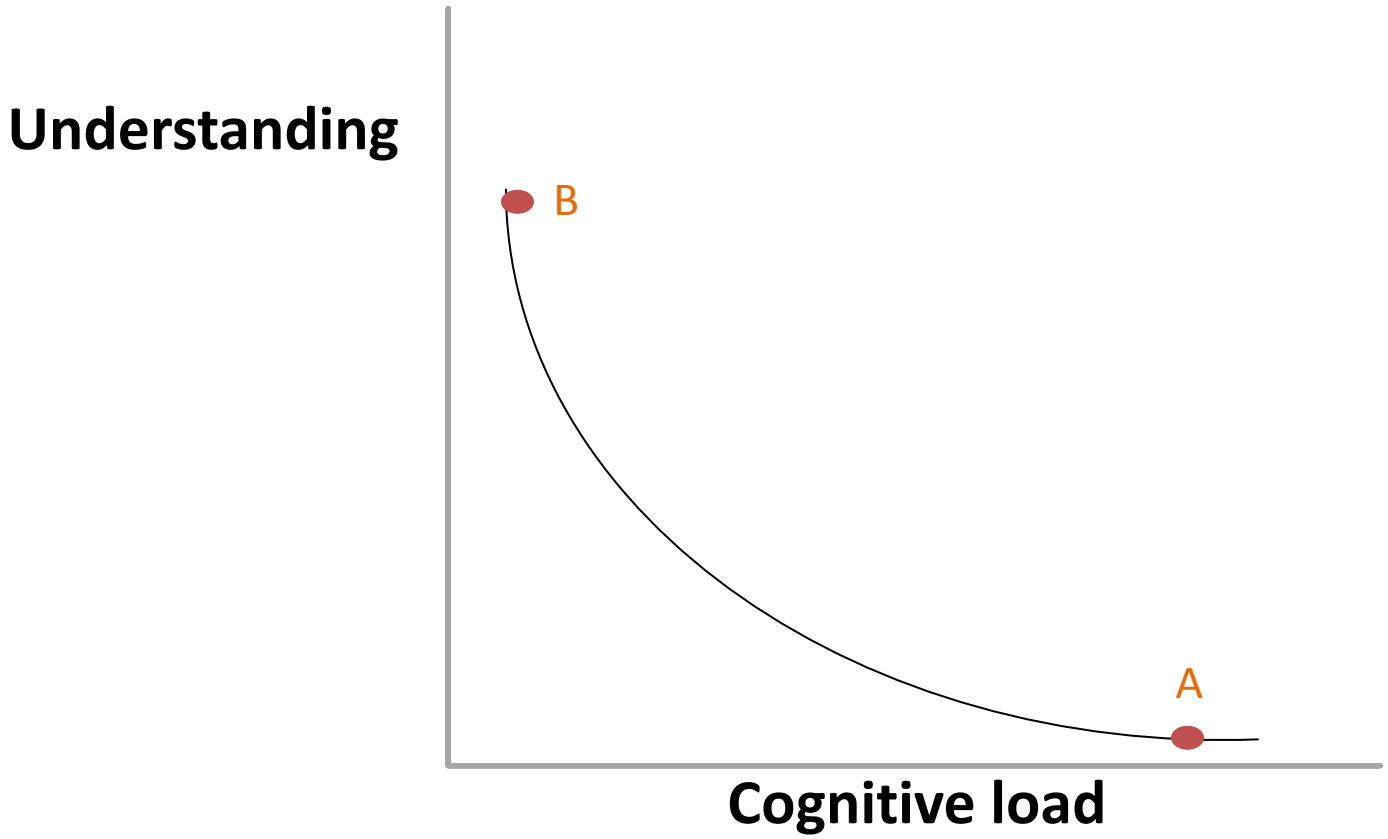
I-95 Population Density Profile, 2010

July 26, 2012



United States Census Bureau

Newburger's hypothesis of Data Visualization



Light

Pre-attentive understanding

Natural visual metaphors

Icons

Single words or numbers

Words or numbers in ordered groups

Sentences

Paragraphs

Jargon

Equations

Clutter

Broken expectations

Heavy

Stuff that outright fools your eyes

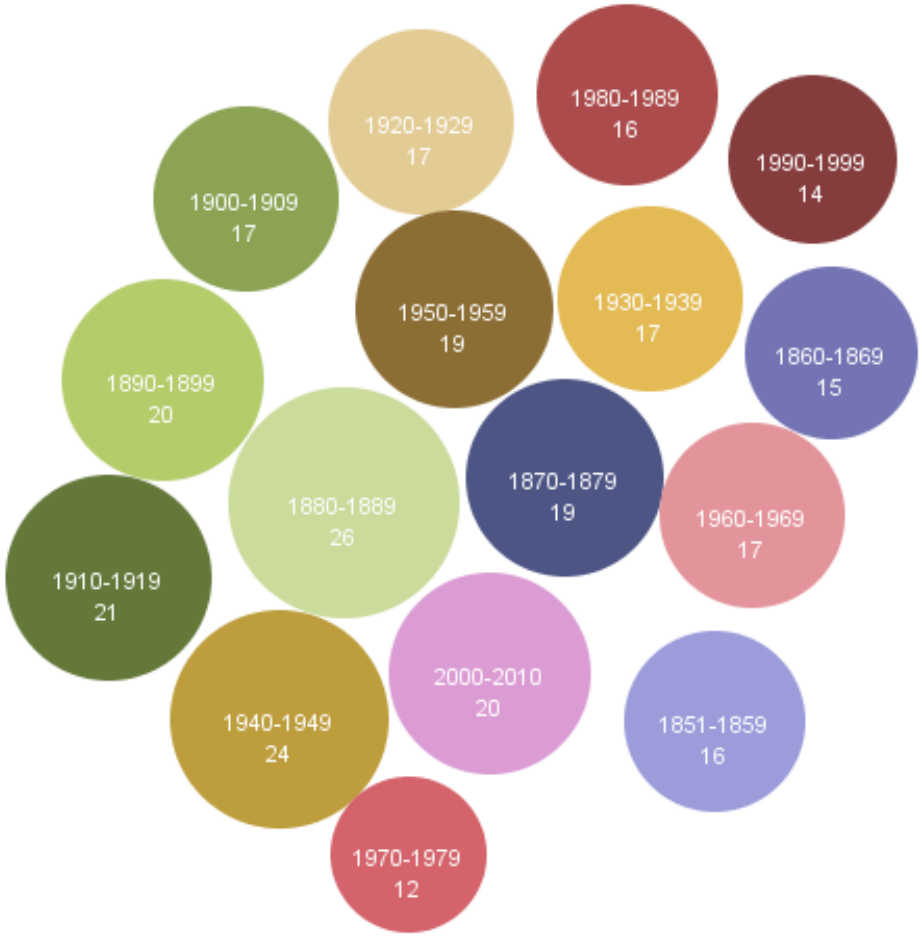
Cognitive loading Scale

Description:
Tags: hurricanes

Decade Years
Click to select,
Ctrl-Click: multiple
Shift-Click: range

- 1851-1859
- 1860-1869
- 1870-1879
- 1880-1889
- 1890-1899
- 1900-1909
- 1910-1919
- 1920-1929
- 1930-1939
- 1940-1949
- 1950-1959
- 1960-1969
- 1970-1979
- 1980-1989
- 1990-1999
- 2000-2010

Total Hurricanes
Disks colored by Decade Years



25
15
5
0

Search>>

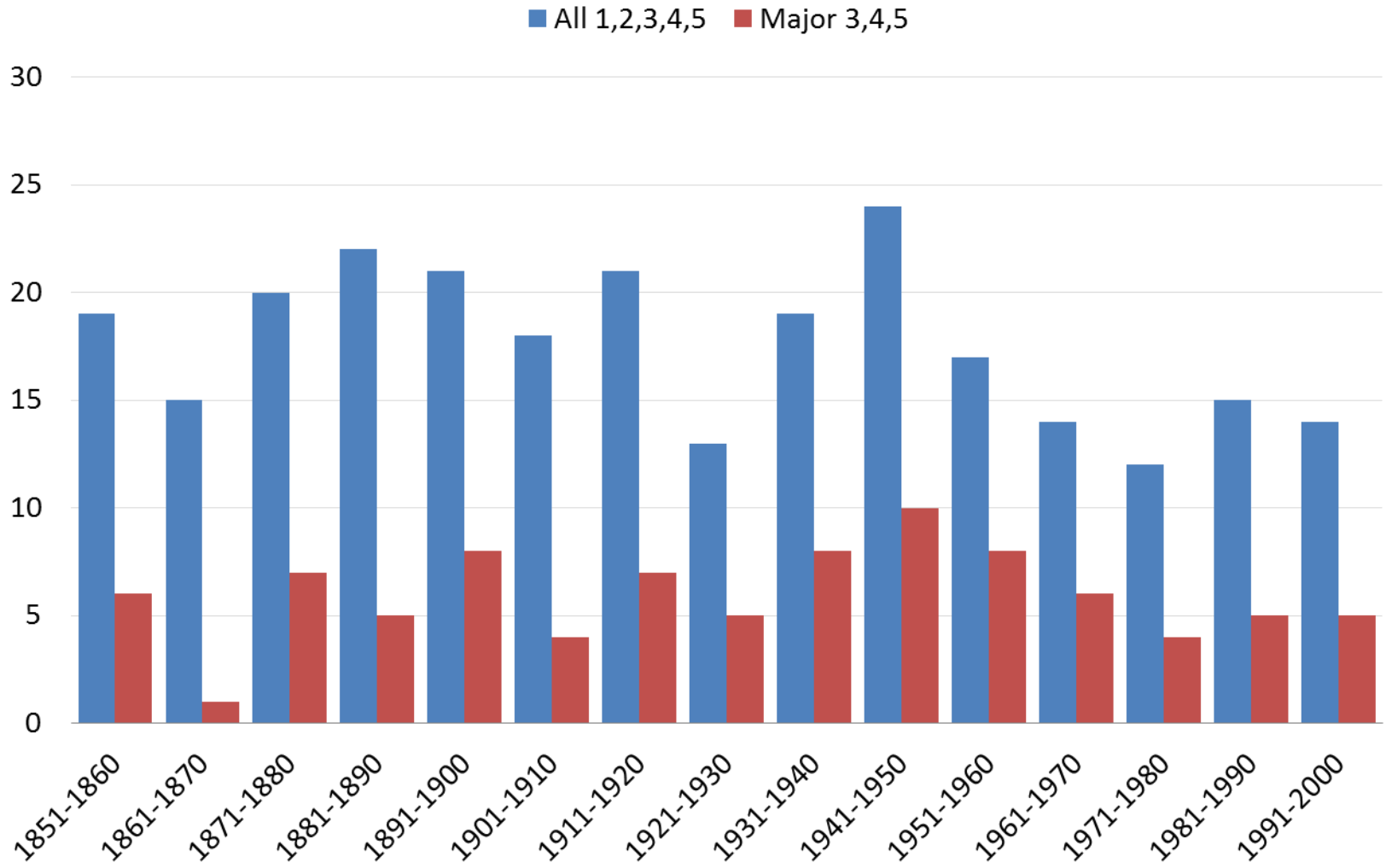
Bubble Size: Total Hurricanes

Color: Decade Years

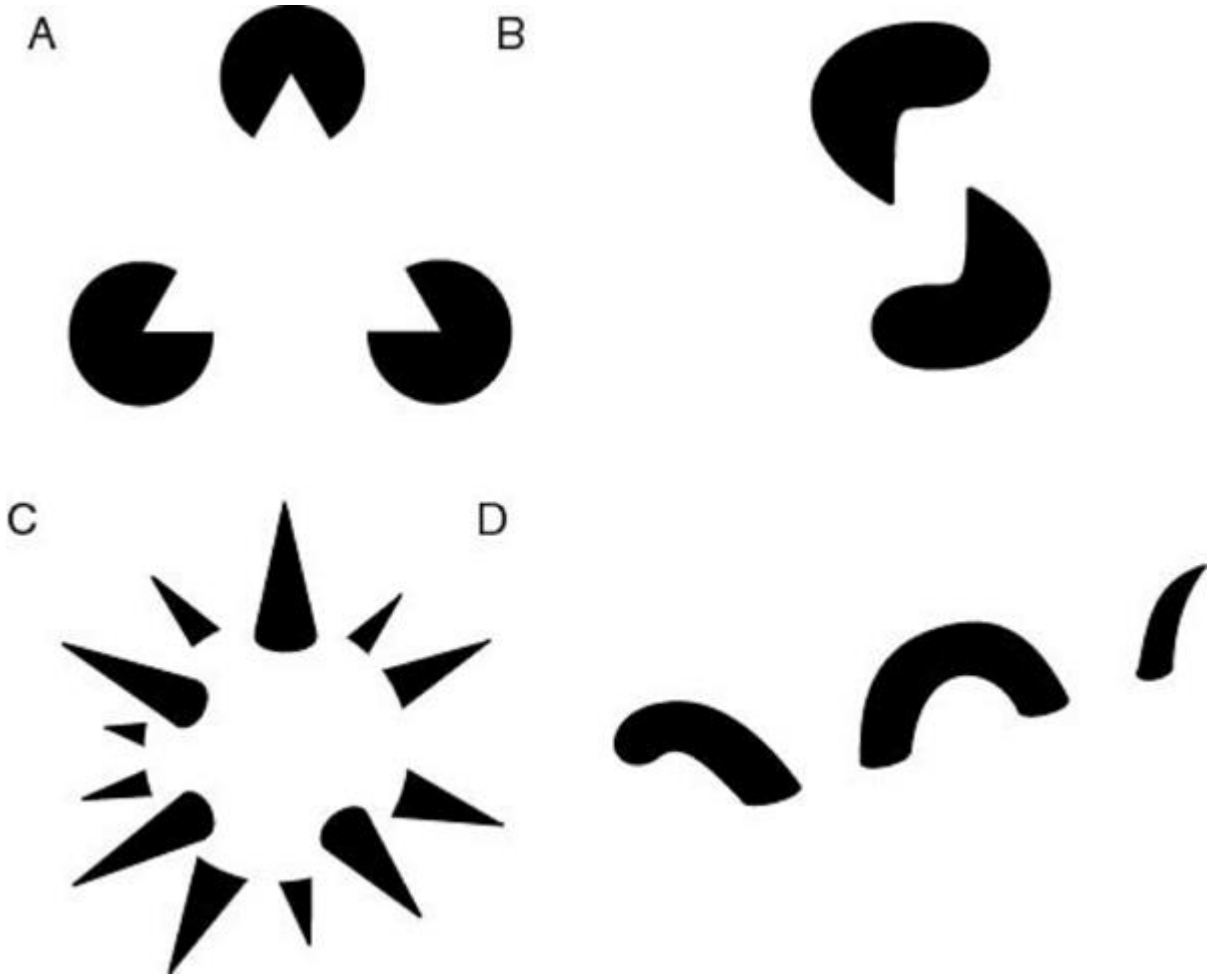
Data file: U.S. Hurricanes from 1851-2010

Data source: HURDAT data via Skillshare course Information Design

Hurricane Strikes per Decade, 1851 to 2000



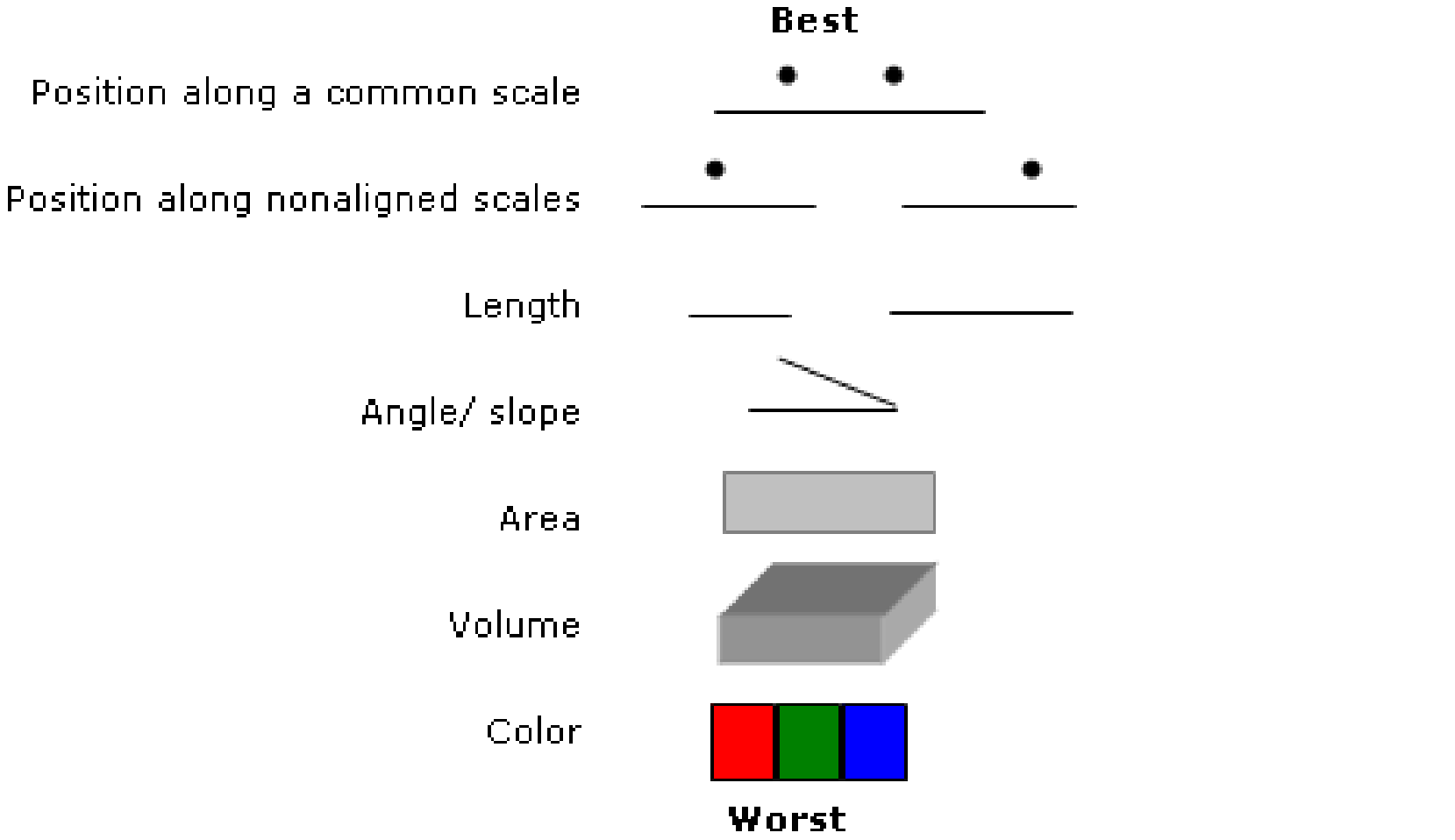
Source: NOAA


A
B
C
D

Just because you're paranoid doesn't mean they aren't after you.

www.all-about-psychology.com

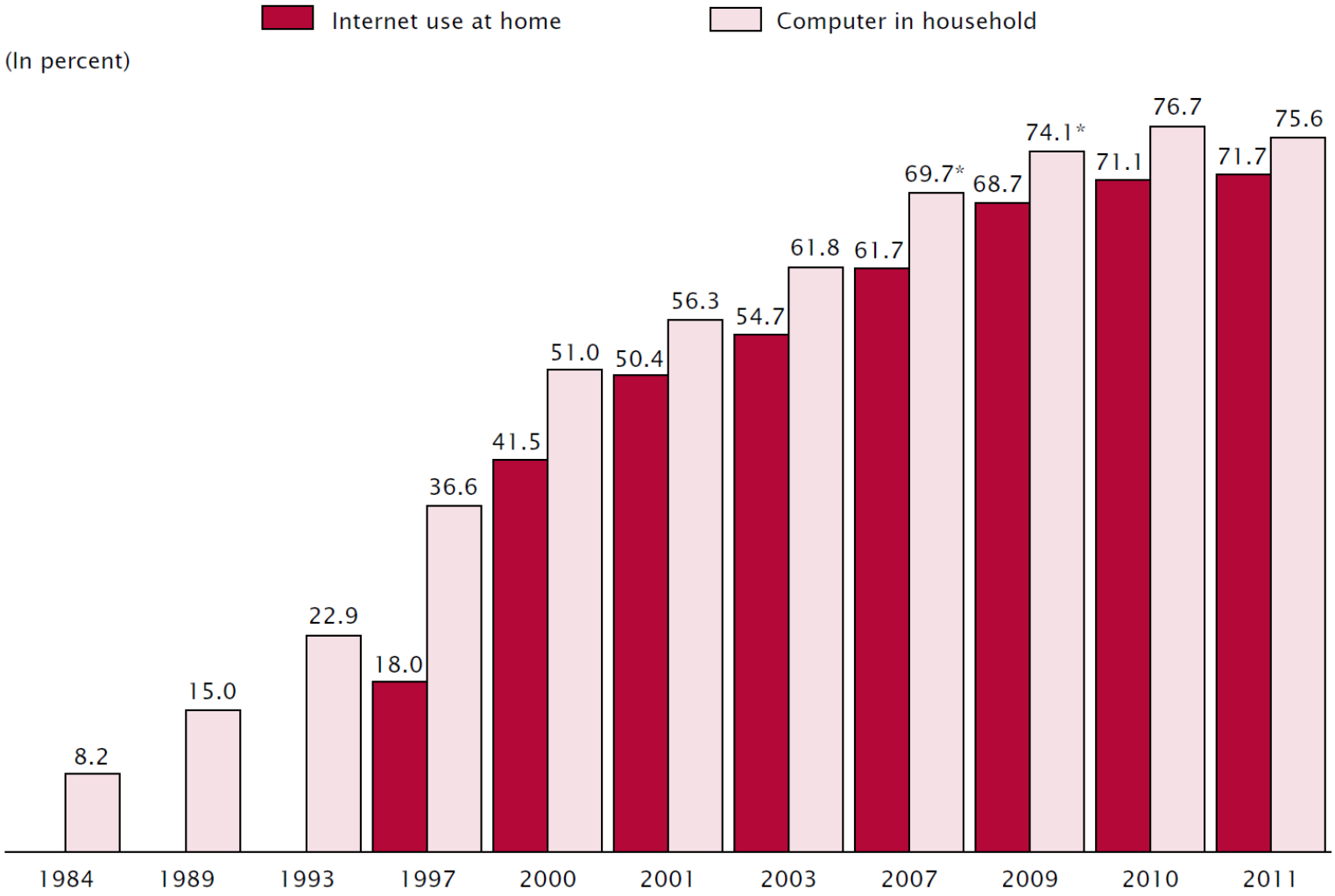
Cleveland's (1984) Graphical Feature Interpretation Hierarchy



Based on graphic (Figure 2) in Presentation Graphics (white paper) by Leland Wilkinson, SPSS, Inc and Northwestern Uiv.

Figure 1.

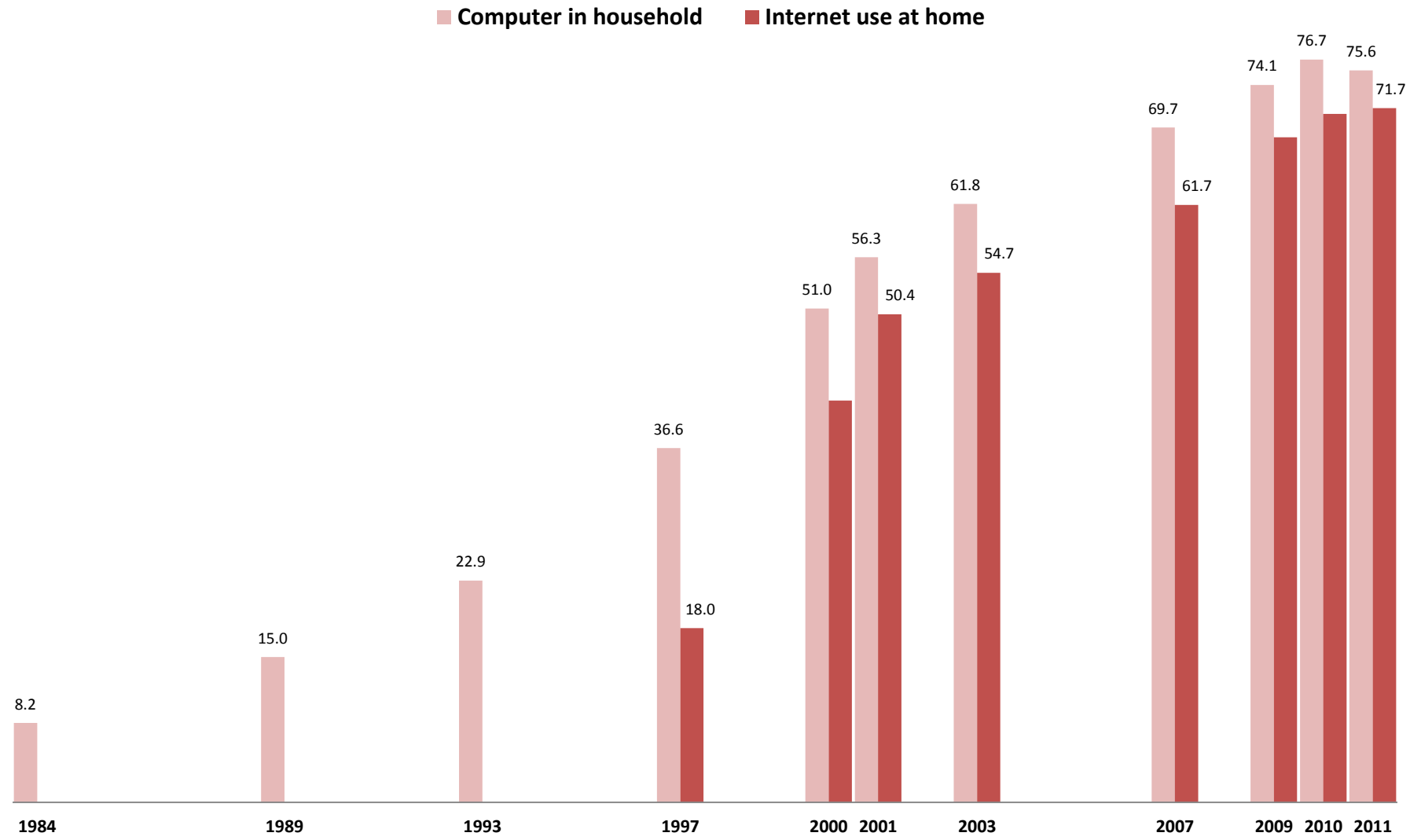
Household Computer and Internet Use: 1984–2011



*Note: In 2007 and 2009 the Census Bureau did not ask about computer ownership. The estimates presented here for 2007 and 2009 reflect estimates made based on the ratio of computer ownership to Internet use in 2003 and 2010, respectively.
Source: U.S. Census Bureau, Current Population Survey, selected years.

Figure 1:

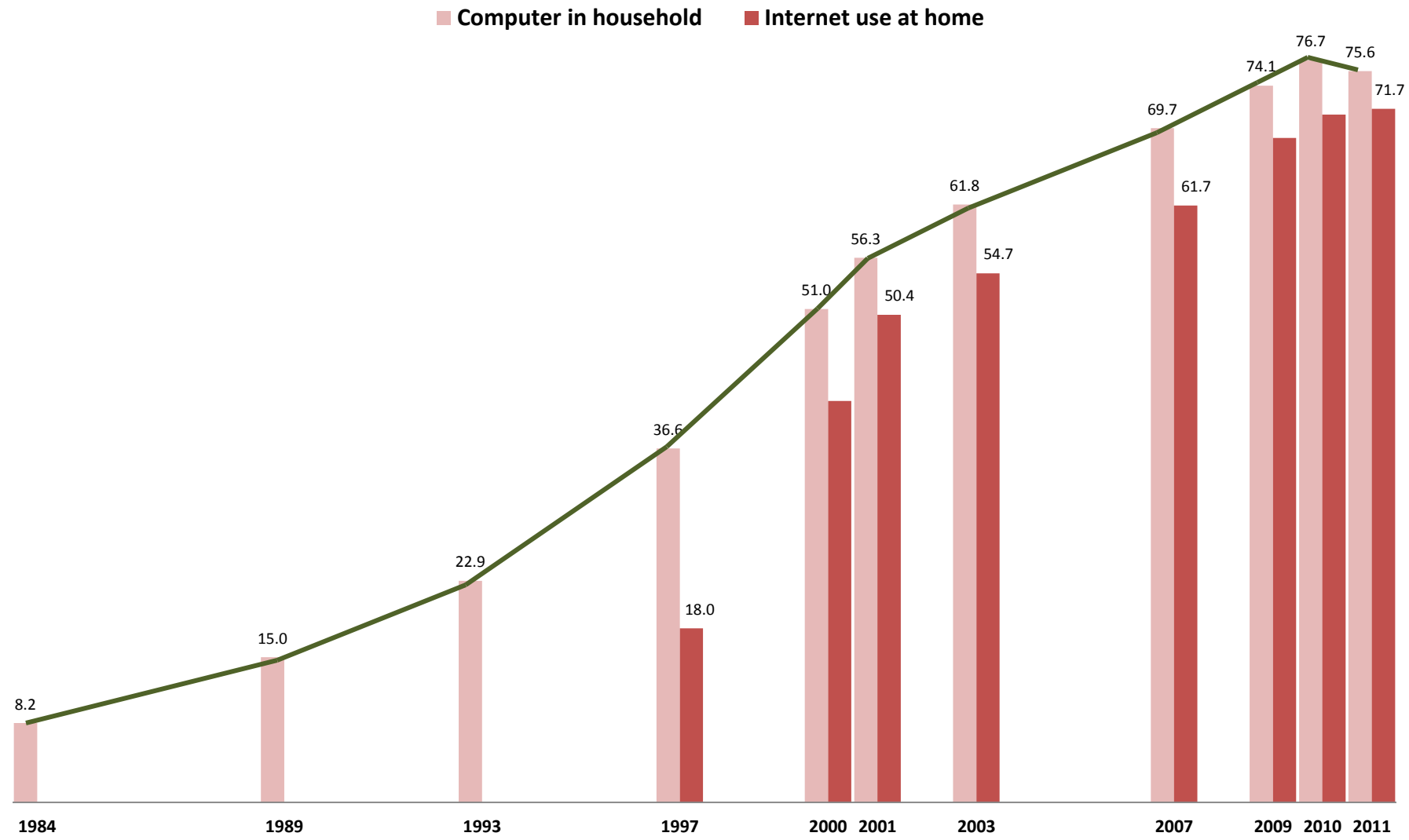
Household Computer and Internet Use: 1984-2011



Source: U.S. Census Bureau, Current Population Survey

Figure 1:

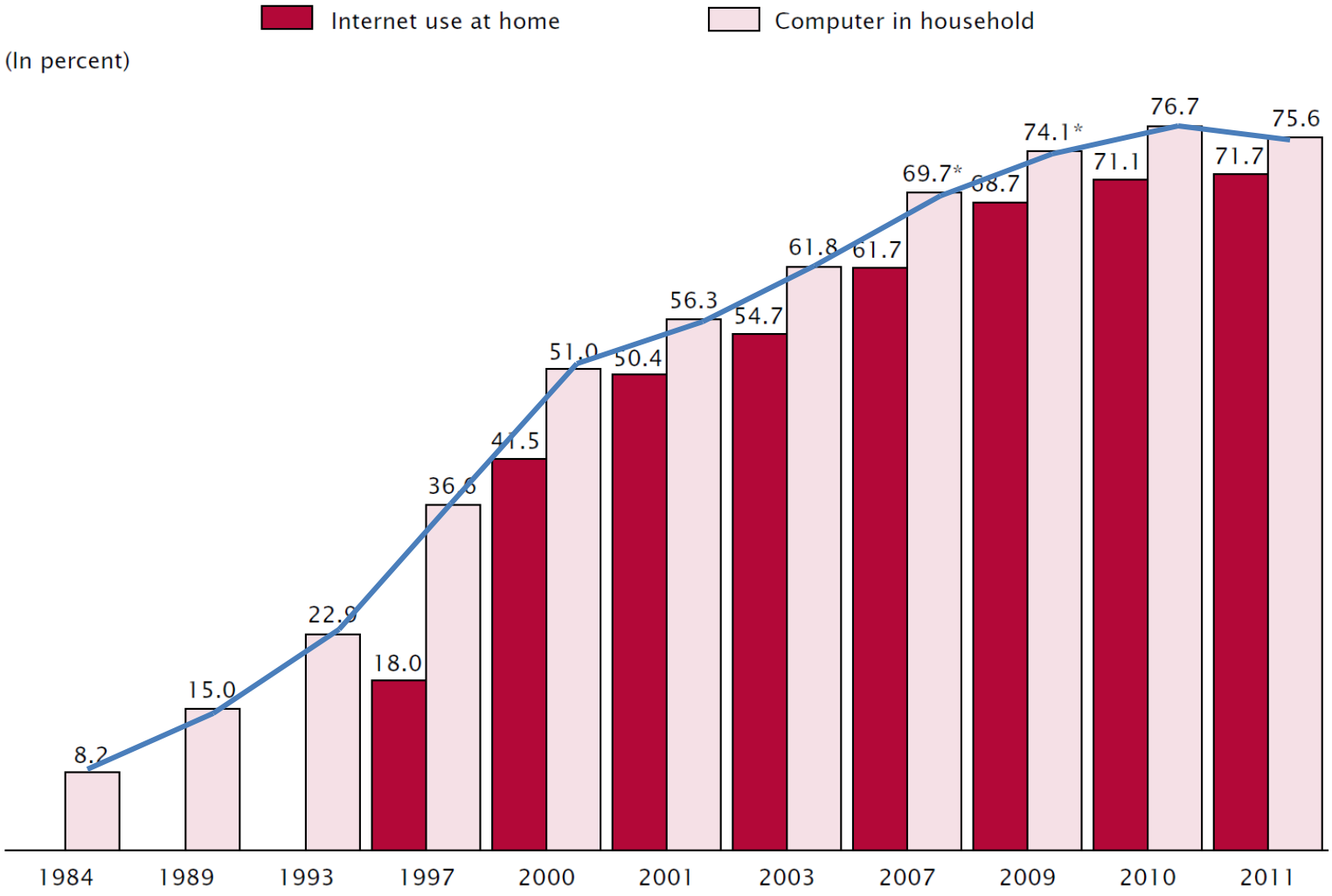
Household Computer and Internet Use: 1984-2011



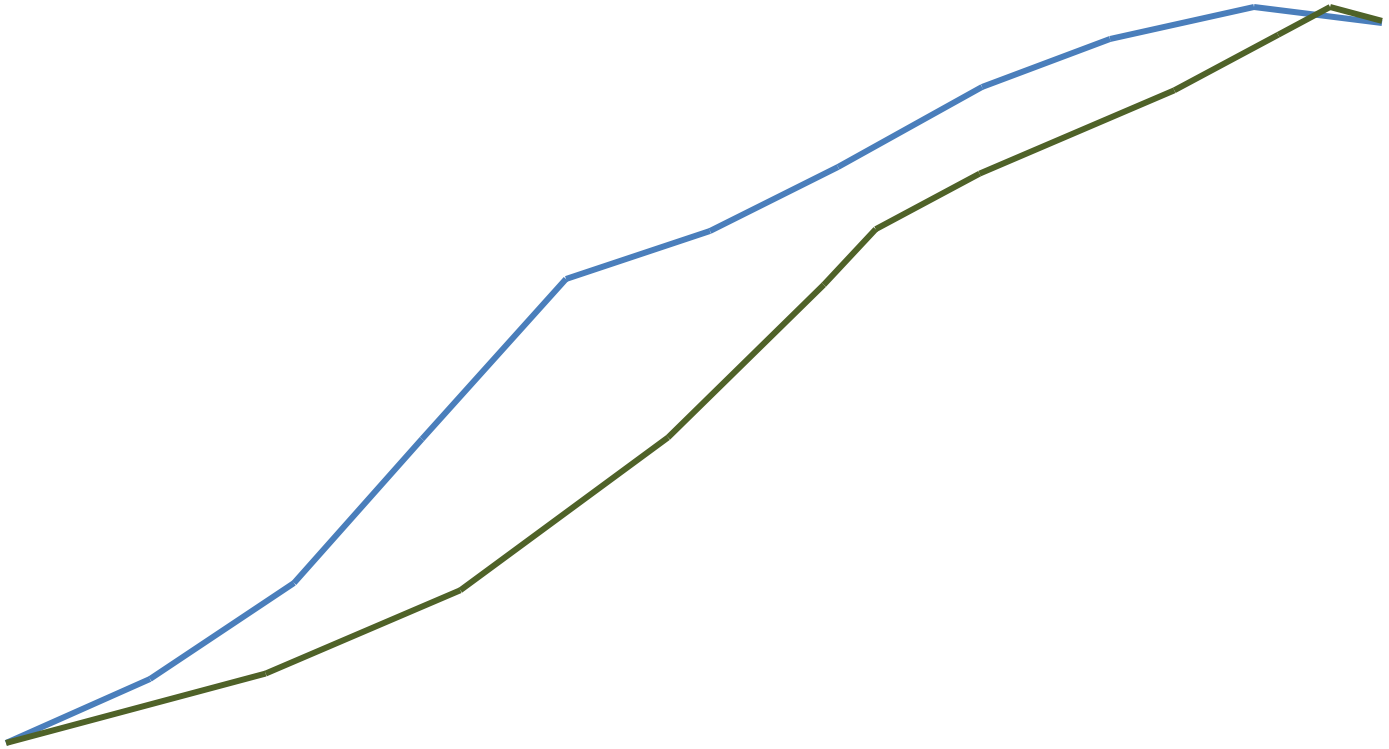
Source: U.S. Census Bureau, Current Population Survey

Figure 1.

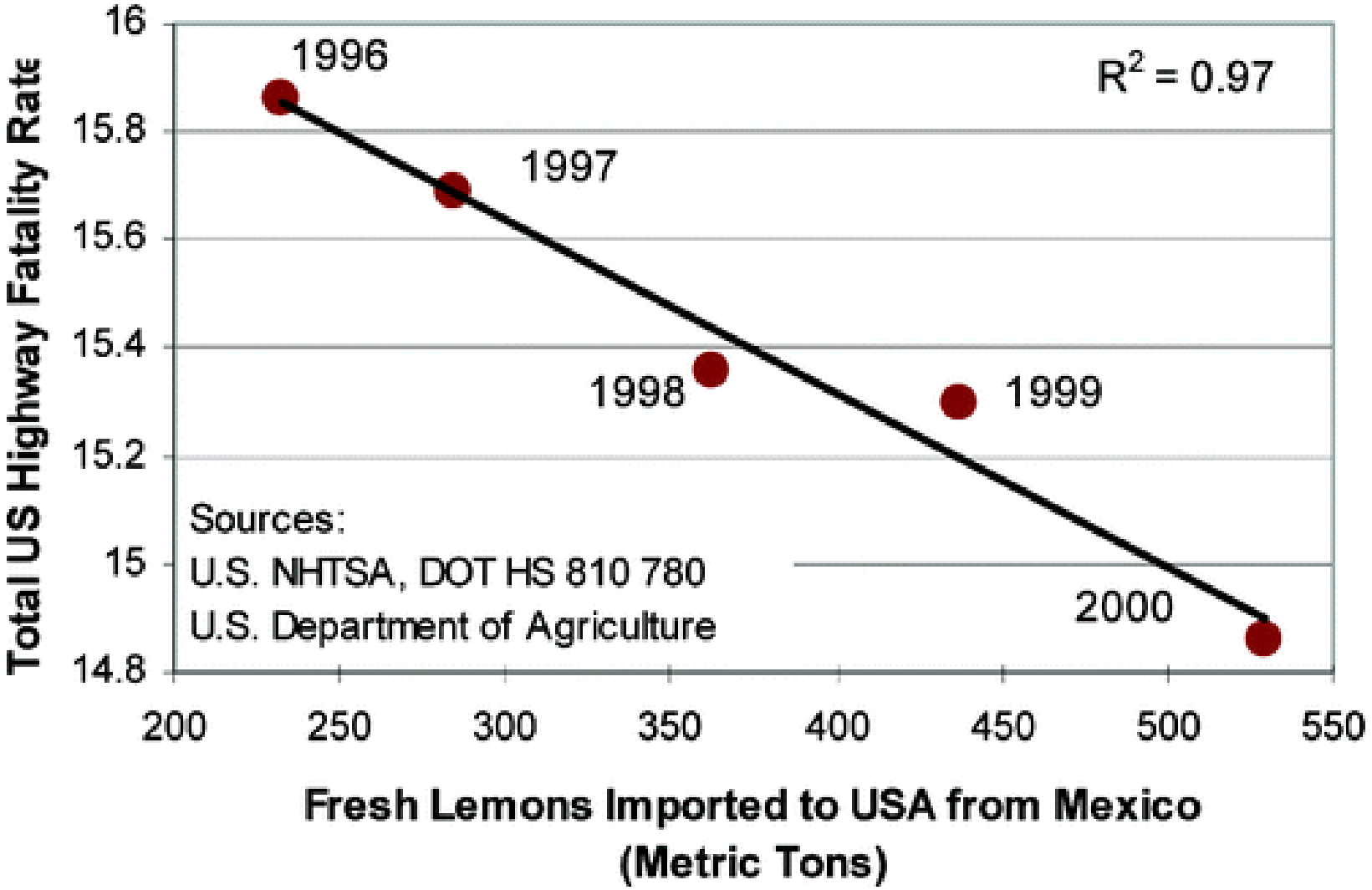
Household Computer and Internet Use: 1984–2011



*Note: In 2007 and 2009 the Census Bureau did not ask about computer ownership. The estimates presented here for 2007 and 2009 reflect estimates made based on the ratio of computer ownership to Internet use in 2003 and 2010, respectively.
Source: U.S. Census Bureau, Current Population Survey, selected years.



Mexican Lemons Save American Lives



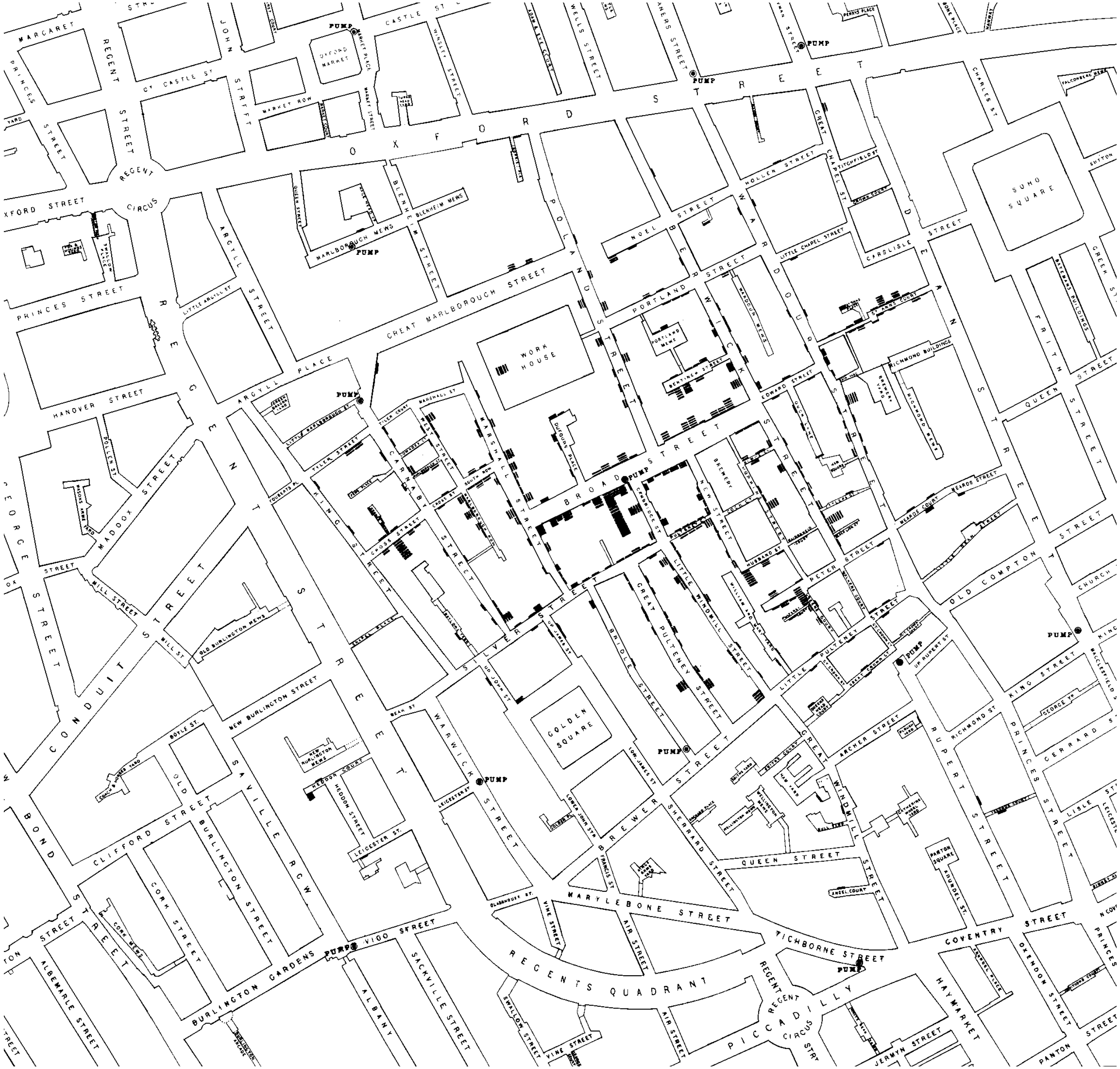
Who is data visualization for in education?


SERC
Fox Point
Canning House Bay

How big is it?

What difference does it make?

Are you sure that’s not just dumb luck?

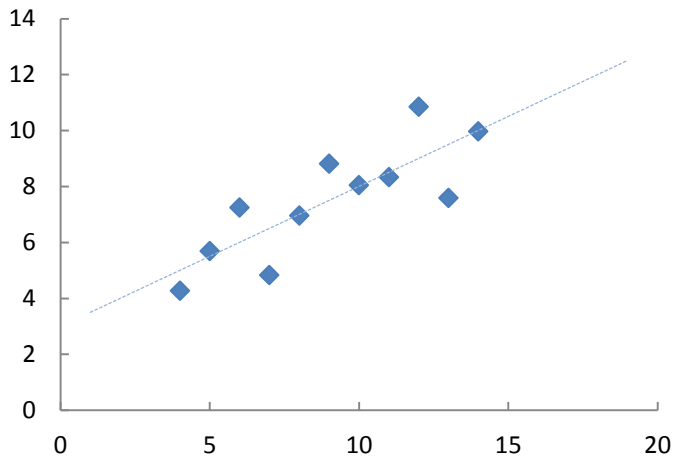


OXFORD STREET
REGENT CIRCUS
REGENT STREET
MARGARET ST
PRINCES STREET
JOHN STREET
CASTLE ST
OXFORD MARKET
MARKET ROW
WELLS STREET
BERNERS STREET
PUMP
CHARLES ST
SOHO SQUARE
GREEK ST
FRITH STREET
DEAN STREET
WARDOUR STREET
BERWICK STREET
POLAND STREET
NOEL STREET
HOLLEN STREET
CARLISLE STREET
LITTLE CHAPEL STREET
PORTLAND STREET
PORTLAND MEWS
BENTINCK STREET
MARSHALL STREET
WORK HOUSE
BROAD STREET
CAMBRIDGE ST
NEW STREET
HUSBAND ST
PETER STREET
LITTLE PULTENEY STREET
LITTLE WINDMILL STREET
GREAT PULTENEY STREET
BRIDLE STREET
GOLDEN SQUARE
SILVER STREET
CARNABY STREET
KING STREET
CROSS STREET
TYLER STREET
MARLBOROUGH MEWS
BLENHEIM MEWS
BLENHEIM STREET
GREAT MARLBOROUGH STREET
ARGYLL STREET
ARGYLL PLACE
LITTLE ARGYLL ST
HANOVER STREET
GEORGE STREET
MADDOX STREET
POLLEN ST
MILL STREET
OLD BURLINGTON MEWS
CONDUIT STREET
NEW BURLINGTON STREET
NEW BURLINGTON MEWS
HEDDON STREET
HEDDON COURT
LEICESTER ST
WARWICK STREET
BEAK ST
BOYLE ST
OLD BURLINGTON STREET
SAVILLE ROW
CLIFFORD STREET
BOND STREET
CORK STREET
BURLINGTON STREET
BURLINGTON GARDENS
VIGO STREET
ALBEMARLE STREET
ALBANY
SACKVILLE STREET
SWALLOW STREET
VINE STREET
GLASSHOUSE ST
REGENTS QUADRANT
AIR STREET
MARYLEBONE STREET
BREWER STREET
SHERRARD STREET
QUEEN STREET
TICHBORNE STREET
PICCADILLY
REGENT CIRCUS
HAYMARKET
COVENTRY STREET
RUPERT STREET
ARCHER STREET
GREAT WINDMILL STREET
RICHMOND ST
PRINCES STREET
KING STREET
GERRARD STREET
OLD COMPTON STREET
QUEEN STREET
JERMYN STREET
PANTON STREET
OXENDON STREET
LISLE STREET
CHURCH STREET
RICHMOND BUILDINGS
MEARDS COURT
EDWARD STREET

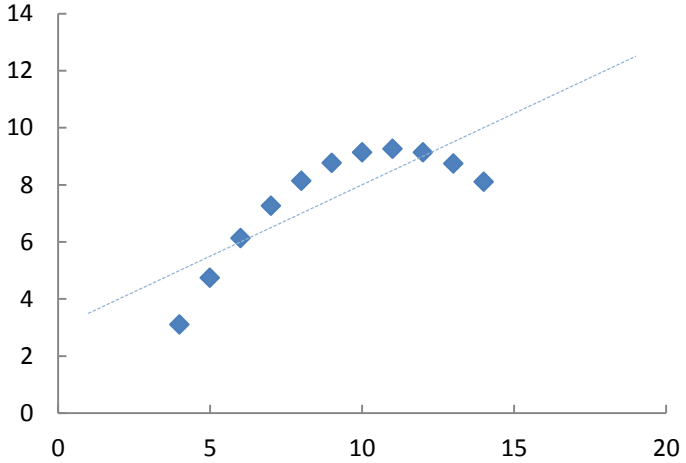
Anscombe's quartet

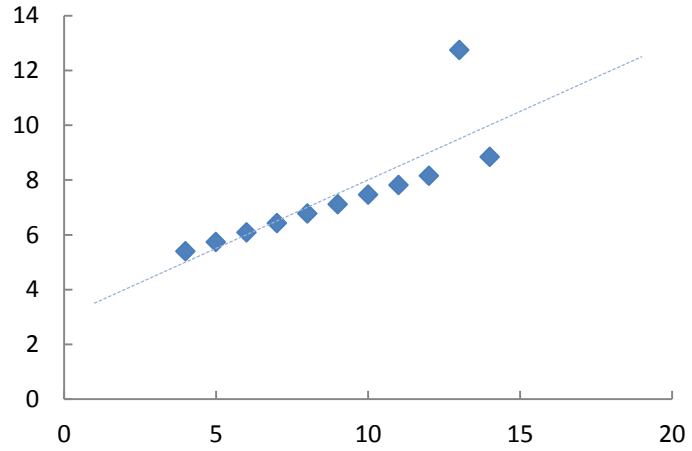
I		II		III		IV	
x	y	x	y	x	y	x	y
10	8.04	10	9.14	10	7.46	8	6.58
8	6.95	8	8.14	8	6.77	8	5.76
13	7.58	13	8.74	13	12.7	8	7.71
9	8.81	9	8.77	9	7.11	8	8.84
11	8.33	11	9.26	11	7.81	8	8.47
14	9.96	14	8.1	14	8.84	8	7.04
6	7.24	6	6.13	6	6.08	8	5.25
4	4.26	4	3.1	4	5.39	19	12.5
12	10.8	12	9.13	12	8.15	8	5.56
7	4.82	7	7.26	7	6.42	8	7.91
5	5.68	5	4.74	5	5.73	8	6.89
Mean	**9, 7.50**		**9, 7.50**		**9, 7.50**		**9, 7.50**
Variance	**11, 4.1**		**11, 4.1**		**11, 4.1**		**11, 4.1**
Correlation	**0.816**		**0.816**		**0.816**		**0.816**
Linear regression	**Y=0.500x + 3.00…..**						

I


14
12
10
8
6
4
2
0
0
5
10
15
20

II


14
12
10
8
6
4
2
0
0
5
10
15
20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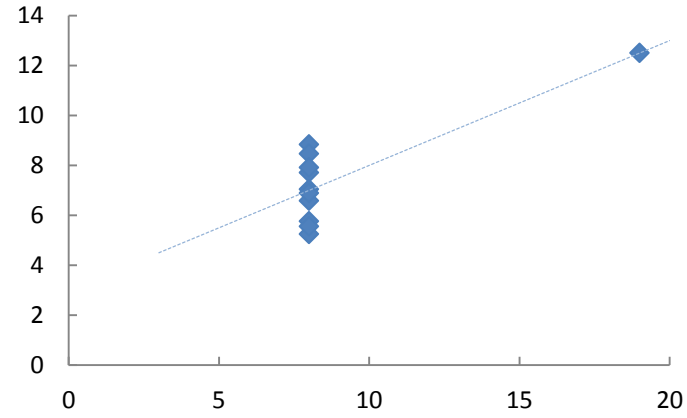
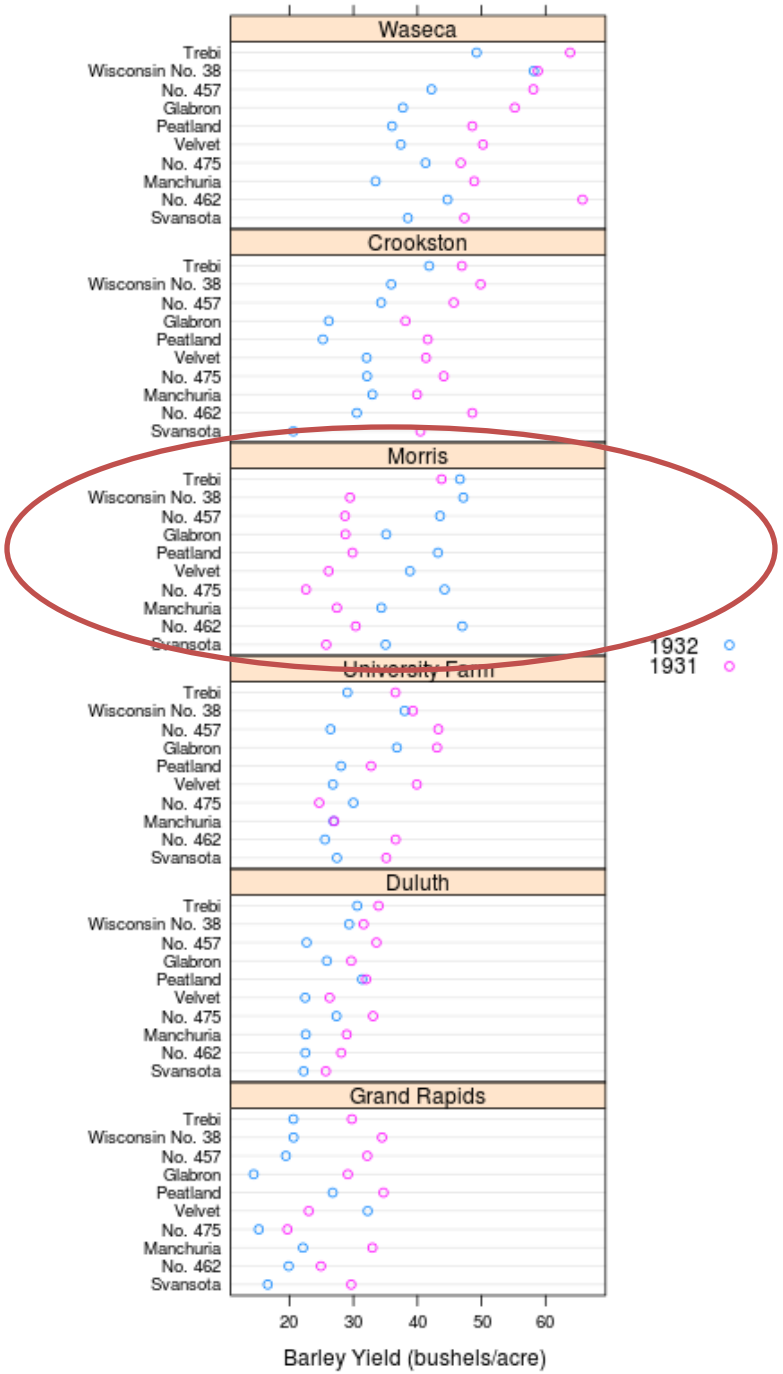
12
10
8
6
4
2
0
0
5
10
15
20

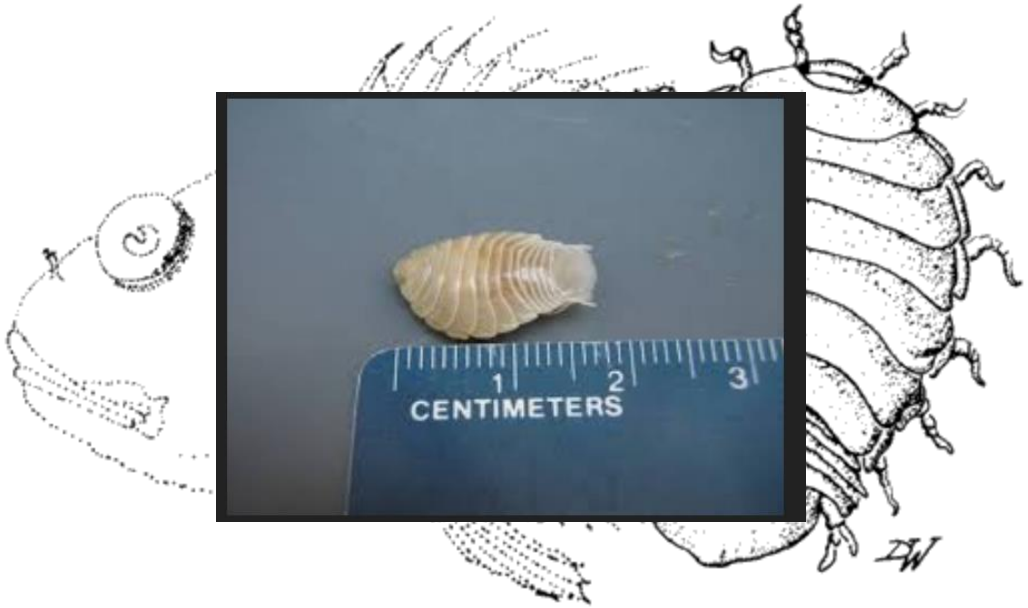
III


14
12
10
8
6
4
2
0
0
5
10
15
20

IV


Waseca
Crookston
Morris
University Farm
Duluth
Grand Rapids
Trebi
Wisconsin No. 38
No. 457
Glabron
Peatland
Velvet
No. 475
Manchuria
No. 462
Svansota
1932
1931
20
30
40
50
60
Barley Yield (bushels/acre)

Smithsonian Environmental
Research Center


1
2
3
CENTIMETERS

White perch

	Total	infected	clear
Total	**32**	**12**	**20**
big	17	7	11
small	15	5	9

Pumpkinseed

	Total	infected	clear
Total	**38**	**16**	**22**
big	18	12	6
small	20	4	16

White perch

	Total	infected	clear
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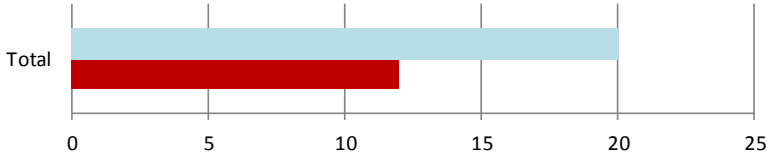

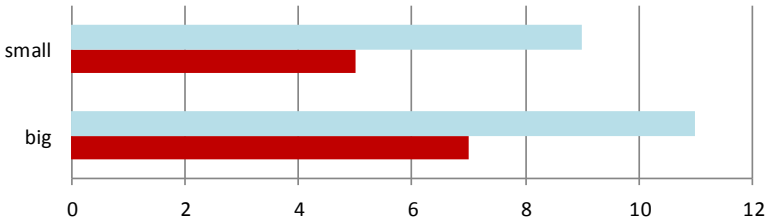

Pumpkinseed

	Total	infected	clear
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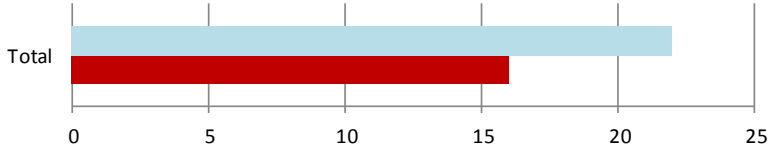
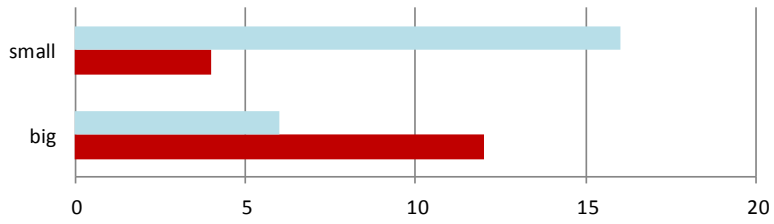
	20	4	16





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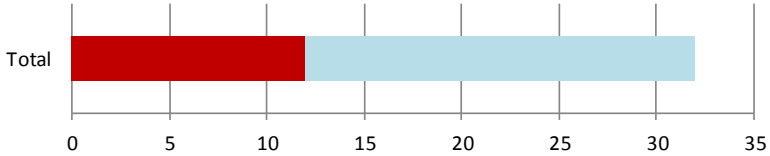

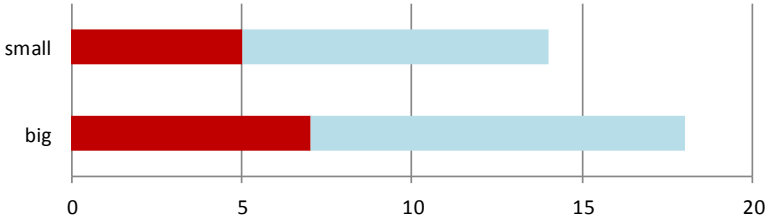

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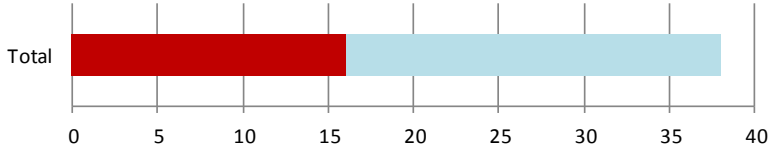

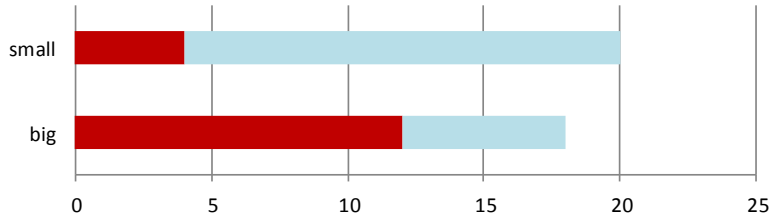

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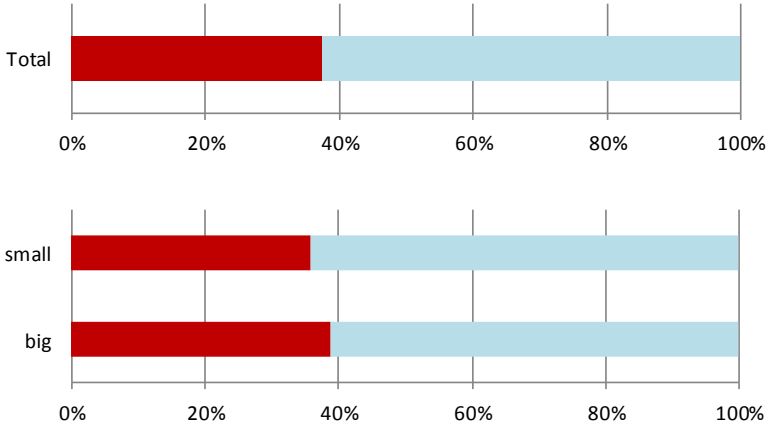

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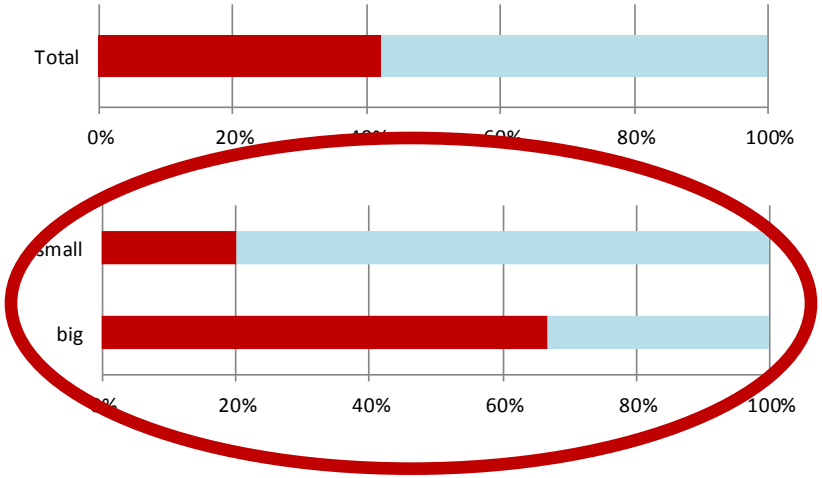
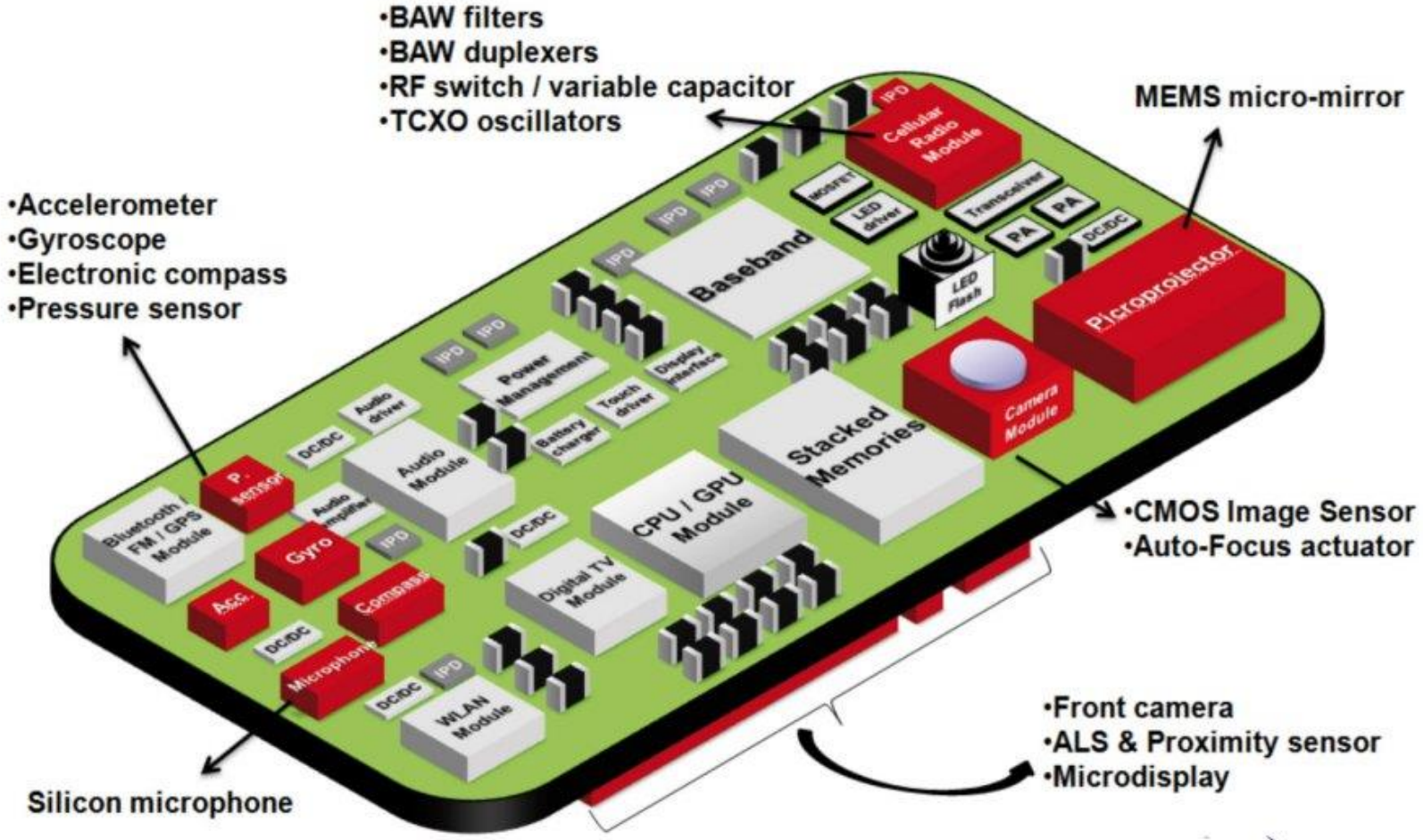



BEST
SERVED


90,000 FT!
© Youtube

Simplified view of a smart-phone board

MEMS & Sensors in red (scope of this report)



2010.91
02.02

Acoustic

GRAV

MAG

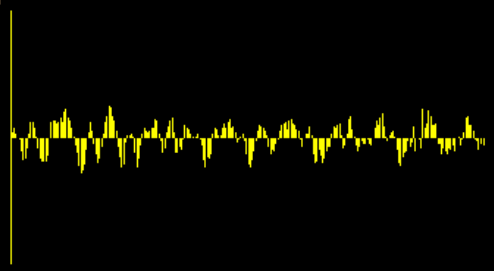
ACO

GEO

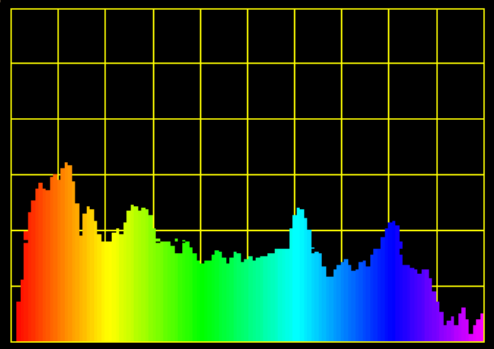
EMS

SOL

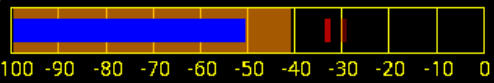
Waveform



Spectrum

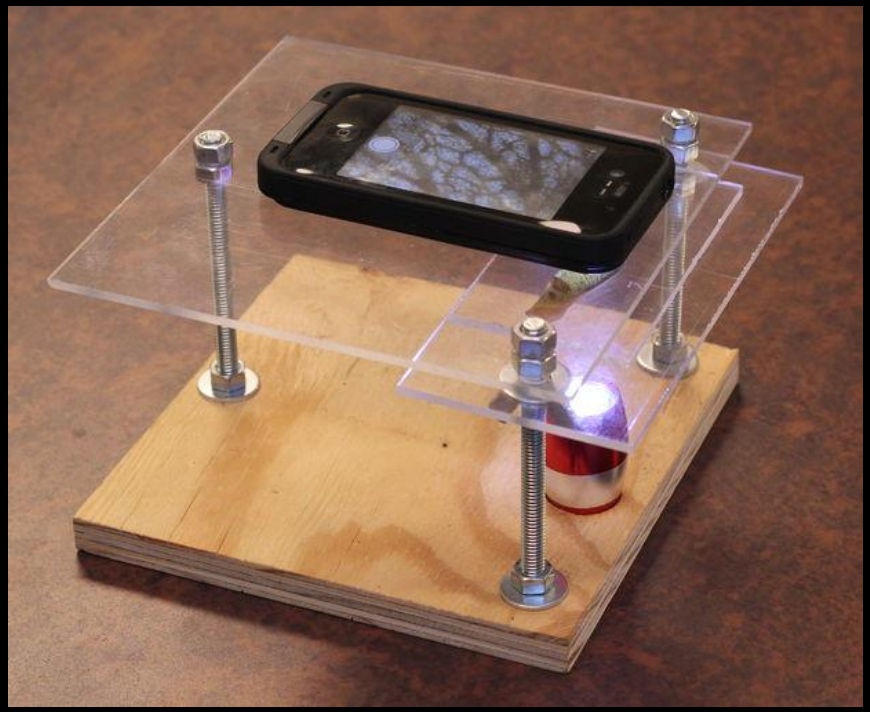


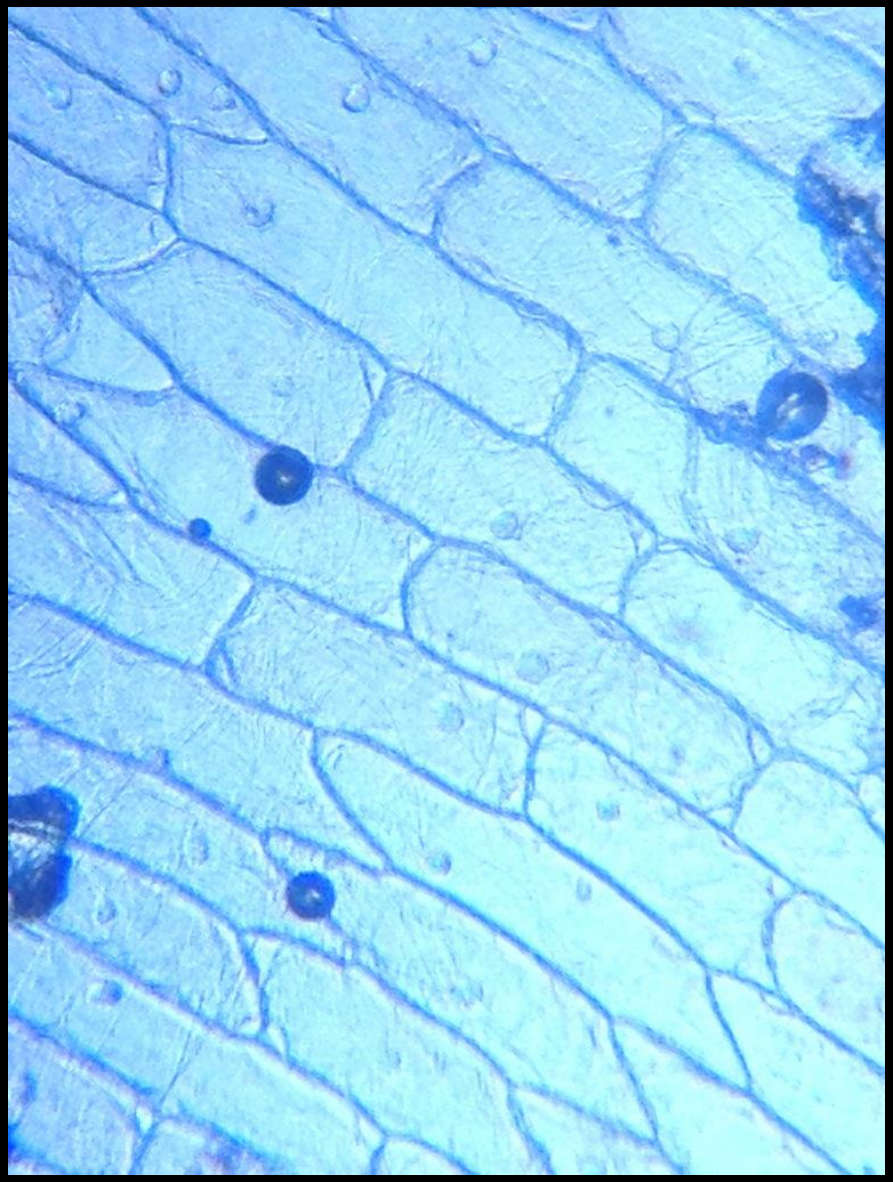
Power



-41.3dB

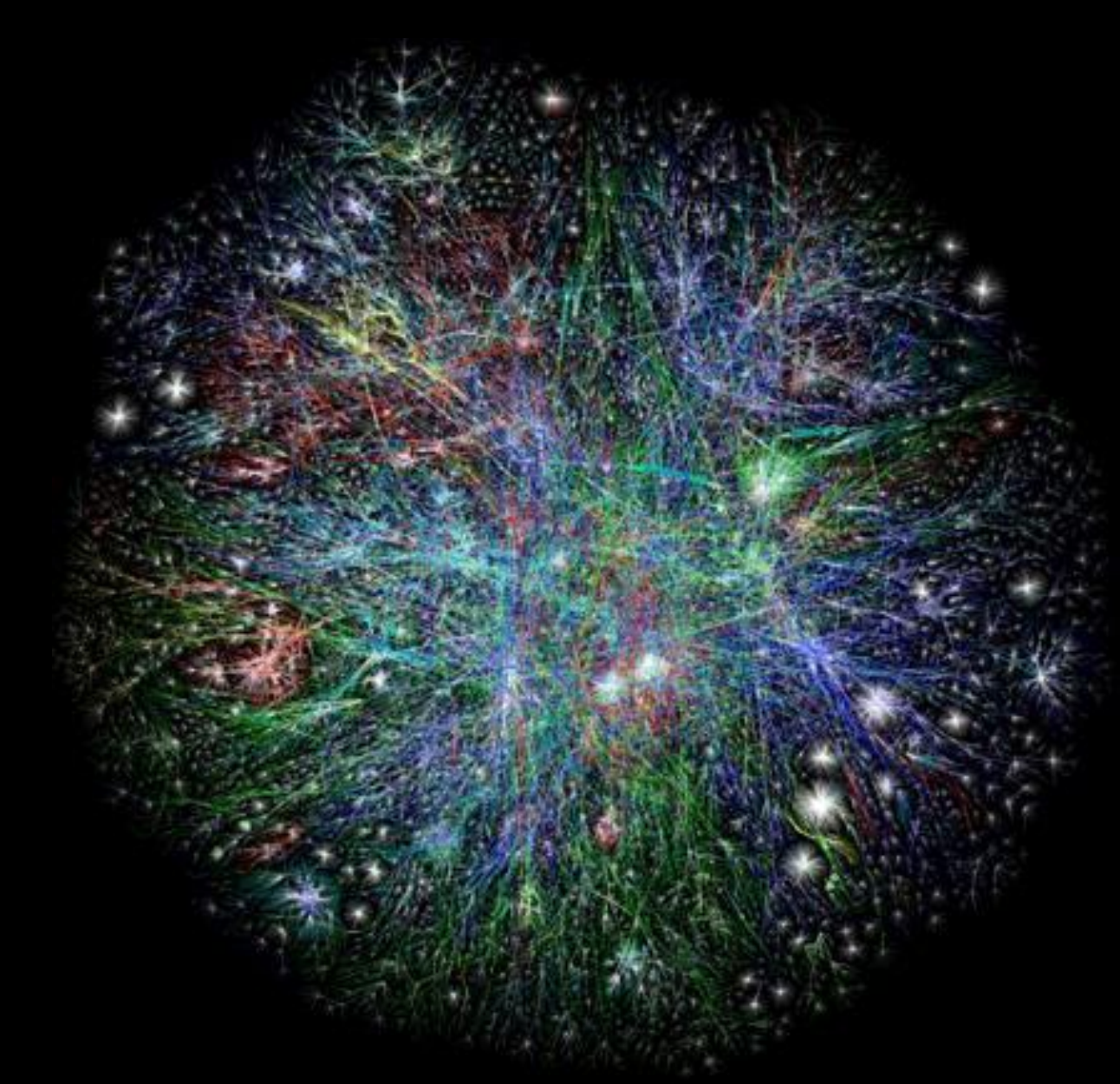
-29.6dB peak





Jupiter through iPhone, no Moon filter

Jupiter through iPhone w/ Moon filter
+ stacking & editing



There are somewhere in the order of 4.2 billion unique Internet addresses (IPs), housed on 44 million servers.

--January 2010

Agriculture

Climate

Education

Energy

Finance

Geospatial

Global Development

Health

Jobs & Skills

Public Safety

Science & Research

Weather

Business

Cities

Consumer

Counties

Ethics

Law

Manufacturing

Ocean

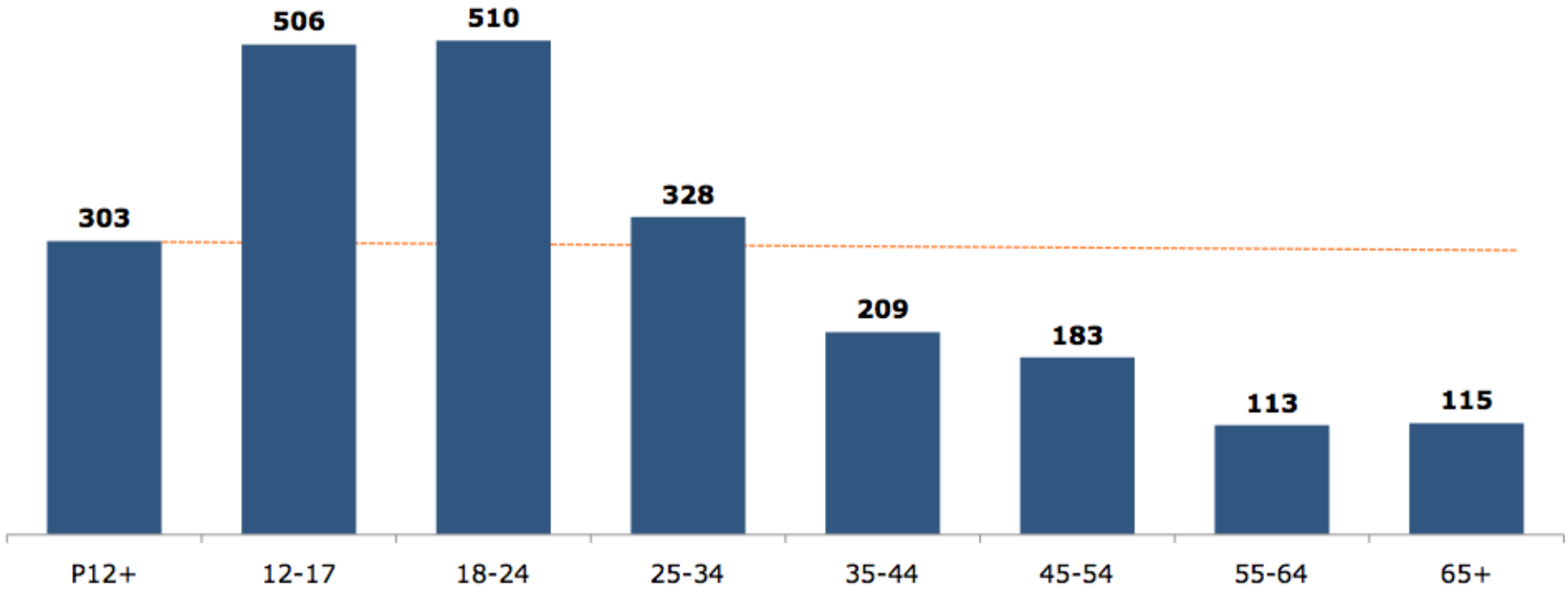
States

http://www.data.gov/

Average Number of Facebook Friends, by Age Group

among Facebook users aged 12+, self-reported

April 2013



MC MARKETINGCHARTS.COM

Source: Arbitron/Edison Research

The first principle is that you must not fool yourself – and you are the easiest person to fool. -- Richard Feynman

That is, if we investigate further, we find that the statements of science are **not** of what is true and what is not true, but statements of what is known to **different degrees of certainty**:

"It is very much more likely that *so and so* is true than that it is not true"

The Scientific Process

- Observation
- Hypothesis formation
- Experiment
- Publication of results
- Repetition of experiment by others
- Acceptance of theory

The Scientific Process

“Hey, that’s curious.”

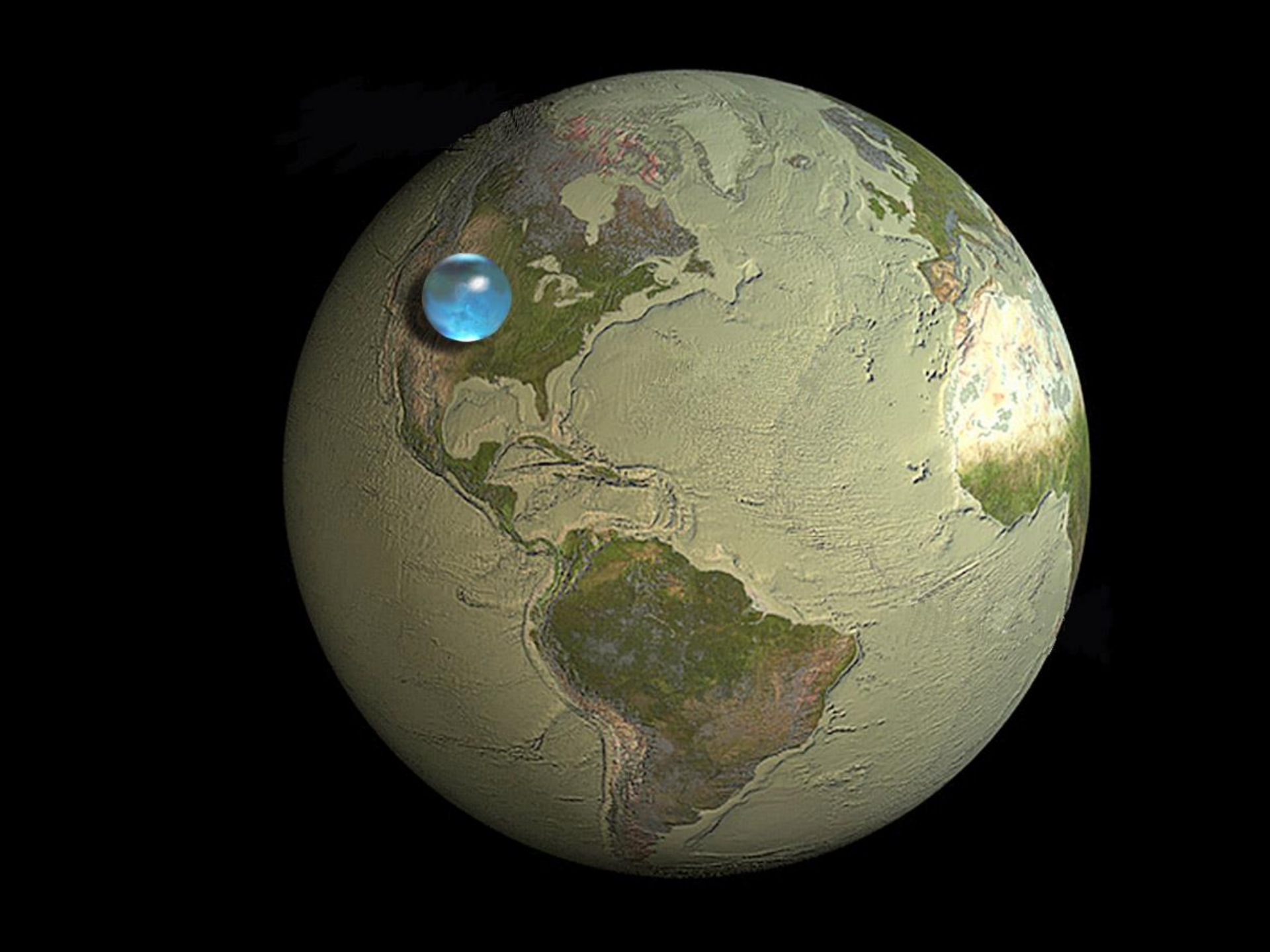
“Maybe XYZ is behind that?”

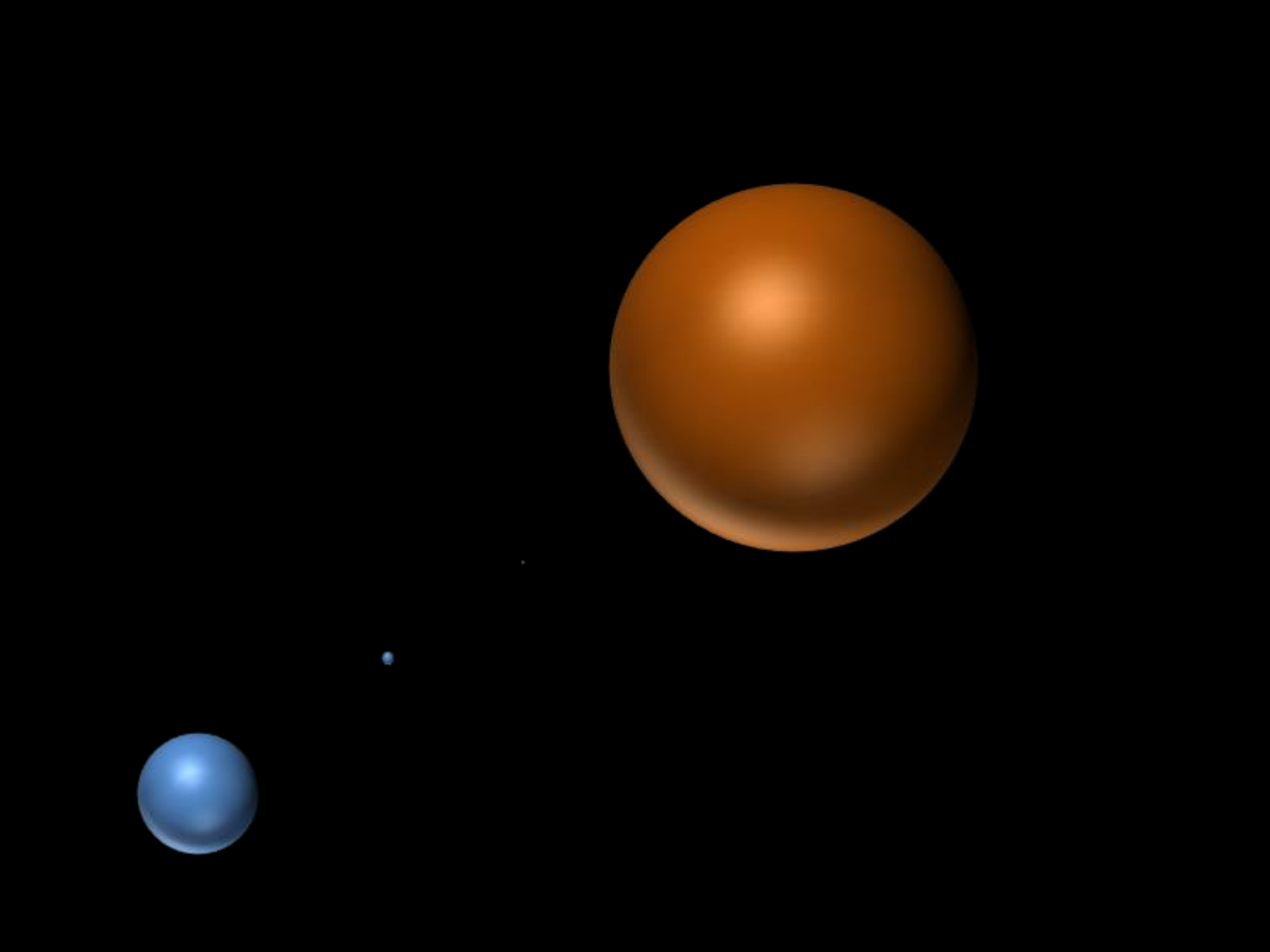
“If it is XYZ, then when I do ABC this other thing should happen.”

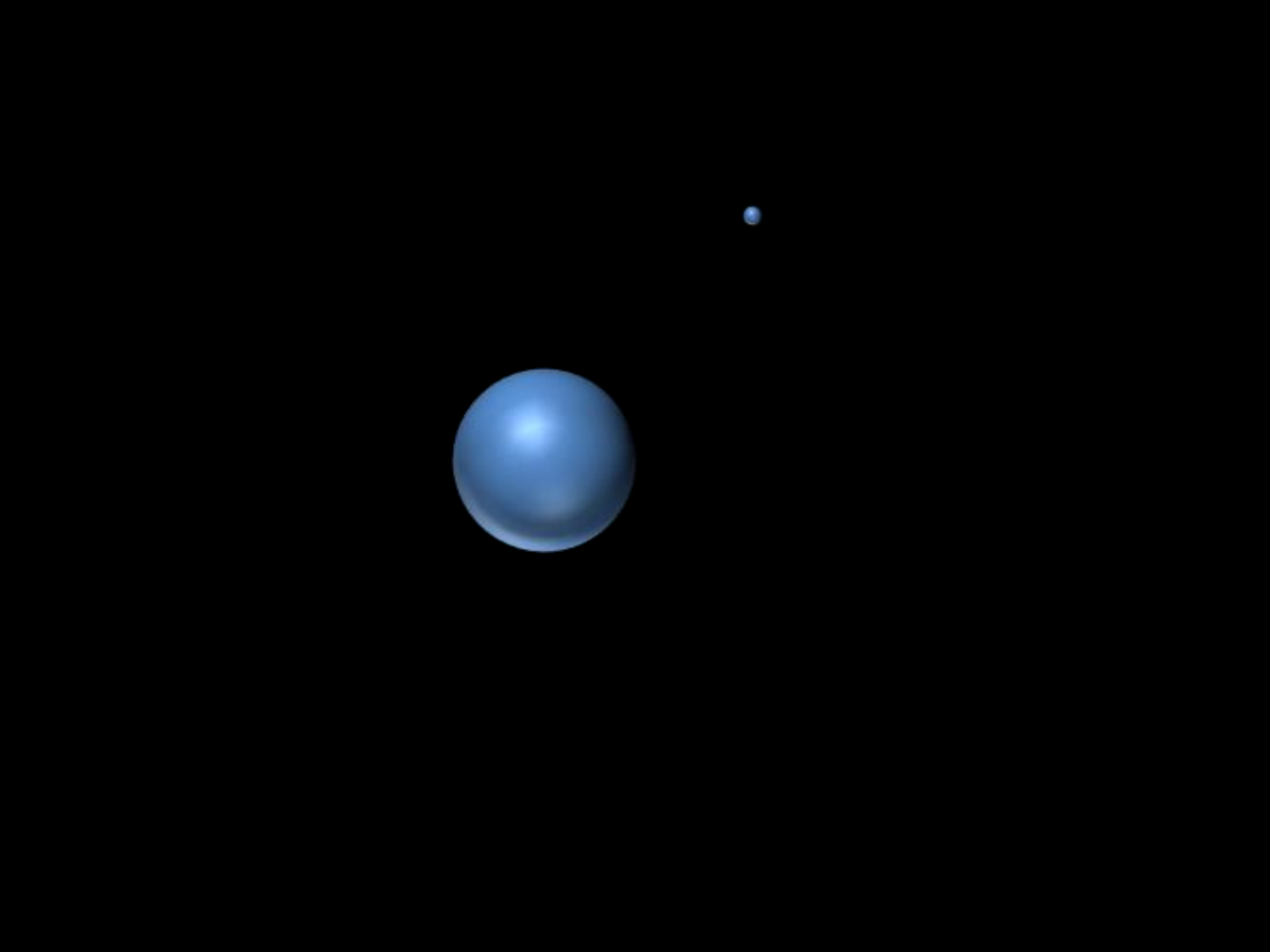
“Cool! Hey guys! Look what I found! Or have I missed something?”

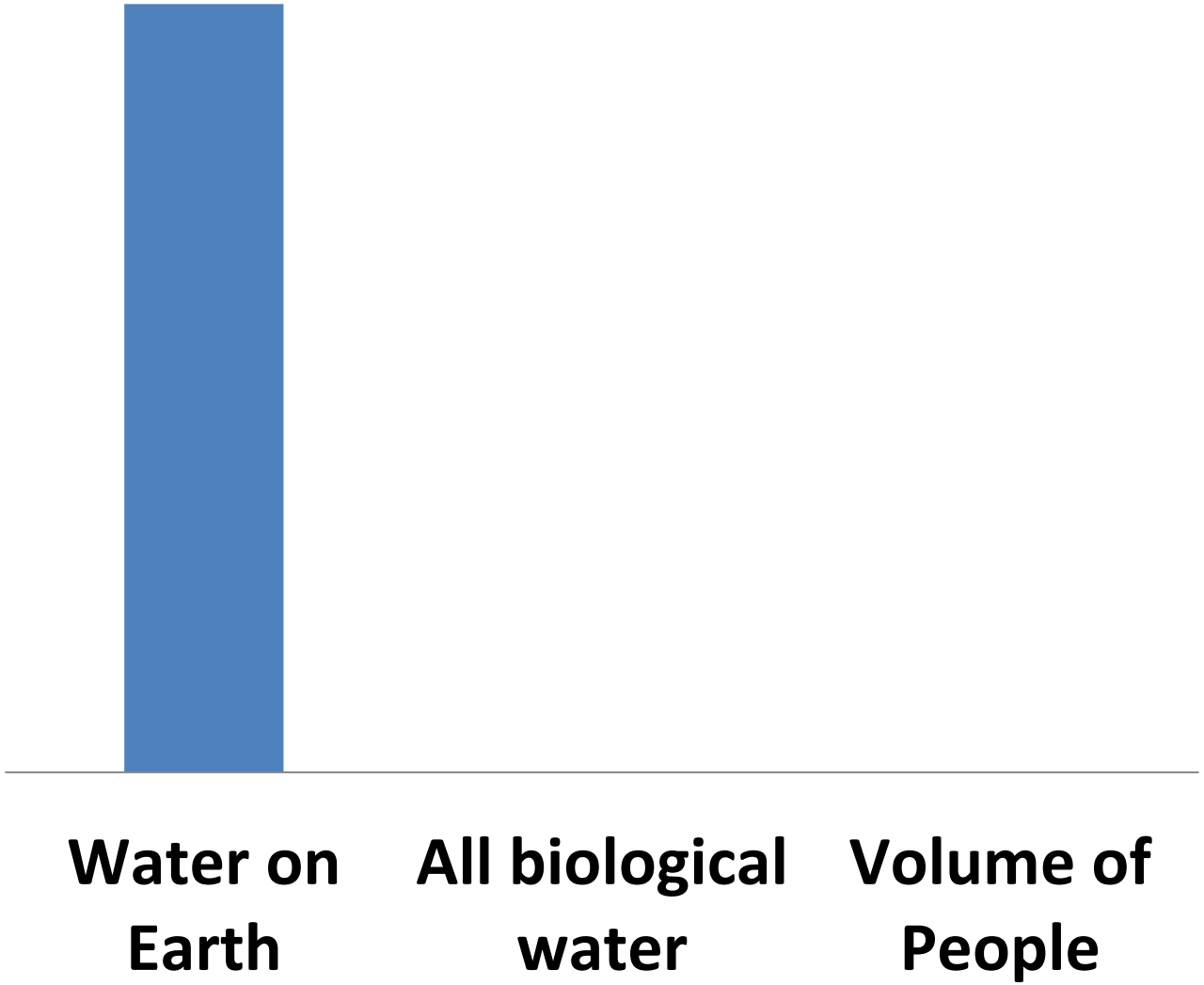
“Nope. It works for us, too.”

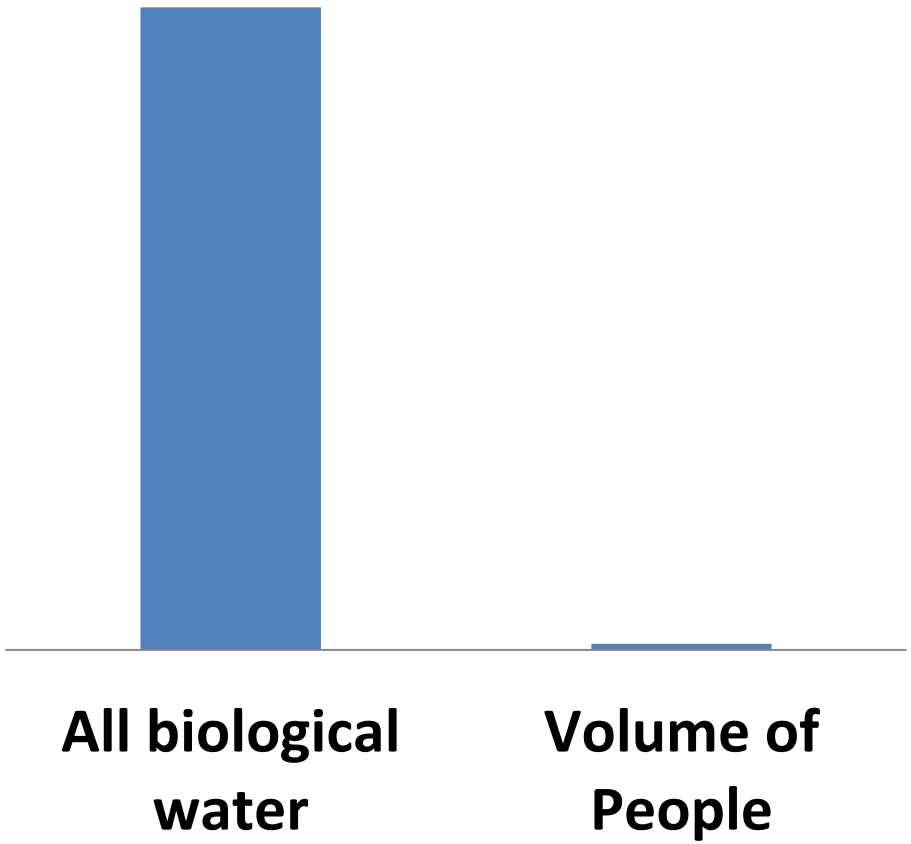
“So, does that mean XYZ is the rule then?”

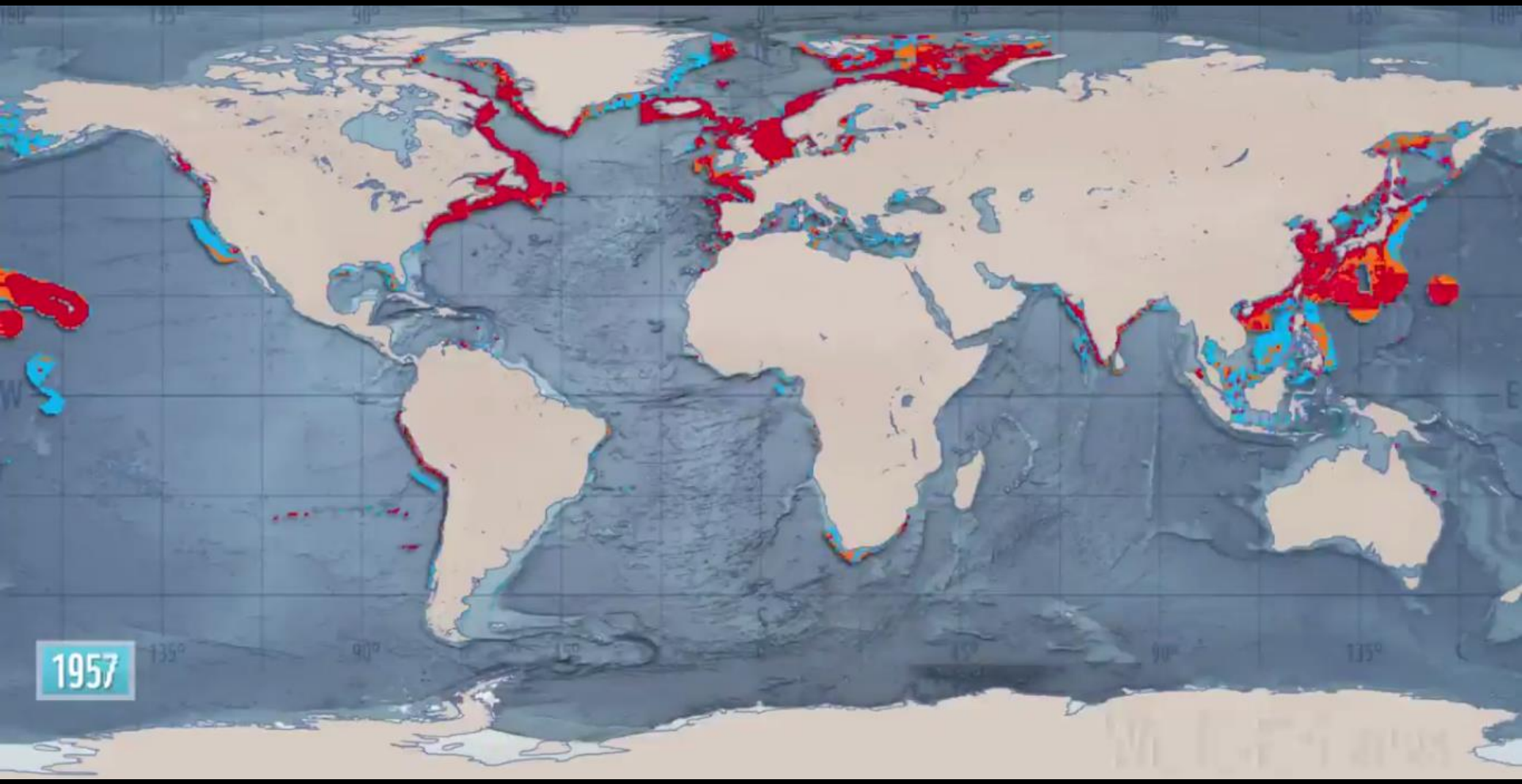


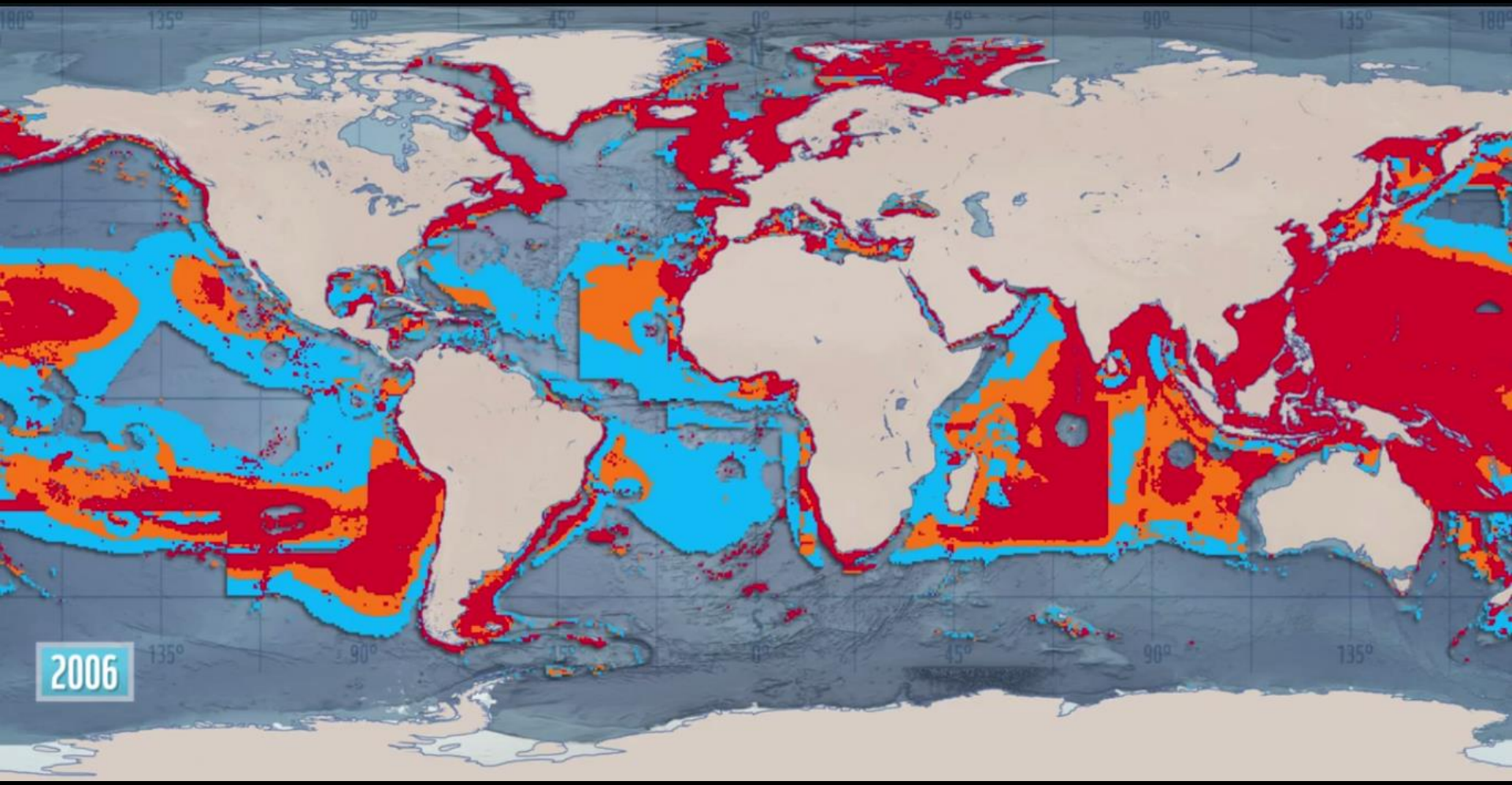





Water on Earth
All biological water
Volume of People


All biological water
Volume of People


1957


180°
135°
90°
45°
0°
45°
90°
135°
180°
2006

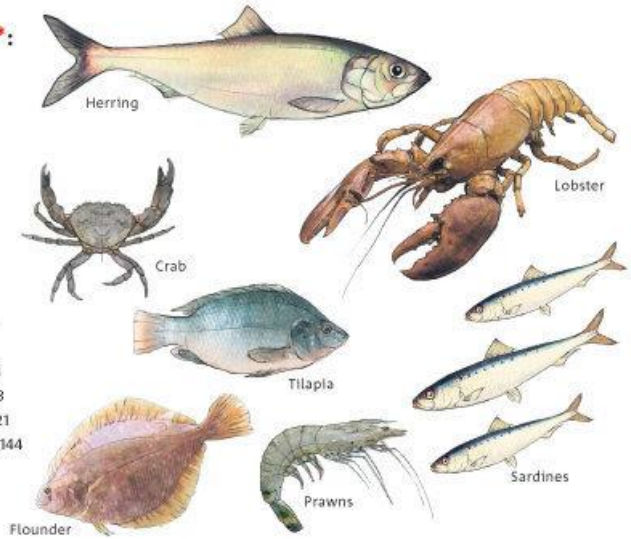
Mercury in fish and mollusks

80
Hg

Almost all seafood can accumulate mercury and methylmercury, highly toxic elements that can cause severe damage to the nervous system. The quantity of these substances varies widely depending on the type of animal. For example, long-living fish contain more mercury than mollusks.
It therefore makes sense to choose those seafoods with a minimal concentration of mercury, bearing in mind that children and pregnant or breastfeeding women are particularly vulnerable.

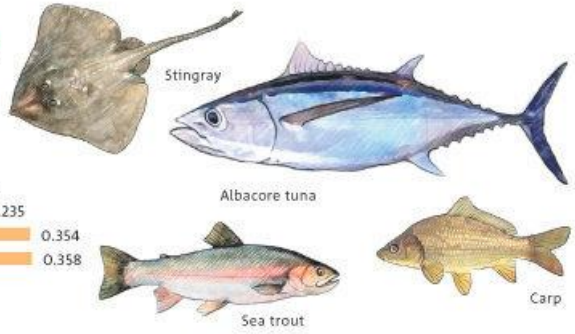
Safe to eat 2-3 times a week*:

Scallops	0.003
Shrimp/Prawns	0.009
Oysters	0.012
Sardines	0.013
Tilapia	0.013
Salmon	0.022
Calamari	0.023
Atlantic mackerel	0.050
Mullet	0.050
Flounder	0.056
Crab	0.065
River trout	0.071
Herring	0.084
Lobster	0.093
Rockfish	0.121
Skipjack tuna	0.144



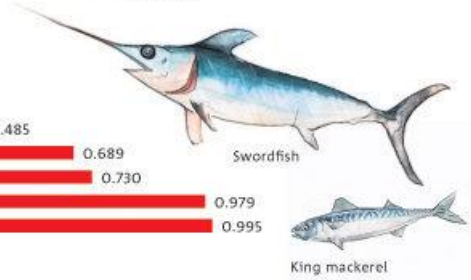
Eat no more than once a week*:

Carp	0.110
Stingray	0.137
European perch	0.150
Sea bass	0.152
Red snapper	0.166
Sea trout	0.235
Yellowfin tuna	0.354
Albacore tuna	0.358



Not recommended to eat*:

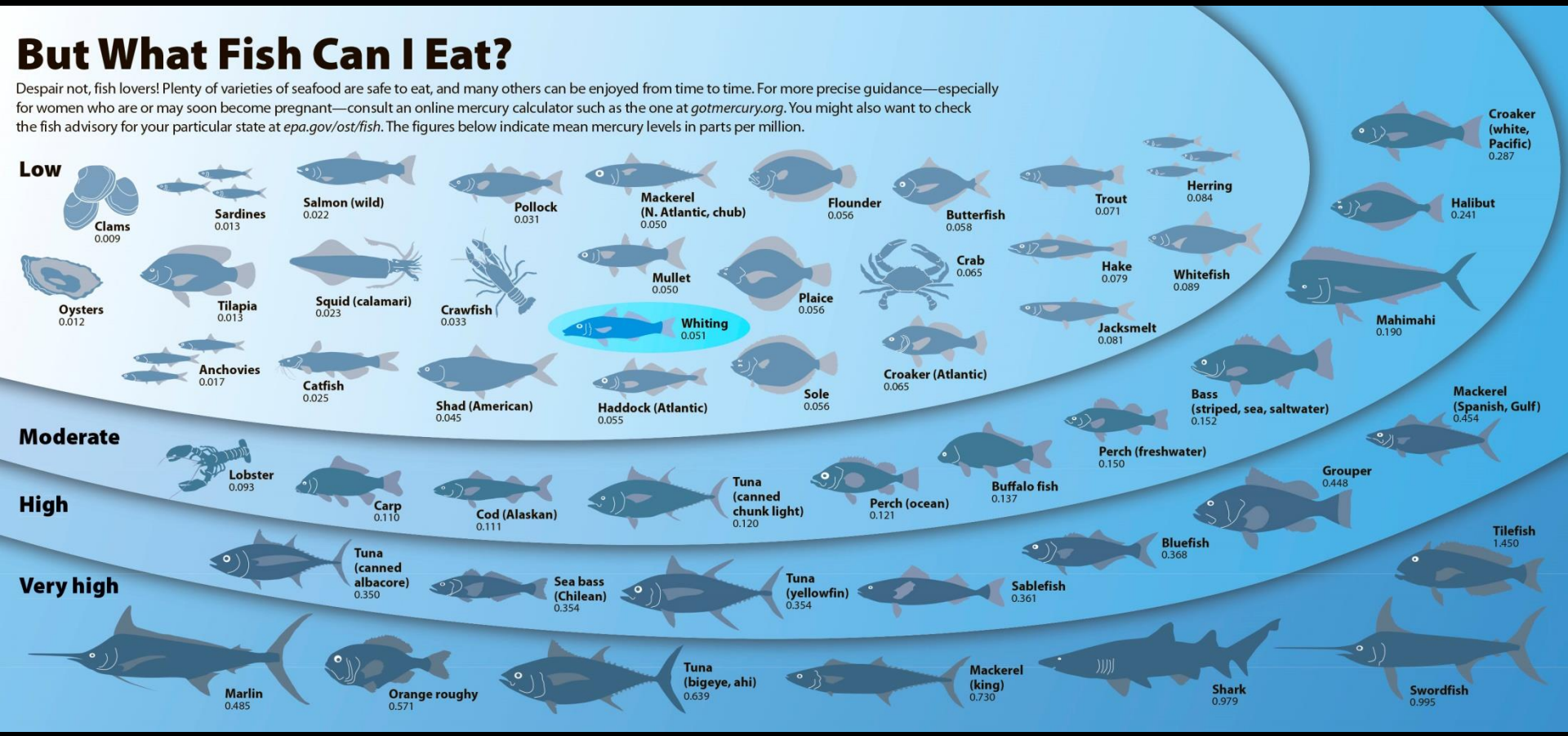
Marlin	0.485
Bigeye tuna	0.689
King mackerel	0.730
Shark	0.979
Swordfish	0.995



* *mercury concentration: parts per million*

But What Fish Can I Eat?

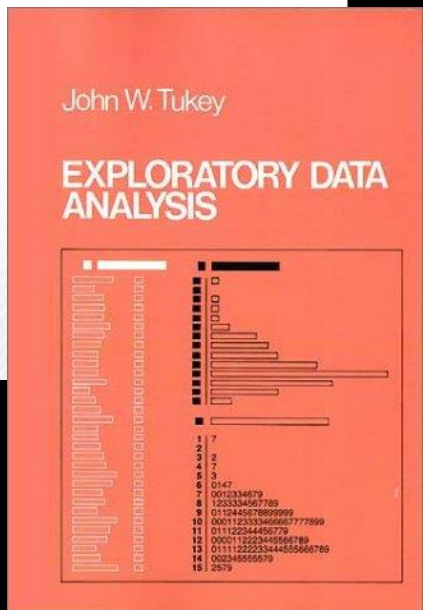
Despair not, fish lovers! Plenty of varieties of seafood are safe to eat, and many others can be enjoyed from time to time. For more precise guidance—especially for women who are or may soon become pregnant—consult an online mercury calculator such as the one at *gotmercury.org*. You might also want to check the fish advisory for your particular state at *epa.gov/ost/fish*. The figures below indicate mean mercury levels in parts per million.

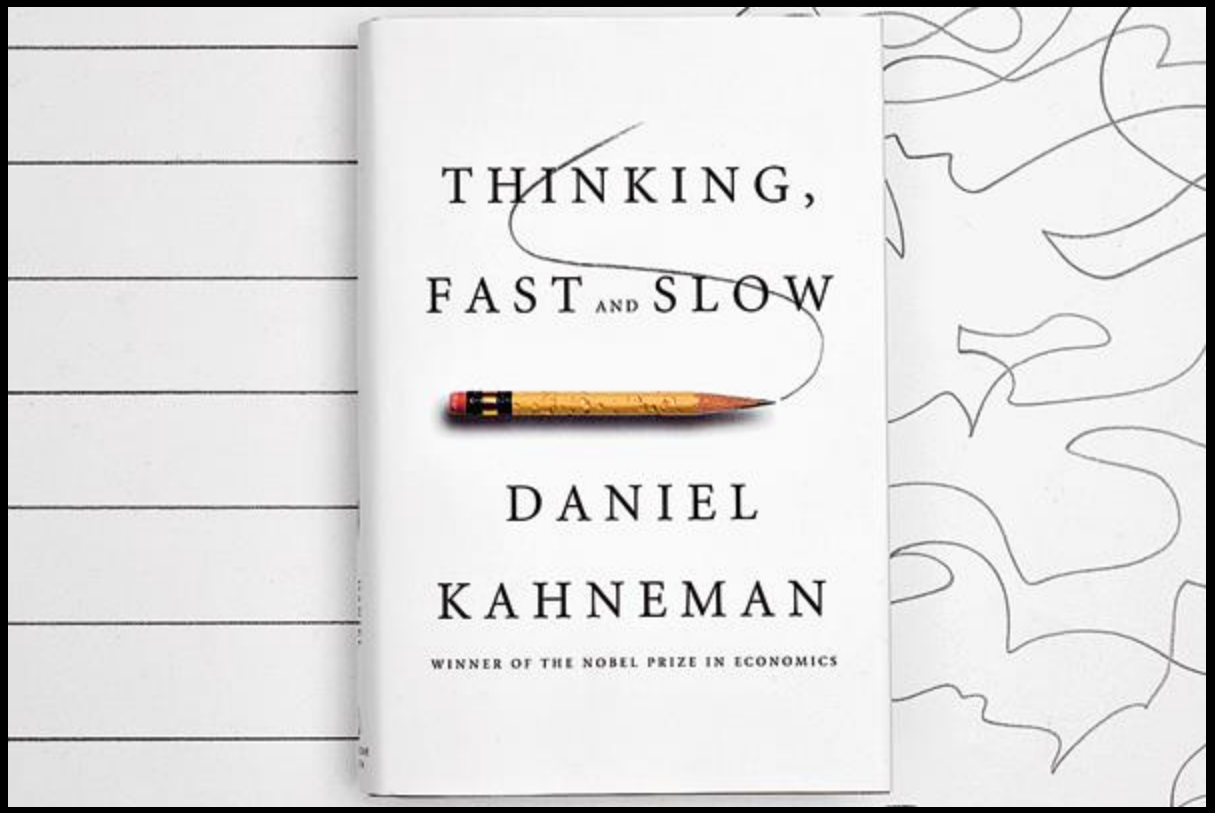


athematics, the research content of PRIM-9 was in the area of computer-human
faces, drawing on tools from computer science. When the product of statistical research
theorems published in journals, PRIM-9 was a program documented in a movie.
W. Tukey's Work on Interactive Graphics. The Annals of Statistics, Vol. 30 No. 6. 2002.

"The greatest value of a picture is when it forces us to notice what we never expected to see."

- John Tukey, 1977




THINKING,
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KAHNEMAN
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