

# VISUAL DESIGN & STORYTELLING

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# APPLICATIONS OF VISUALIZATIONS

ANALYSIS **EXPLORATORY**

PRESENTATION **EXPLANATORY**

See also <https://vimeo.com/98986594>

# A FEW MISTAKES THAT WE ALL MAKE

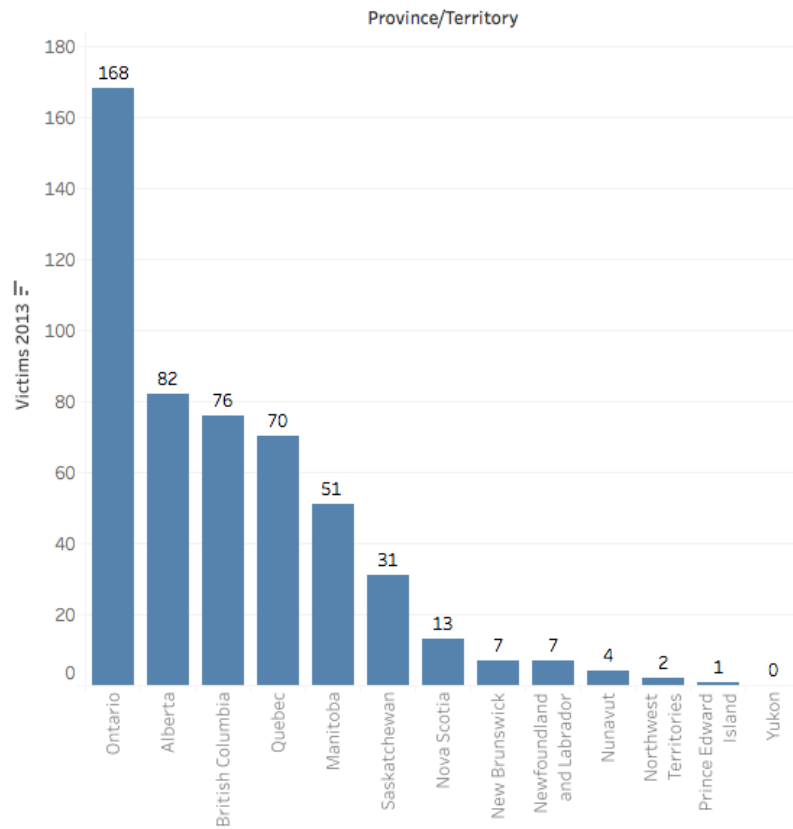
- Making meaningful comparisons
- Inferring trends and differences from noise
- Assumptions about the meaning of correlations
- Claims of “significance”

# MAKING MEANINGFUL COMPARISONS

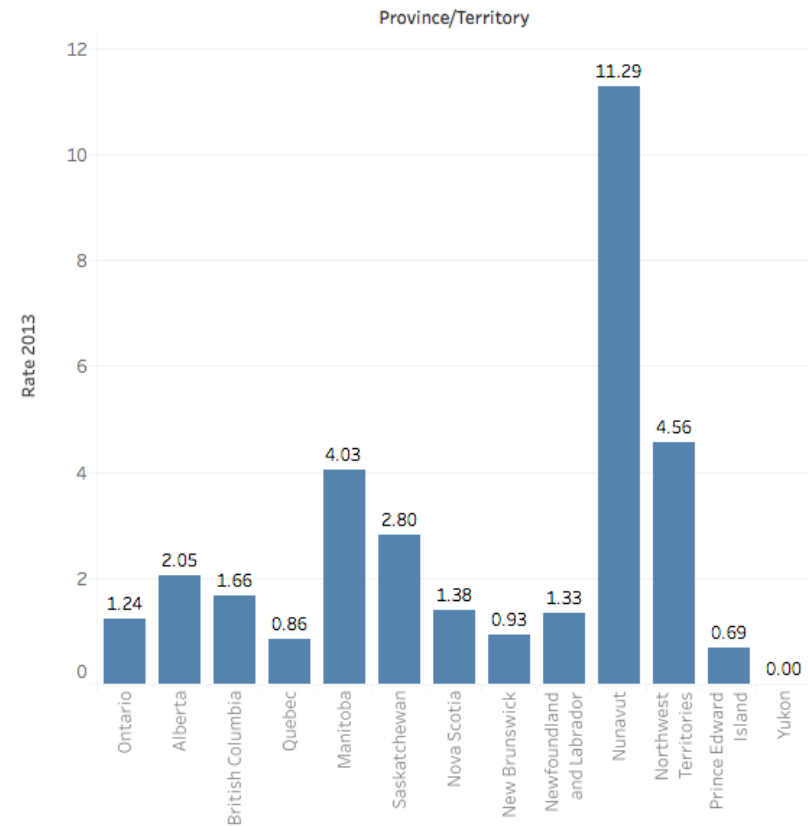
- Normalized vs. Non-normalized Counts
  - Murders / Capita
  - Failing grades / 100 Students
  - Etc.
- Counts vs. Distinct Counts
  - # visits vs. # of customers

# WHAT IS THE MOST DANGEROUS PROVINCE?

Victims by Province/Territory 2013



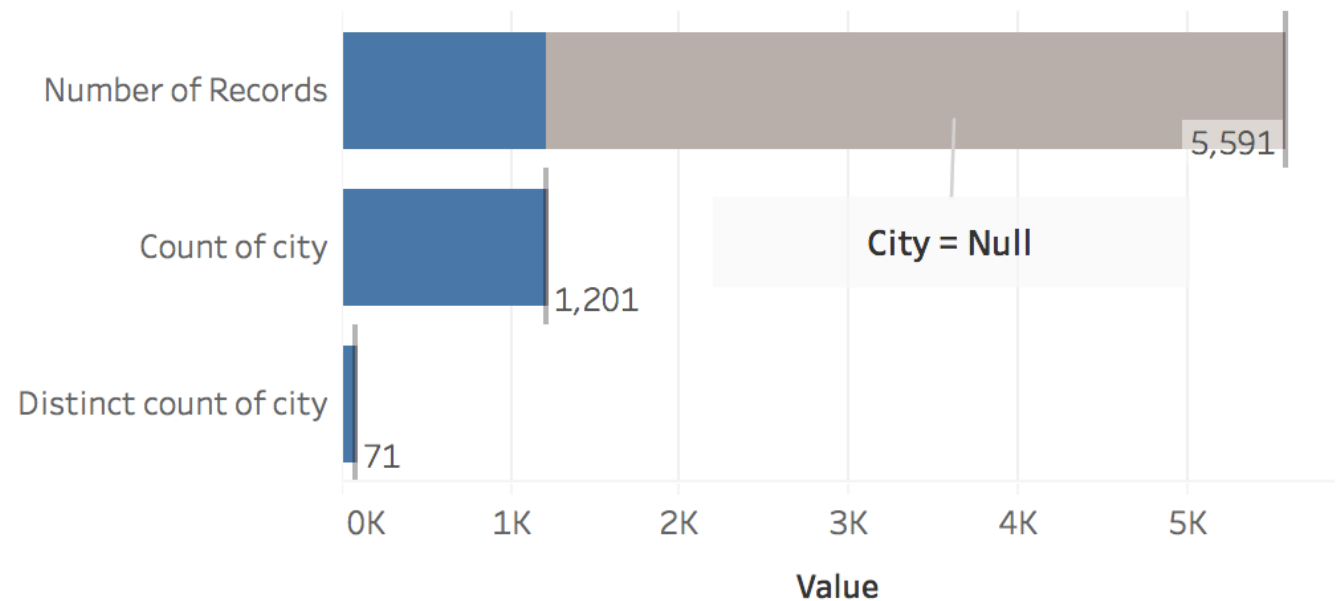
Victims per 100,000 residents by Province/Territory 2013



# COUNT VS COUNT DISTINCT

- Number of Records =
- How many individual rows are there?
- Count =
- How many rows have a value for this column?
- Count Distinct =
- How many distinct values are there in this column?

Yelp - Businesses near Montreal



# A FEW MISTAKES THAT WE ALL MAKE

- Making meaningful comparisons
- Inferring trends and differences from noise
- Assumptions about the meaning of correlations
- Claims of “significance”

**WE ALMOST ALWAYS  
KNOW LESS THAN  
WE THINK WE DO**

(Even after we've looked at the data.)



# LOOKING FOR PATTERNS IN STATIC

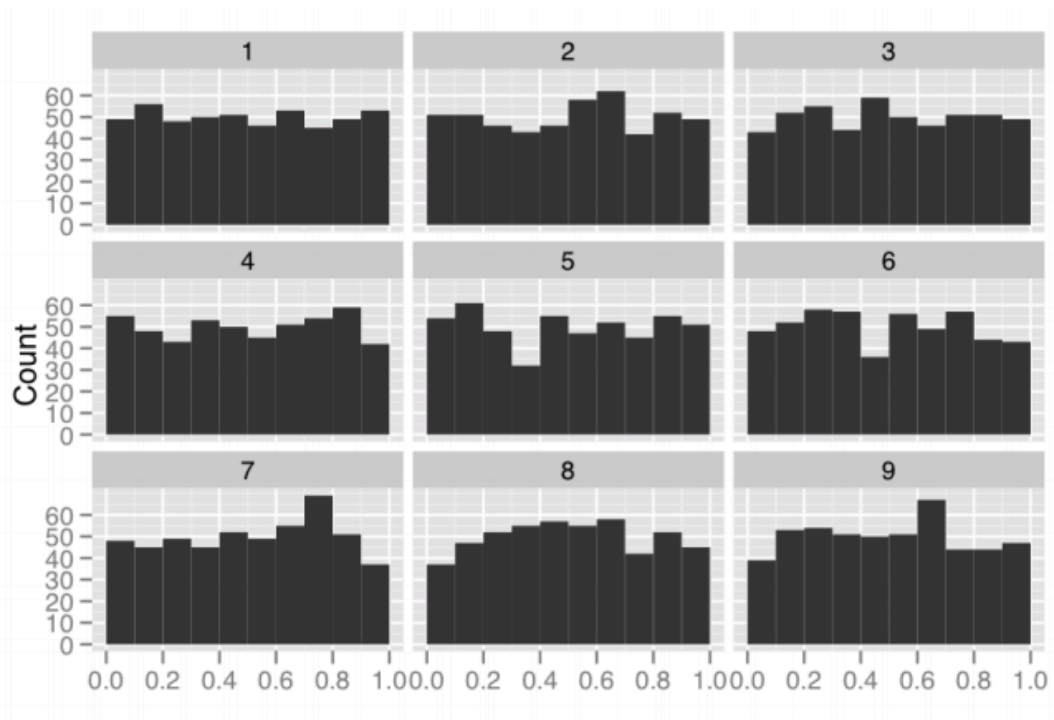
- Almost all data has noise, errors, and variability.
- We are great at seeing patterns – even when we shouldn't.



# IT'S VERY EASY TO TELL STORIES AROUND DATA

...but it's harder to show that those stories are robust!

# RANDOM DATA VS REAL DATA



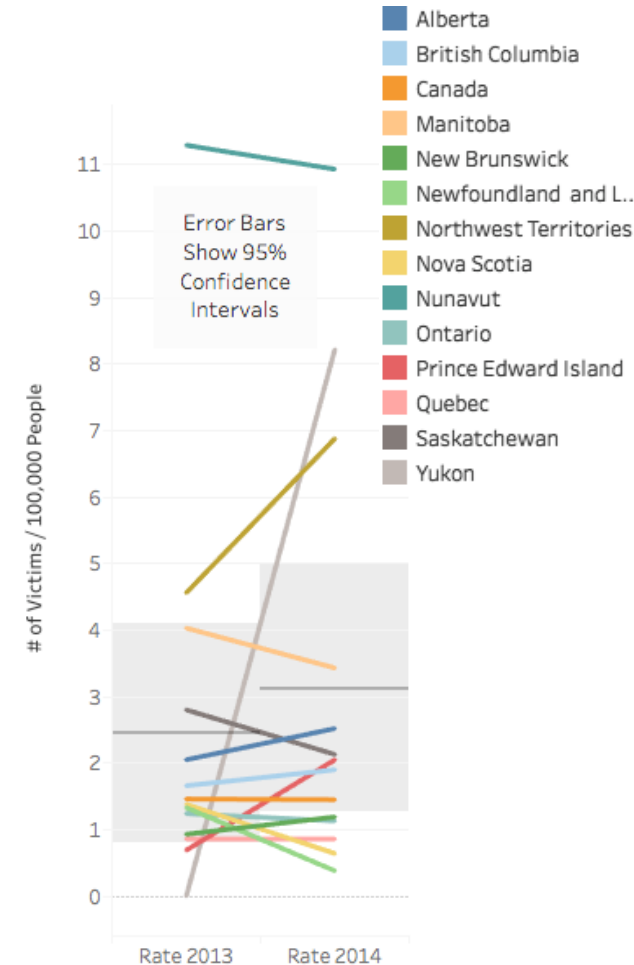
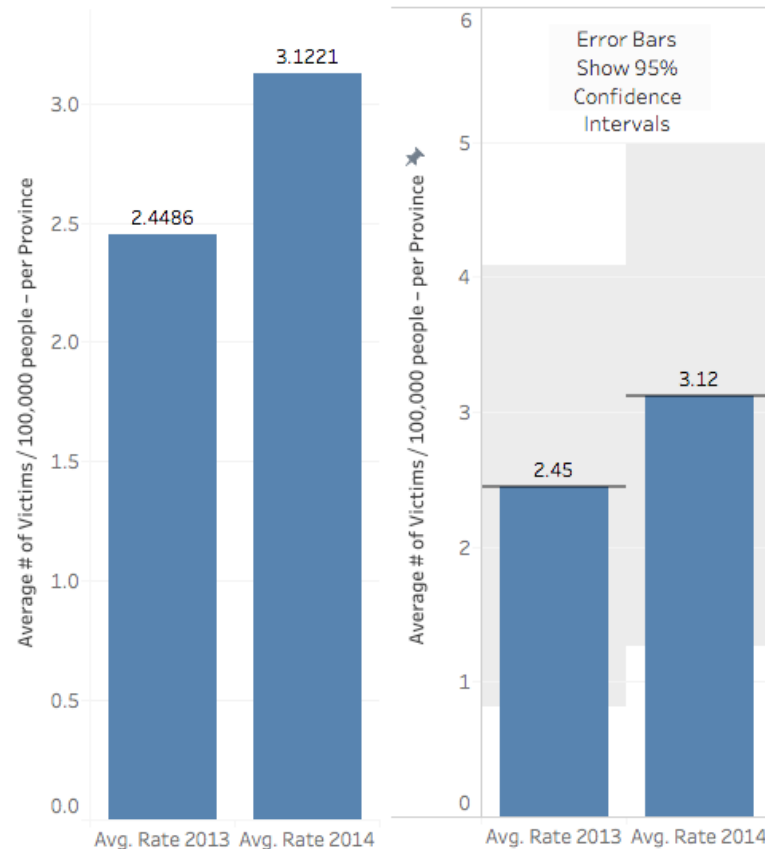
[Wickham et al. 2010](#)

A “RORSCHACH” PROTOCOL

# IGNORING EFFECT SIZE AND VARIABILITY

Victims by Province Territory Table

Province/Territory	Rate 2013	Rate 2014
Alberta	2.05	2.52
British Columbia	1.66	1.90
Manitoba	4.03	3.43
New Brunswick	0.93	1.19
Newfoundland and Labra..	1.33	0.38
Northwest Territories	4.56	6.88
Nova Scotia	1.38	0.64
Nunavut	11.29	10.93
Ontario	1.24	1.13
Prince Edward Island	0.69	2.05
Quebec	0.86	0.86
Saskatchewan	2.80	2.13
Yukon	0.00	8.22



# A FEW MISTAKES THAT WE ALL MAKE

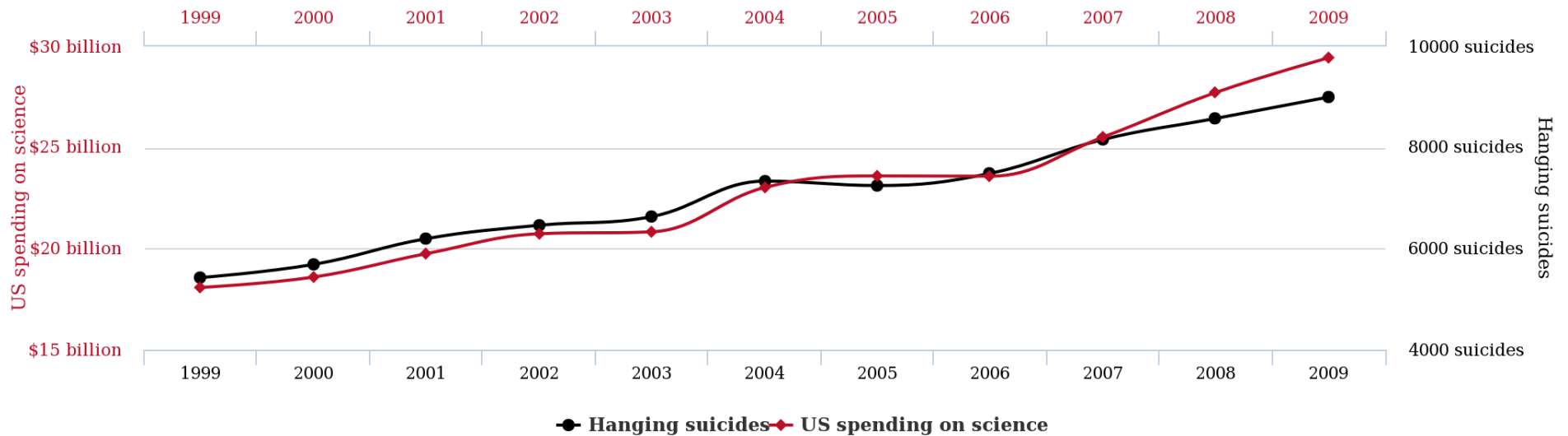
- Making meaningful comparisons
- Inferring trends and differences from noise
- Assumptions about the meaning of correlations
- Claims of “significance”

# CORRELATIONS

- Is there really a correlation?
- How strong is it?
- Is it corroborated by other data?
- Does it make sense?

# EVEN STRONG CORRELATIONS MIGHT NOT MEAN ANYTHING!

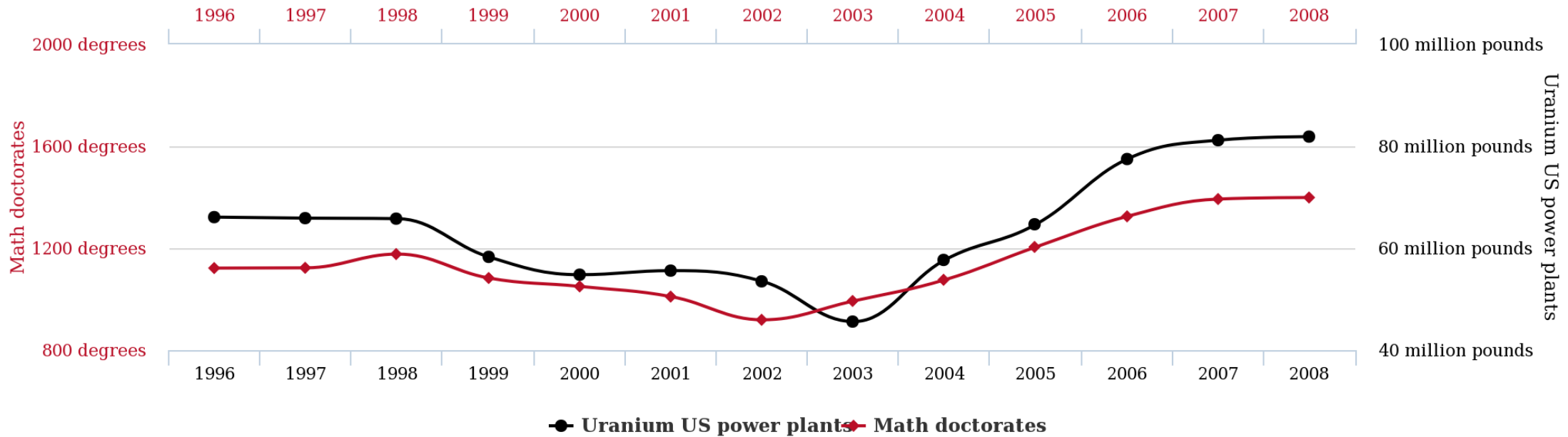
## US spending on science, space, and technology correlates with Suicides by hanging, strangulation and suffocation



tylervigen.com



# Math doctorates awarded correlates with Uranium stored at US nuclear power plants



**TRY THIS!**

[http://tylervigen.com/view\\_correlation](http://tylervigen.com/view_correlation)

# A FEW MISTAKES THAT WE ALL MAKE

- Making meaningful comparisons
- Inferring trends and differences from noise
- Assumptions about the meaning of correlations
- Claims of “significance”

# THE “LITERALLY” OF DATA ANALYSIS



**“SIGNIFICANTLY...**

**DIFFERENT**

**NEVER SAY THIS ...**

**UNLESS YOU'RE SURE  
THAT YOU HAVE  
PERFORMED THE  
CORRECT STATISTICAL  
SIGNIFICANCE TEST  
AND CAN REPORT P-  
VALUES, EFFECT SIZES,  
ETC.**

**HIGHER/LOWER**

**BIGGER/**

**SMALLER**

**MORE/LESS**

**MORE**

**IMPORTANT**

**ETC...**

# **COMMUNICATING ASSUMPTIONS AND LIMITATIONS**

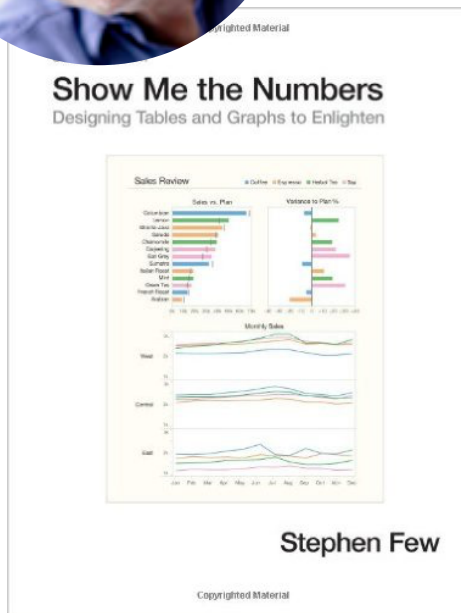
A good analysis must avoid overstating claims, and be honest about what you don't or can't know!



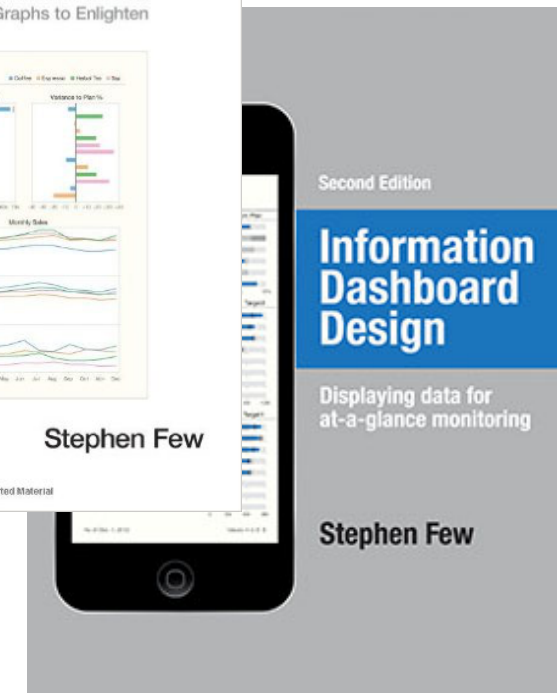
**Edward Tufte**



**Stephen Few**



**Stephen Few**



# GRAPHICAL INTEGRITY

- Well-designed presentation of interesting data
  - Substance, statistics, and design
- Complex ideas communicated with clarity, precision and efficiency
- Gives the viewer greatest number of ideas in the shortest amount of time, with the least ink and smallest space
- Nearly always multivariate
- Requires telling the truth



**Edward Tufte**



# TUFTE'S INTEGRITY PRINCIPLES

- MAXIMIZE THE DATA-INK RATIO
- AVOID CHART JUNK (*SOMETIMES*)
- LAYER INFORMATION
- MAXIMIZE THE DATA DENSITY
  - *SHRINK THE GRAPHICS*
  - *MAXIMIZE THE AMOUNT OF DATA SHOWN (SOMETIMES)*



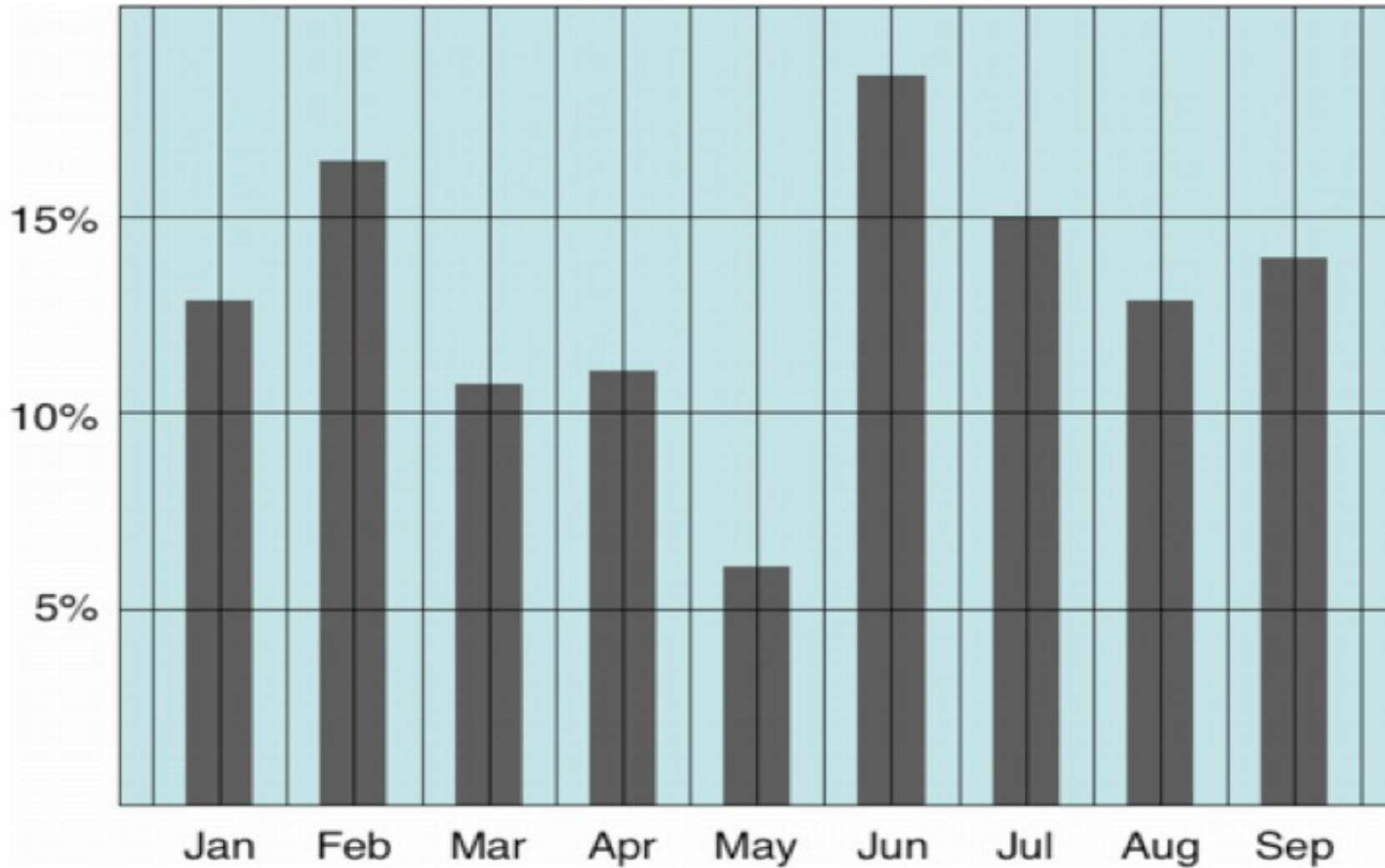
**EDWARD TUFTE**

# DATA-INK RATIO

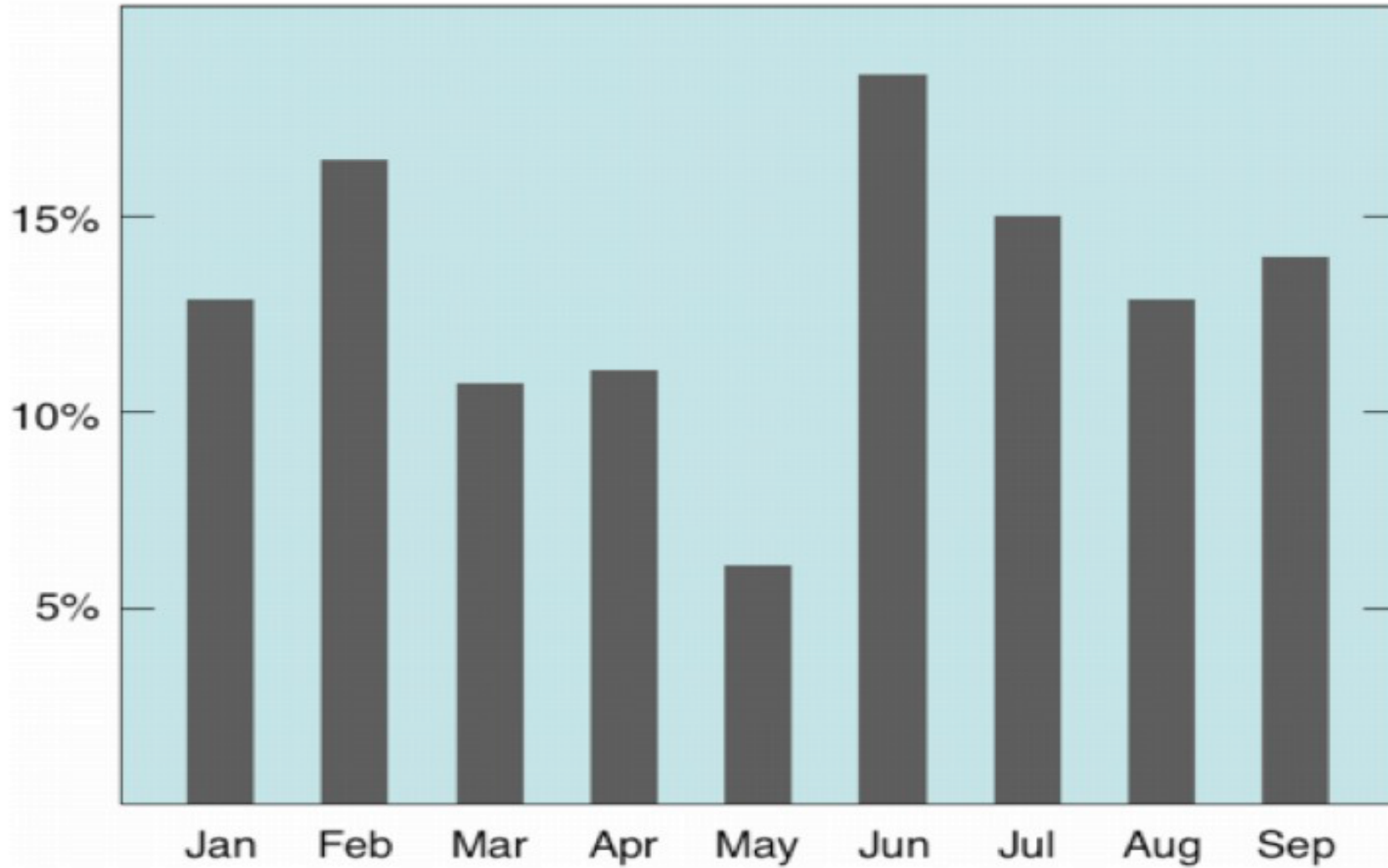
MAXIMIZE THE RATIO OF

$$\frac{\text{(INK USED TO SHOW DATA)}}{\text{(TOTAL INK USED)}}$$

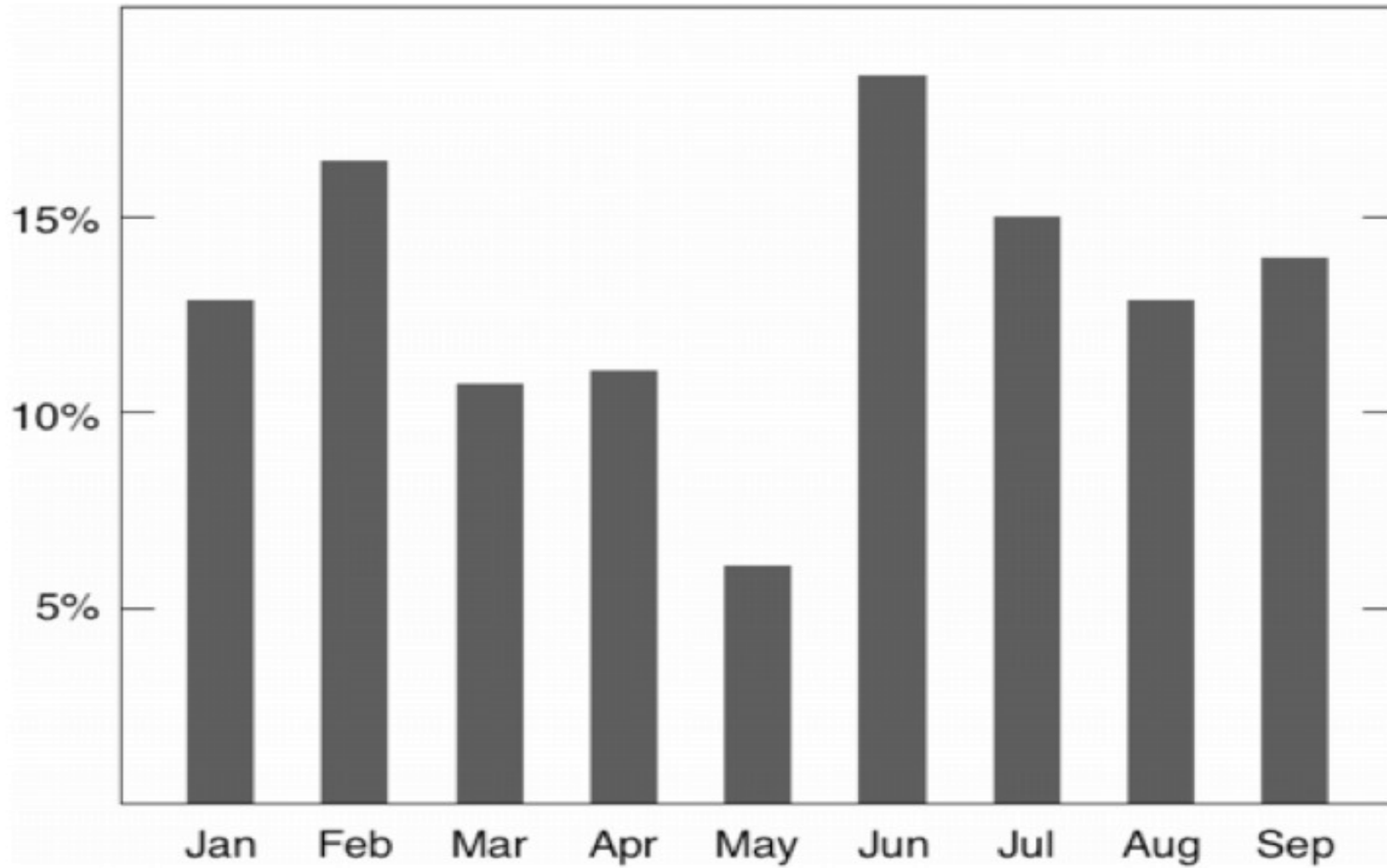
# DATA-INK RATIO



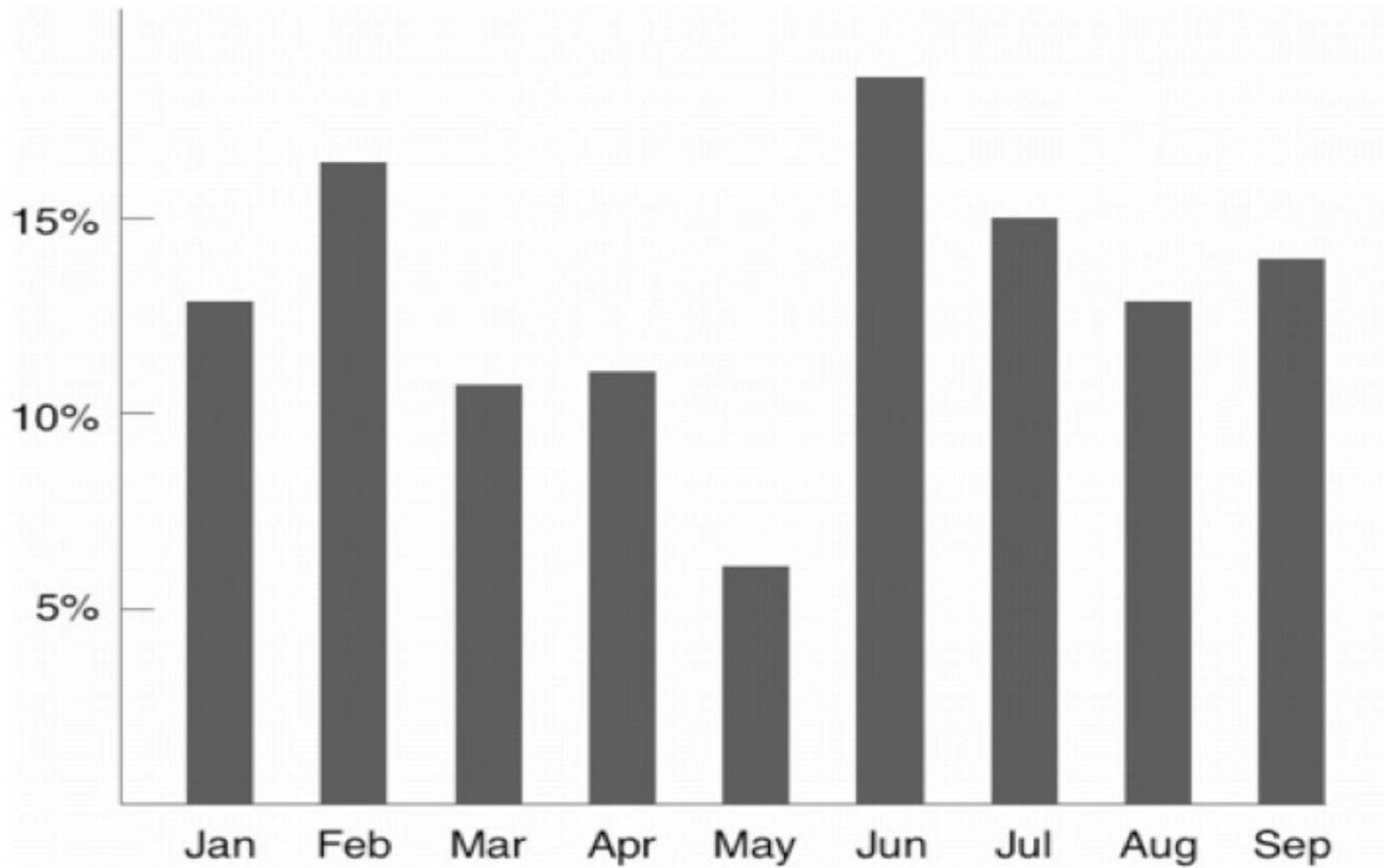
# DATA-INK RATIO



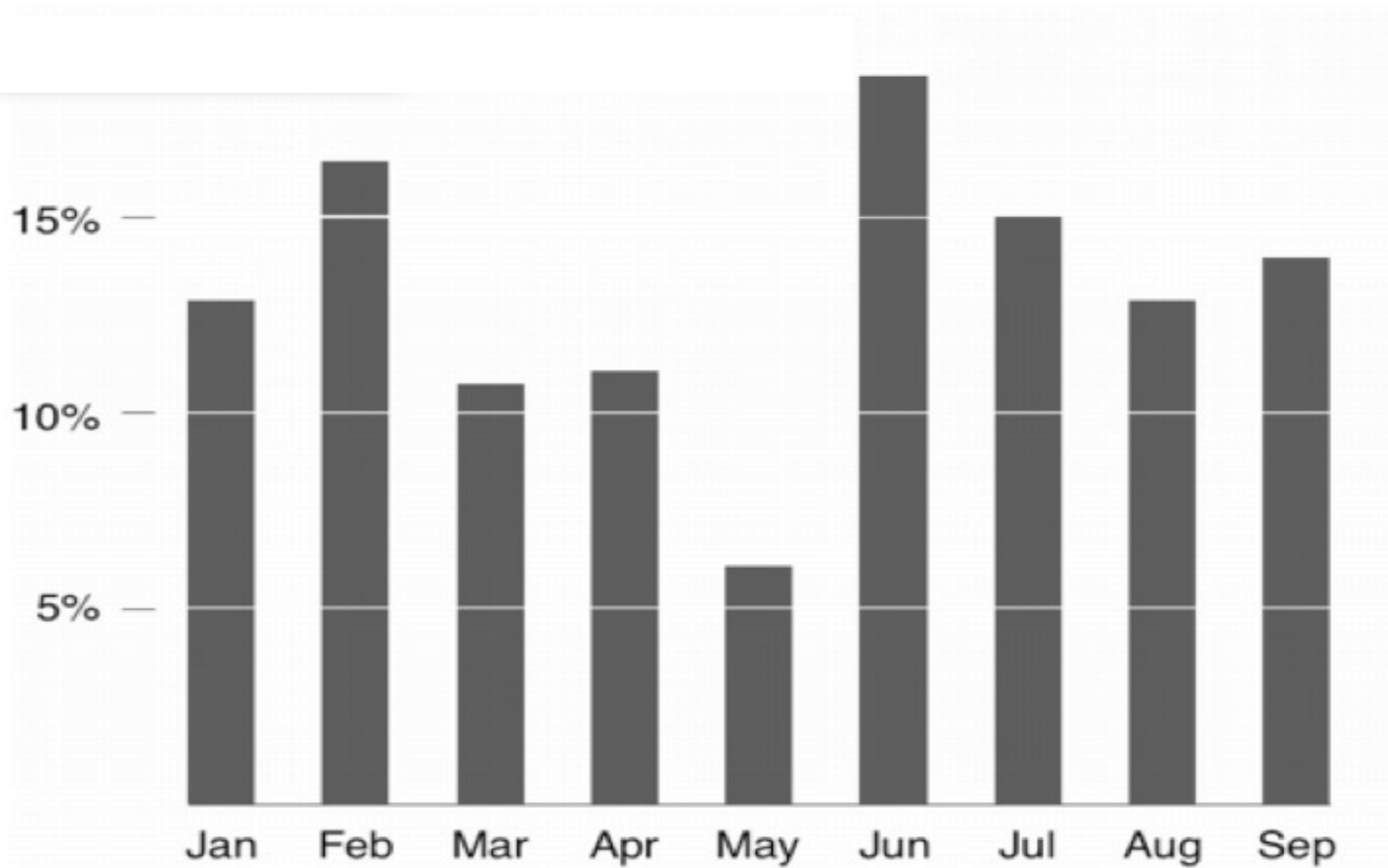
# DATA-INK RATIO



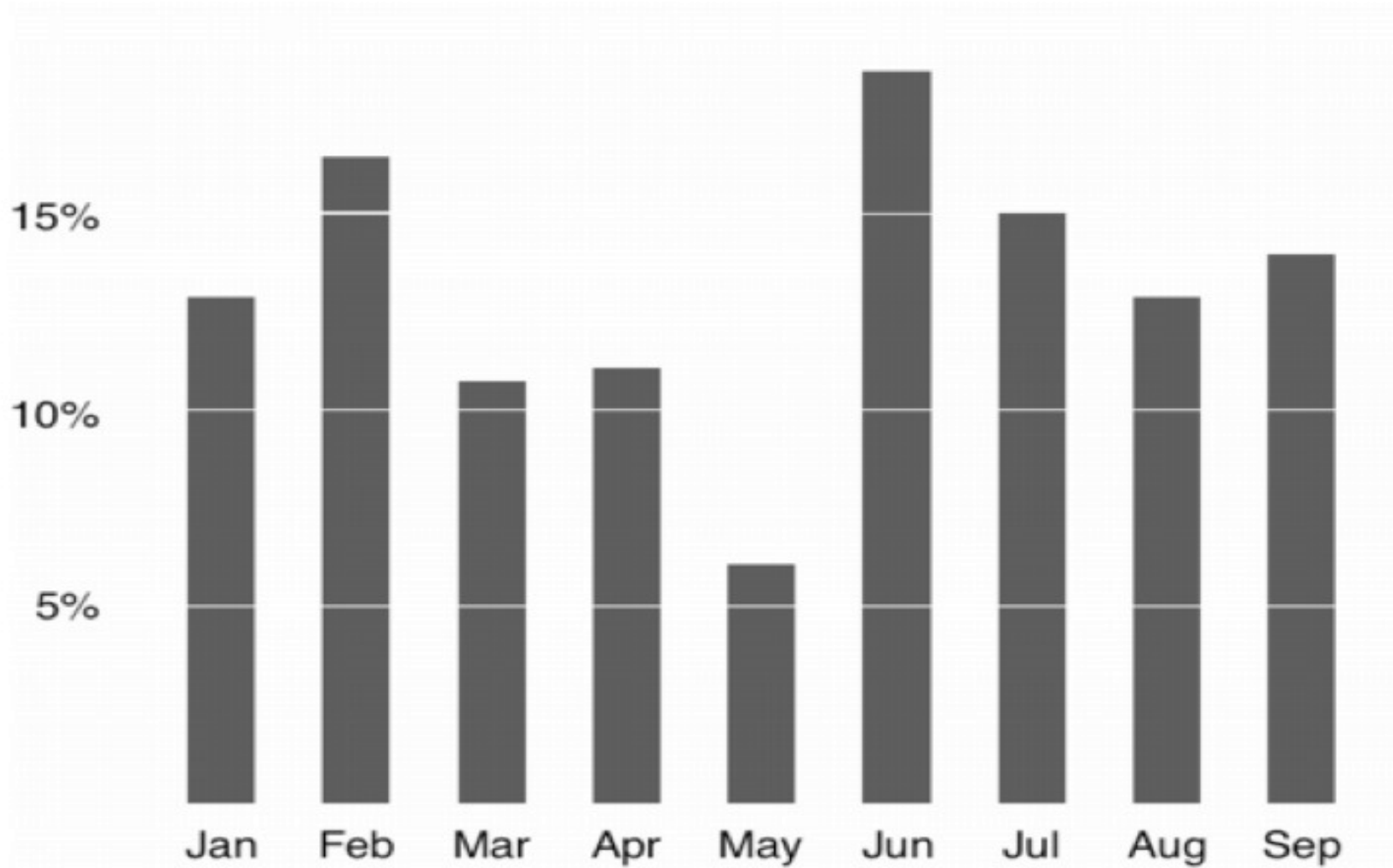
# DATA-INK RATIO



# DATA-INK RATIO



# DATA-INK RATIO





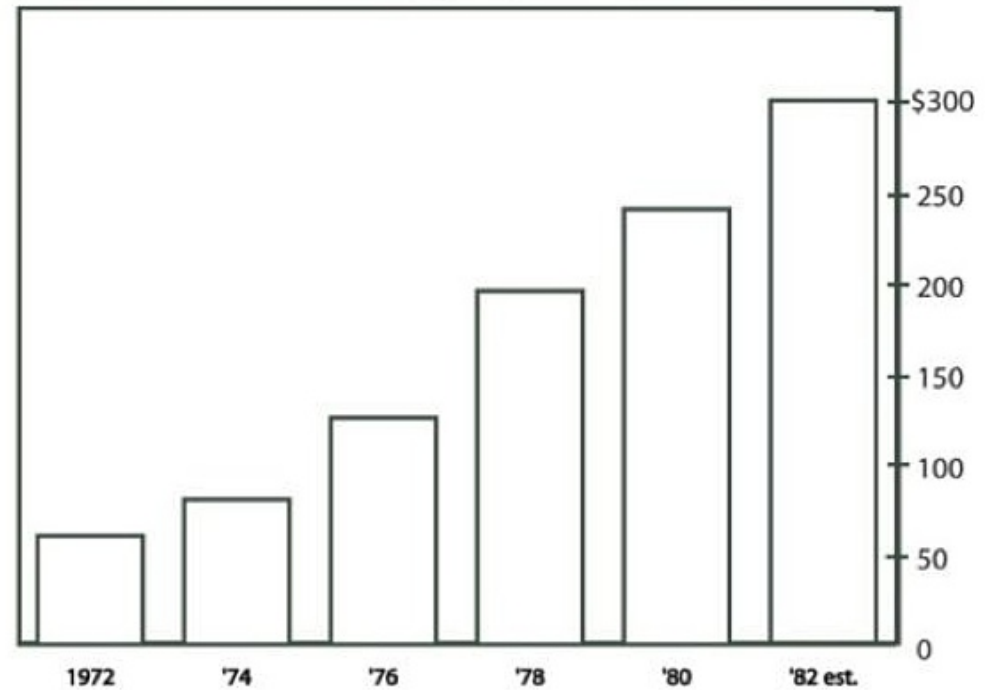
# MINIMIZE CHART JUNK

## MONSTROUS COSTS

Total House and Senate campaign expenditures, in millions



MONSTROUS COSTS  
Total House and Senate campaign expenditures, in millions



Wayne Lytle

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The Dangers of  
*GLITZINESS*  
and other  
Visualization Faux Pas

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or... "What's Wrong with this Visualization?"

# DATA DENSITY

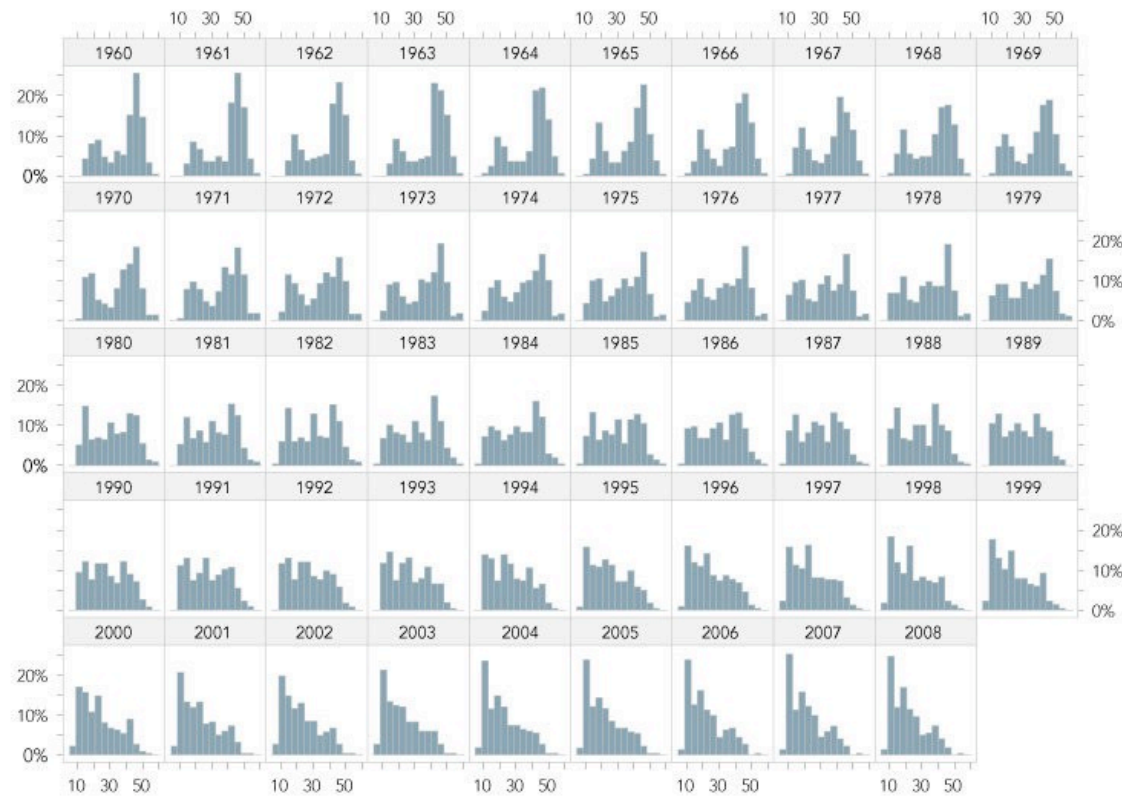
MAXIMIZE THE RATIO OF:

$$\frac{\text{(NUMBER OF ENTRIES IN DATA)}}{\text{(AREA OF THE GRAPHIC)}}$$

# DATA DENSITY – SHRINK THE GRAPHICS

## Annual Worldwide Distributions of Live Births

Live births per 1,000 population



Live births per 1,000 population

**“SMALL MULTIPLES”**

# DATA DENSITY – SHRINK THE GRAPHICS

## GRAPHIC PROBLEMS POSED BY TIME SERIES

### Scale in years

With a scale in years, a two-year total (figure 1) should be divided by 2 (figure 2). A total for six months should be multiplied by 2.

### Pointed curves

For overly pointed curves (figure 3), the scale of the Q should be reduced; optimum angular perceptibility occurs at around 70 degrees (figure 4).

If the curve is not reducible (large and small variations), filled columns can be used (figure 5).

### Flat curves

For overly flat curves (figure 6), the scale of the Q should be increased (figure 7).

### Small variations

For small variations in relation to the total (figure 8), the total loses its importance, and the zero point can be eliminated, provided the reader is made aware of this elimination (figure 9). The graphic can be interpreted as an acceleration if a precise study of the variations is necessary; here, we use a logarithmic scale (figure 10). (See also page 240)

### Large range

For a very large range between the extreme numbers (figure 11), we must either:

- (1) leave out the smallest variations;
- (2) be concerned only with relative differences (logarithmic scale), without knowing the absolute quantities;
- (3) select different parts (periods) within the ordered component and treat them on different scales above the common scale (figure 12).

### Obvious periodicity

If there is obvious periodicity (figure 13), and the study involves a comparison of the phases of each cycle, it is preferable to break up the cycles in order to superimpose them (figure 14). A polar construction can be used, preferably in a spiral shape (figure 15), but we should not begin with too small a circle. As striking as it seems, it is less efficient than an orthogonal construction.

### Annual curves

For annual curves of rainfall or temperature, if a cycle has two phases (figure 17), why depict only one (figure 16)?

### A contrast

Unlike what we see in figure 18, the pertinent or "new" information must be separated from the background or "reference" information. The background involves: (a) the invariant, highlighted by a heading (Port St. Michel); (b) the highly visible identification of each component (tonnage and date). The new information (the curve) must stand out from the background (figure 19).

### Reference points

It is impossible to utilize a graphic such as figure 20, except in a general manner. There is confusion concerning the position of the points, and no potential comparison is possible, as it is in figure 21.

### Precision reading

A precision reading (utilization on the elementary level, as in figure 24) is difficult in figure 22, which results in a poor reading of the order of the points, and in figure 23, where there is ambiguity concerning the position of the points. On the other hand, figure 22 does favor overall vision (correlation).

### Null boxes

Curves accommodate null boxes poorly (figure 25). Columns (figure 26) are preferable.

### Unknown boxes

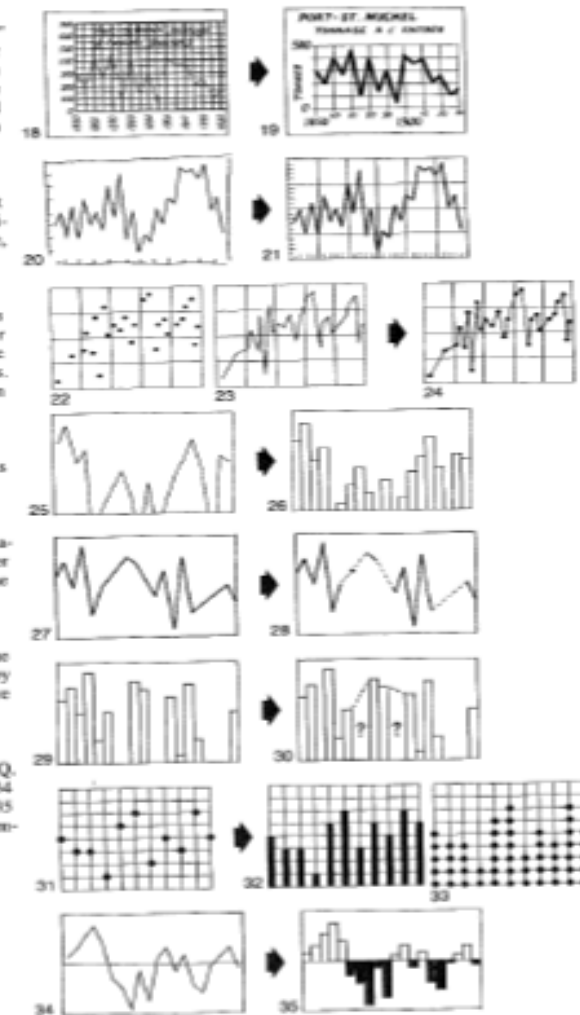
The drawing must indicate the unknowns of the information in an unambiguous way (figures 28 and 30). The reader might interpret figure 27 as a change in the structure of the curve and figure 29 as involving null values.

### Very small quantities

Except in seeking a correlation (quite improbable here) the number of ships entering into a port is represented better by figure 33 than by figures 31 or 32. The reader can perceive the numerical values at first glance.

### Positive-negative variation

This is in fact a problem involving three components O, Q,  $\neq$  (+, -), and it must be visually treated as such. Figure 34 can be improved by utilizing a retinal variable (as figure 35 a value difference: black-white) to differentiate the  $\neq$  component and thus highlight positive-negative variation.



# DATA DENSITY – SHRINK THE GRAPHICS

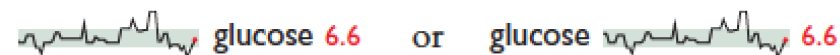
Placed in the relevant context, a single number gains meaning. Thus the most recent measurement of glucose should be compared with earlier measurements for the patient. This data-line shows the path of the last 80 readings of glucose:



Lacking a scale of measurement, this free-floating line is dequantified. At least we do know the value of the line's right-most data point, which corresponds to the most recent value of glucose, the number recorded at far right. Both representations of the most recent reading are tied together with a color accent:



Some useful context is provided by showing the *normal range* of glucose, here as a gray band. Compared to normal limits, readings above the band horizon are elevated, those below reduced:



# SPARKLINES & WORD-SCALE VIS

## Science fiction

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From Wikipedia, the free encyclopedia

*For other uses, see [Science fiction \(disambiguation\)](#).*

33k visits in last 30 days

**Science fiction** is a genre of [fiction](#) dealing with imaginative content such as [futuristic](#) settings, futuristic [science](#) and [technology](#), [space travel](#), [time travel](#), [parallel universes](#), and [extraterrestrial life](#). It often explores the potential consequences

# SPARKLINES & WORD-SCALE VIS

## EASTERN EUROPE

### Soviet cult and pragmatism in Transnistria

Experts worry that the next

"Crimea"



could be the

breakaway region of Transnistria



Many locals there don't share that fear,

and if the last referendum holds, a large

majority would welcome a Russian



annexation.





# SPARKLINES & WORD-SCALE VIS

Gonzalo Higuaín slides  
a cross in from the right



and Ronaldo,  
at the front post, shoots  
off target.

# HOW TO COMMUNICATE DATA HONESTLY TO AN AUDIENCE

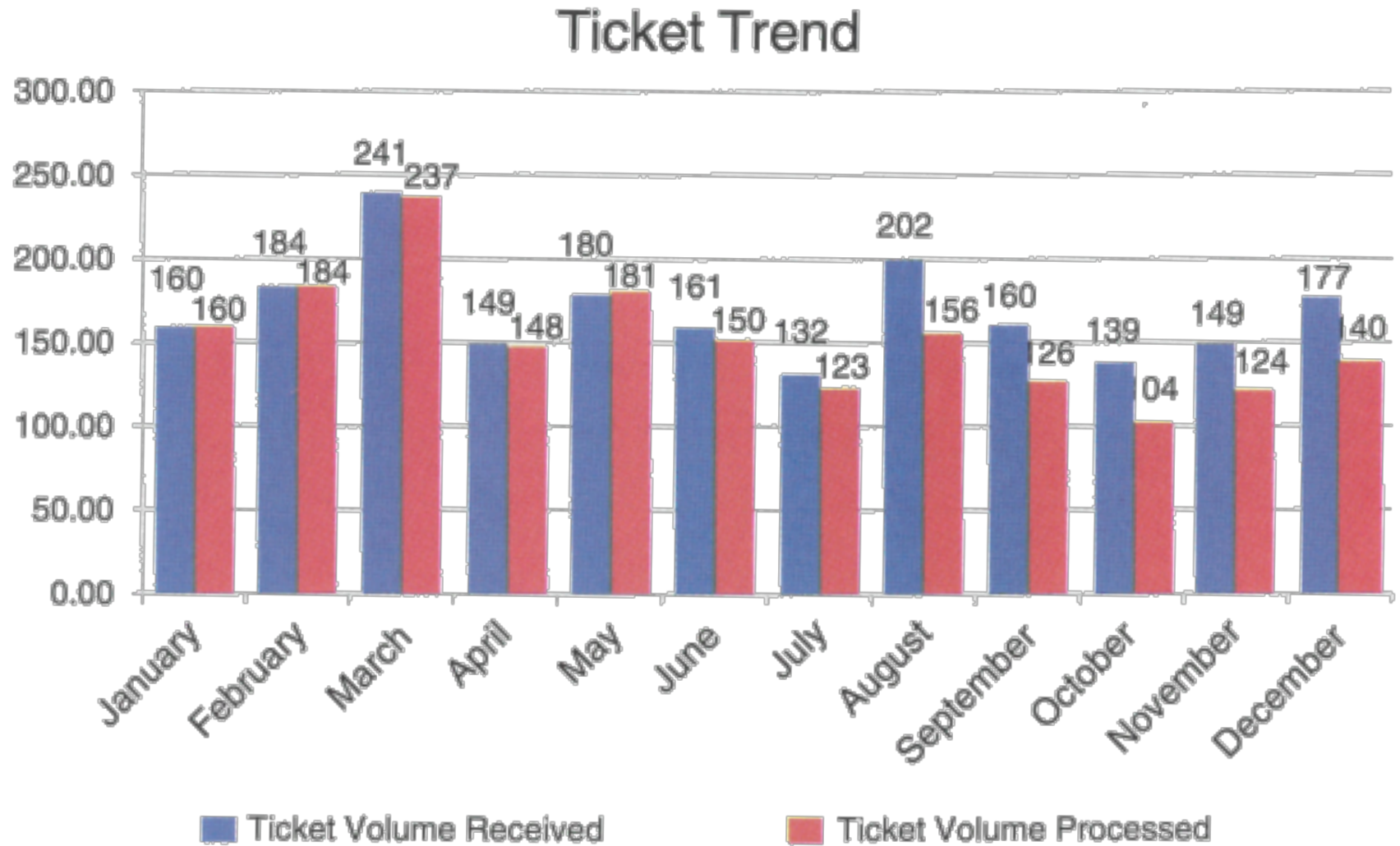
(W. Willett)

1. Be clear
2. Emphasize the important parts
3. Acknowledge assumptions and ambiguity
4. Avoid overstating results

# STORYTELLING WITH DATA

Design of Visualization for Communication

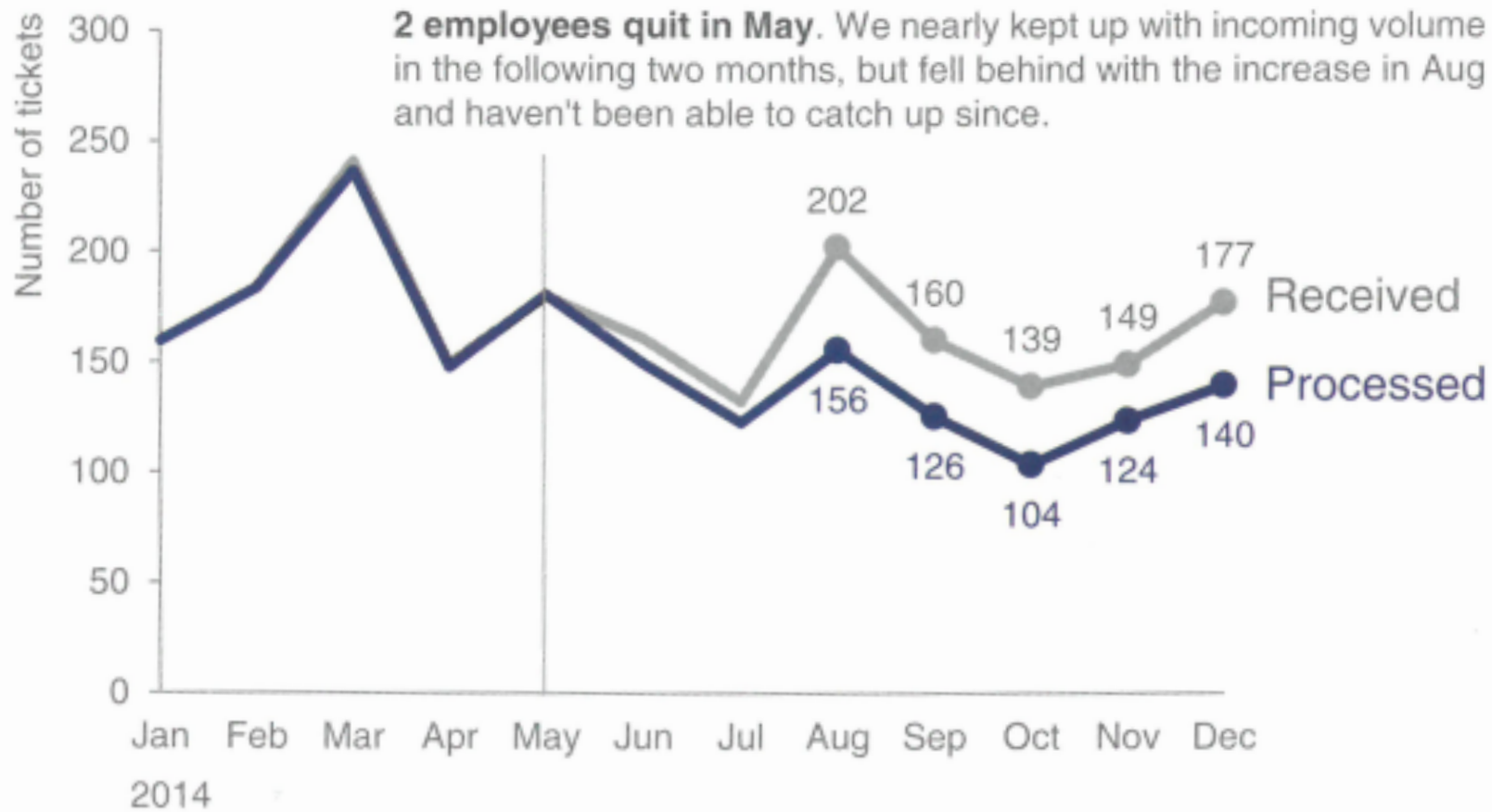
The chart was designed to argue for the hire of more two employees



# Please approve the hire of 2 FTEs

to backfill those who quit in the past year

## Ticket volume over time

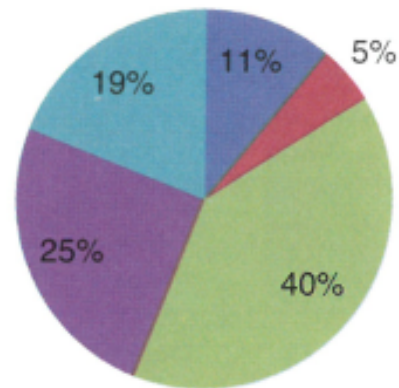


# EXAMPLE - EXERCISE

## Survey Results

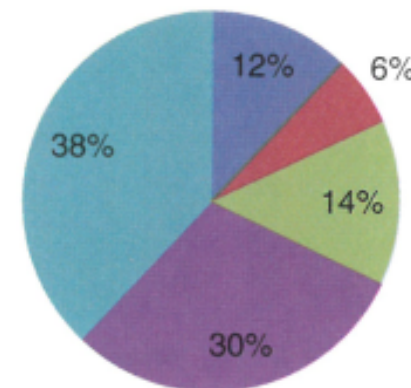
PRE: How do you feel about doing science?

■ Bored ■ Not great ■ OK ■ Kind of interested ■ Excited



POST: How do you feel about doing science?

■ Bored ■ Not great ■ OK ■ Kind of interested ■ Excited



survey conducted on 100 students before and after a pilot program

SKETCH – 10 MINUTES  
DESIGN A CHART THAT BETTER CONVEYS THE OUTCOME OF THE PROGRAM

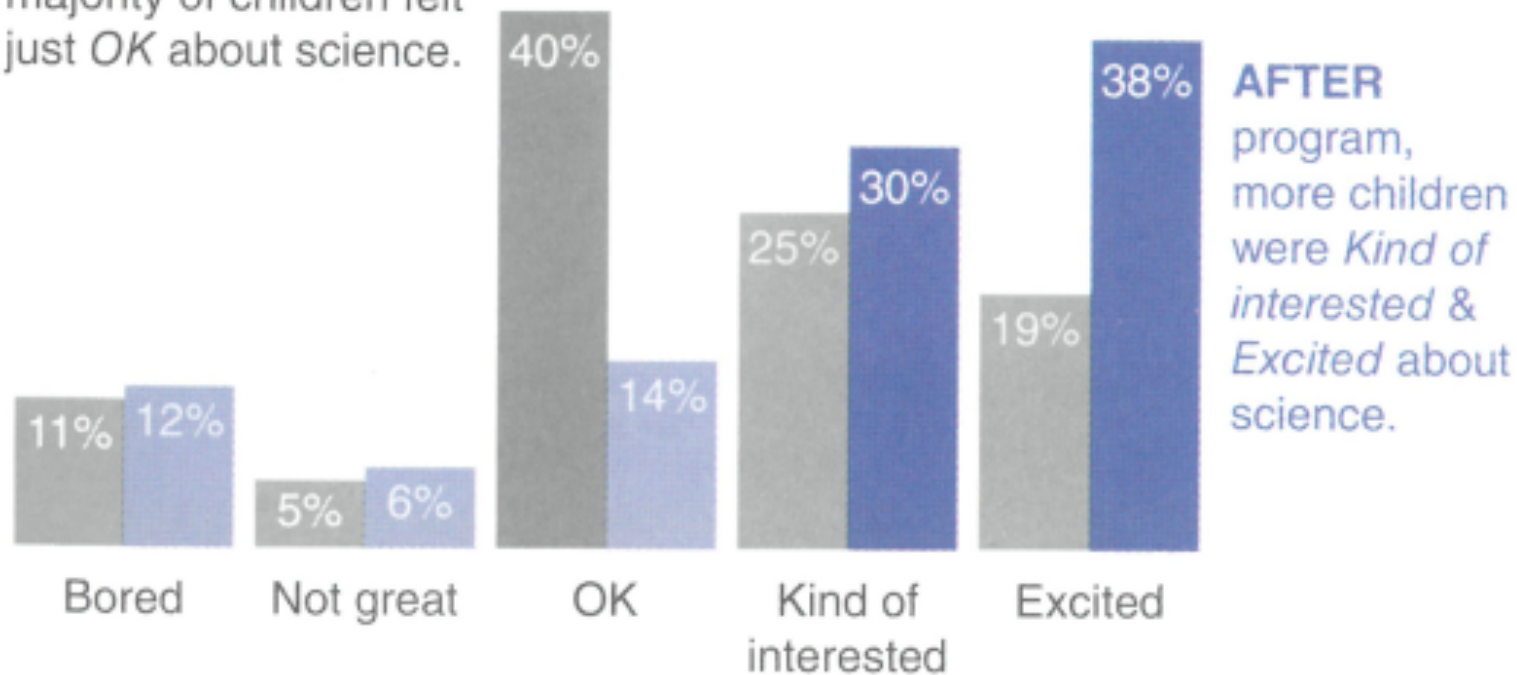
# QUESTIONS ON YOUR SKETCH

- WHAT POINT DID YOU TRY TO MAKE?
- WHAT LAYOUT DID YOU CHOOSE?
- DID YOU PUT A TITLE?
- DID YOU PUT A SUBTITLE?
- DID YOU HIGHLIGHT ANY DATA?
- DID YOU ADD ANYTHING ELSE TO HELP COMMUNICATE?

# Pilot program was a success

How do you feel about science?

**BEFORE** program, the majority of children felt just *OK* about science.



**AFTER** program, more children were *Kind of interested* & *Excited* about science.



# KNOW YOUR CONTEXT

AUDIENCE, MEDIUM, MESSAGE

**WHO DO YOU WANT TO  
COMMUNICATE TO?**

# YOUR AUDIENCE

**AVOID:**

ANYONE WHO IS INTERESTED

INTERNAL AND EXTERNAL STAKEHOLDERS

**BE MORE SPECIFIC, FIND OUT ABOUT THEM:**

WILL THEY BE SUPPORTIVE OF YOUR MESSAGE?

DO THEY KNOW THE DATA?

# YOUR AUDIENCE

WHAT DO THEY WANT TO KNOW?

WHAT DO THEY NEED TO DO?

*accept | agree | begin | believe | change | collaborate | commence |  
create | defend | desire | differentiate | do | empathize | empower |  
encourage | engage | establish | examine | facilitate | familiarize | form  
| implement | include...*

**WHAT IS YOUR MEDIUM?**

# MEDIUM

- how much control does the audience have over the presentation?
- how much detail can they get?

LIVE PRESENTATION vs. ONLINE VISUALIZATION

**WHAT DO YOU WANT TO SHOW?**

# QUESTIONS

IN A SINGLE SENTENCE

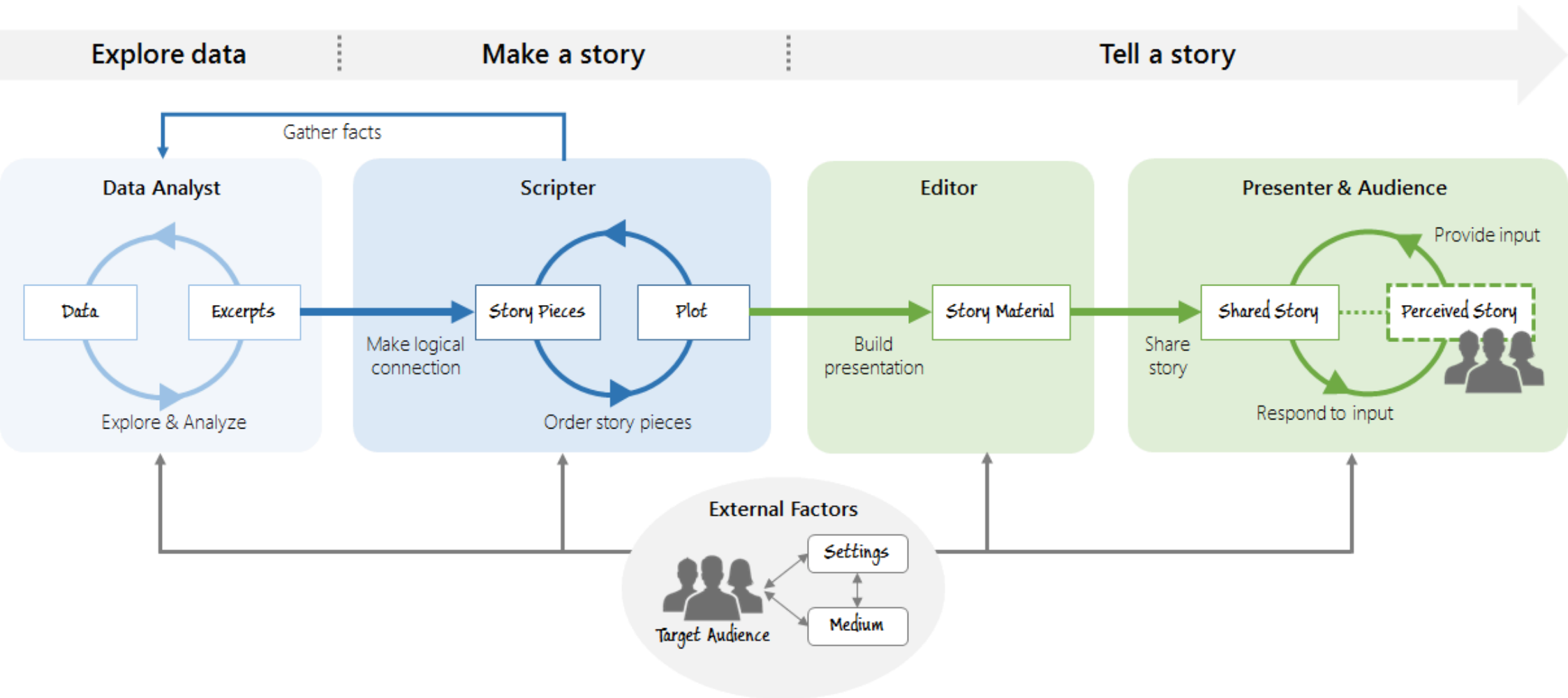
IN 3 MINUTES

WHAT IS YOUR MESSAGE?

WHAT DOES YOUR AUDIENCE NEED TO  
KNOW?

FIGURE THIS OUT BEFORE YOU IMPLEMENT ANYTHING





Lee et al. 2015

# LAYOUT

FEATURED

## U.S. Says It May Not Need Apple's Help to Unlock iPhone

By KATIE BENNER and MATT APUZZO 2:51 PM ET



Martin Jose Sanchez/Associated Press

A court hearing set for Tuesday was canceled in the Justice Department's bid to gain access to phone data in the San Bernardino mass shooting inquiry.

404 Comments

- [Breaking Down Apple's iPhone Fight With the U.S. Government](#)
- [White Collar Watch: Apple May Be Willing to Risk Contempt Charge](#)

MORE NEWS

### Chip-Card Payment System Delays Frustrate Retailers

By RACHEL ABRAMS 3:53 PM ET

Many complications were widely predicted, but a lag in certifying payment terminals has added an unexpected wrinkle — and lots of finger-pointing.



TECH TIP

### Keeping Up With Android Security Patches

By J. D. BIERSDORFER

After a nasty Android bug surfaced last summer, Google has been sending out monthly updates for the software on its Nexus hardware.

### Apple and Yahoo Each Struggle for Control of Their Futures

By QUENTIN HARDY

Apple is in a courtroom fight with the Justice Department, while Yahoo is contending with a sliding stock price and an activist hedge fund.



### CrowdSignals Aims to Create a Marketplace for Smartphone Sensor Data

By STEVE LOHR

A new project seeks to collect, label and pay for mobile sensor data and encourage innovation in many fields.



### Andrew S. Grove, Intel Chief Who Spurred Semiconductor Revolution, Dies at 79

By JONATHAN KANDELL

The semiconductor chip was a development as momentous as hydrocarbon fuels, electricity and telephones were in



BITS

Insight and analysis on Silicon Valley and the technology industry.

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PERSONAL TECHNOLOGY

### Instagram May Change Your Feed, Personalizing It With an Algorithm

By MIKE ISAAC

As our online networks of friends have grown and the social media companies have matured, feeds are evolving, too.



APP SMART

### Checklists and Tips to Help Streamline Spring Cleaning

By KIT EATON

It's time for spring cleaning again, and some apps can help users stay organized while getting their homes in order.



TECH TIP

### Speaking Your Mind to Google Docs

By J. D. BIERSDORFER

An external microphone can help you be better understood by Google's online word-processing program when you type by talking.

TECH TIP

### Marking Up a Mac's eBook Pages

By J. D. BIERSDORFER

Apple's e-books program for OS X includes tools for making margin notes, highlighting passages and sharing your favorite parts of the story.

TECH TIP

### Recording Live Television in Windows 10

By J. D. BIERSDORFER

If you miss the digital-video recording functions of Windows Media Center, you can find other ways to watch and record your favorite broadcast shows.



TECH TIP

### Getting the Weather Report From Windows

By J. D. BIERSDORFER

Windows 10 offers several ways to get a forecast on your screen.

APP SMART

### Mobile Games to Make Time Fly

By KIT EATON

Here are some of the best games to take the boredom out



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U.S.

### The Terminator and the Washing Machine

What the legendary matches between supercomputer Deep Blue and chess grandmaster Garry Kasparov reveal about today's artificial intelligence and machine learning fears.

# LIAR LIAR

Most of us like to think we can get ahead in life while keeping our noses clean. But, as **Ian Leslie** explains, we only got to the top of the evolutionary tree because we had a gift for misrepresentation

of Jane Goodall, and during their own fieldwork in the Drakensberg mountains of South Africa they noticed baboons engaging in deceptive behaviour. For instance: a young baboon gets in trouble with several elders, including his mother, for attacking another member of the group. When he hears them coming for him, granting aggressively, he stands and stares into the distance. The elders, thinking that a predator or rival troop must be approaching, stop and stare too. There is no threat. But the elders are distracted enough to forget what they came running over for.

Another example: an adult male baboon shoves a female off her feeding patch. Rather than protest or retreat, she flicks her gaze in a characteristic way from him to a younger male who is happily feeding nearby. The first male charges over to the younger one and chases him away. The female, meanwhile, returns to her patch and resumes feeding.

When Byrne and Whiten asked around, their colleagues regaled them with similar anecdotes. The two developed a hunch: that these stories represented something beyond aberrant aspects of primate behaviour, and that our closest relatives — chimps, gorillas and orang-utans — are practised, habitual deceivers. Byrne and Whiten also began to suspect that such behaviour might be linked to the development of primate intelligence: those animals with the mental sophistication to trick their way into getting more food, as our female baboon did, would have had a reproductive edge. Through the slow work of natural selection, the primate brain evolved to cope with the demands of such trickery.

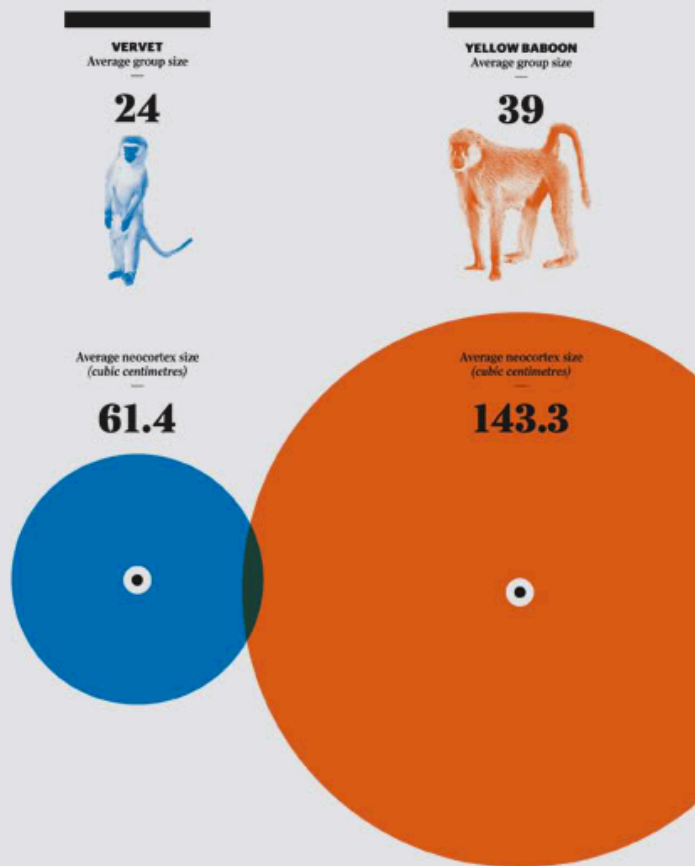
So a connection between deception and mental capacity in our primate ancestors might help to explain the development of our own brains. This was an exciting thought. But initially, Byrne and Whiten found it hard to get any of their research published despite amassing a substantial body of evidence. Deception just was not a subject that many in their field took seriously.

**Y**ou could call it humanity's dirty little secret. What helped to make us the most intelligent species on Earth was, to be honest, our talent for deception.

The human brain, possibly evolution's most impressive achievement, is also a bit of a mystery. We have much bigger brains, relative to our bodies, than any other mammal. Our hominid ancestors had brains about a third the size of ours. At some point between 2 and 15 million years ago, our ancestors' brains began to expand, and at quite a rate. Scientists have never been sure why.

For a long time, the nearest thing to an accepted explanation was that our intelligence resulted from our facility for making tools. But in the early 1980s, two young primatologists at the University of St Andrews began to wonder if it wasn't linked to something less flattering to our self-image: a capacity for deceit.

Richard Byrne and Andy Whiten had read descriptions of chimpanzee trickery in the works



In 1982, however, they gained new impetus from a book that gave a gripping account of the shifting relationships within a colony of chimpanzees in a Dutch zoo. Franz de Waal's *Chimpanzee Politics* reads like the script of a soap opera or gangster movie. Alliances are formed, broken and re-formed, individuals are manipulated, violence is selectively employed, females are fought over and seduced. De Waal prefaced his book with quotes from Hobbes and Machiavelli, suggesting that this was a vision of human politics in the raw. Byrne and Whiten were fascinated, particularly by those episodes that showed deceptive behaviour, as when a chimp, presenting himself as a friend, would suddenly attack an unsuspecting rival.

In 1988 the two primatologists finally published their work in the form of a book, *Machiavellian Intelligence*. An unsettling read, it explored "the idea that intelligence began in social manipulation, deceit and cunning co-operation", showing that animals, far from living in a state of innocence, are as manipulative and underhand as the worst of our own species. It was persuasive too, making a big impact not only in primatology but in psychology, anthropology and medicine.

Byrne and Whiten believed that what they termed Machiavellian intelligence was linked to the size of the group an animal lived in: the bigger the group, the more complex the calculations individuals needed to make to survive. But there was little hard evidence for this until 1992, when Robin Dunbar, at the University of Liverpool, came up with a way to demonstrate a link between brain size and the complexity of an animal's social life.

Dunbar, too, had noticed that the size of a primate's brain appeared to be related to the size of the group it lived in. Baboons have big brains and live in big groups; vervets, who have smaller brains, live in smaller groups. He decided to investigate by looking at the neocortex. This is the "thinking" part of the brain: the part that deals with abstraction, self-reflection and planning. It was also the part that showed such rapid expansion in primates — especially humans — two million years ago.

Dunbar plunged into the vast accumulation of primate data from around the world, looking for a correlation between the size of an animal's neocortex and the size of its social groups. He found a link so strong that he was able to predict, with impressive accuracy, the group size of a species he hadn't looked at, just by knowing its brain size. He even came up with a prediction for human →

## SEEING IS DECEIVING

Many species, not just primates, practise deception as one of their survival strategies. The eastern hognose snake will, if threatened, fake its own death by rolling over on its back, emitting a foul stench and letting its tongue loll out of its mouth. The mimic octopus, found in the waters off Bali in Indonesia, can disguise itself as one of several other sea creatures, all the better to lure its prey.

Even plants deceive. The mirror orchid of North Africa produces small flowers to attract potential pollinators. The flowers have no nectar, but the orchids have a special ruse to seduce the wasps that pollinate them: they impersonate female wasps. The blue-violet centre of the flower resembles the wings of a female wasp at rest, while a thick set of long red hairs imitates the hairs on the insect's abdomen. It's bait — insect porn for horny male wasps.

### THE MIMIC OCTOPUS...

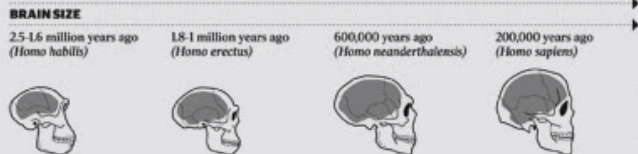
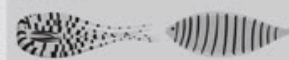
... as a sea snake

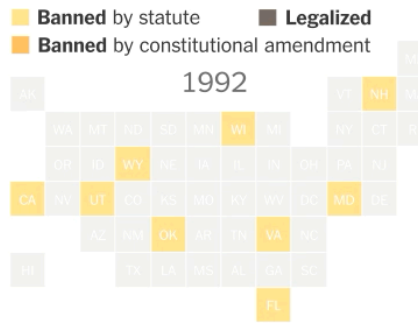


... as a lion fish



... and a flatfish

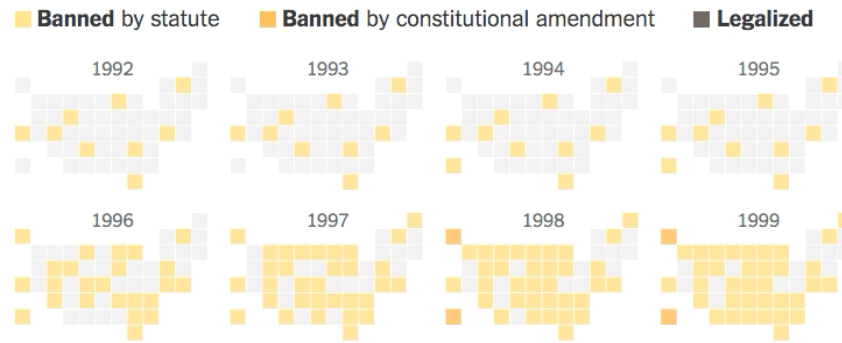




## Gay Marriage State by State: From a Few States to the Whole Nation

By HAEYOUN PARK

The Supreme Court in June said that same-sex couples had a constitutional right to marry, effectively requiring that the 13 states that prohibit such unions reverse those bans. Over the last two years, the number of states authorizing gay marriage had expanded rapidly because of legislative decisions, referendums or court orders.



A ruling by the Hawaii Supreme Court in 1993 allowing same-sex marriage, along with rising demands for marriage equality nationwide, prompted a backlash. A majority of states, including Hawaii, adopted laws or constitutional amendments that limited marriage to a man and a woman. In 1996, Congress passed the Defense of Marriage Act, banning federal recognition of same-sex marriage.



[NYTIMES](#) 2015

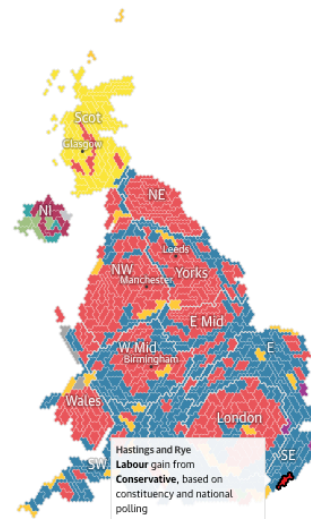
Last update on May 07 2015 13:00 BST

# Election 2015 interactive: what did the opinion polls say about your seat?

**Final projection:** Find out who was leading the race in your constituency, according to the final polls. The map shows which party was expected to win each of **the 650 seats**, which might **change hands**, and which were the **battleground seats** with a projected margin of less than 5%. The constituencies are scaled so each seat has the same area. [Methodology »](#)



Legend: Lab (red), SNP (green), Green (blue), Others (purple), UKIP (yellow), LD (orange), Con (grey), DUP (brown), SF (pink), SDLP (light blue)

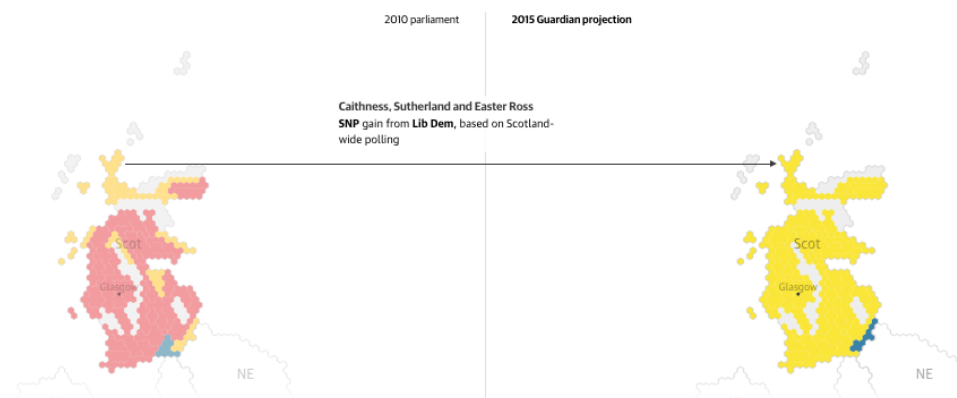


## Battleground Britain

More than ever before, this election is made up of several different regional battles, between Labour and the SNP in Scotland, Conservative and UKIP on the east coast, and Labour vs Tory in England

### Scotland

The scale of SNP gains from Labour will be crucial after the election; a good result for the SNP increases their power as kingmakers. But if Labour can hold on in Scotland it could make them the largest party overall



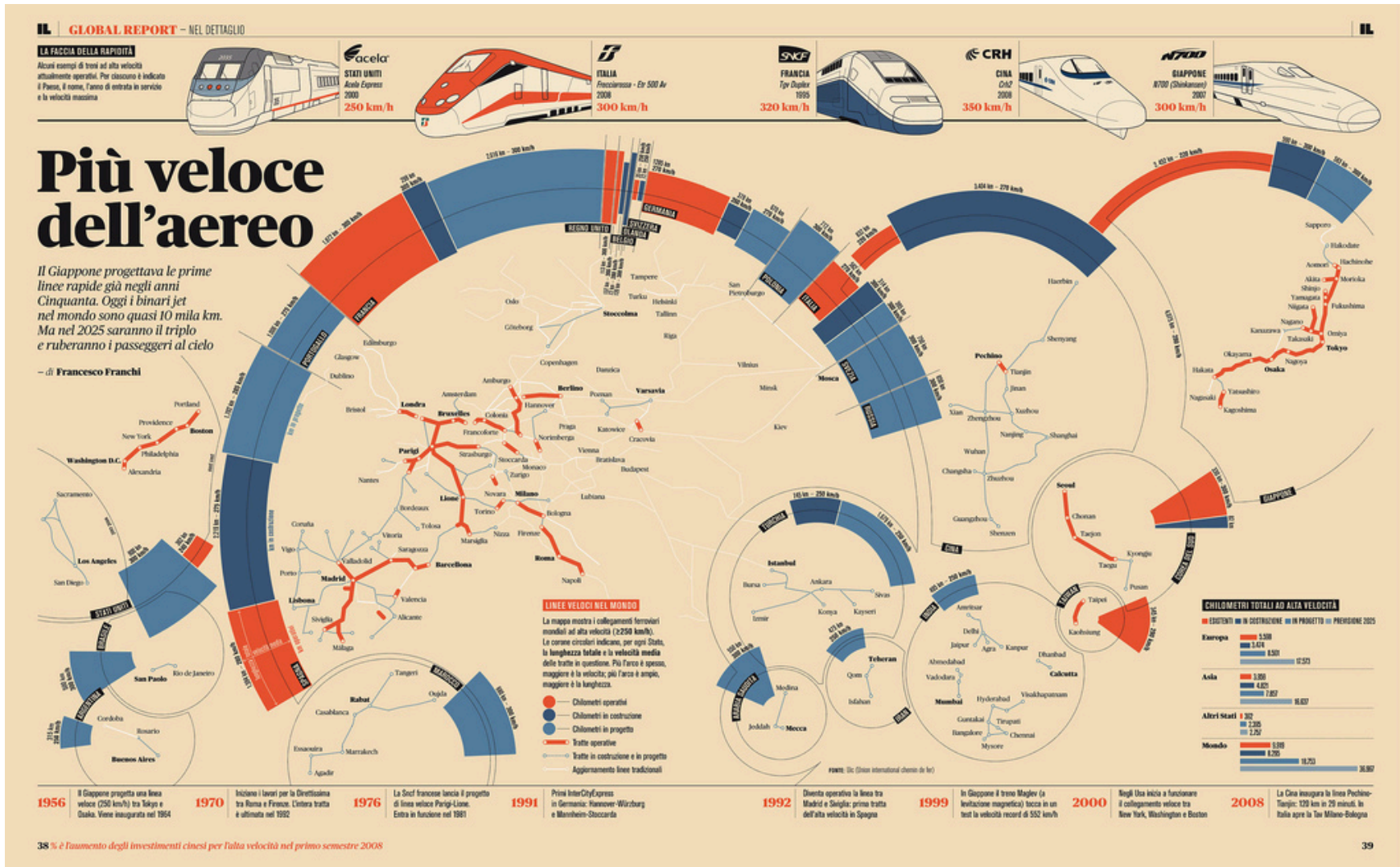
### North

The north is Labour's heartland, so it should do well. The more interesting aspect in many of these contests may well be who comes second between Ukup and the Conservatives

**ESPECIALLY IMPORTANT  
WHEN INTEGRATING  
VISUALIZATIONS INTO SOMETHING  
BIGGER**

A STORY, A BIGGER INTERACTIVE, ETC.

# BUT LAYOUT IS ALSO IMPORTANT FOR INTRODUCING SELF-CONTAINED INFOGRAPHICS AND INTERACTIVE CHARTS





# A 3-D View of a Chart That Predicts The Economic Future: The Yield Curve

By GREGOR AISCH and AMANDA COX MARCH 18, 2015

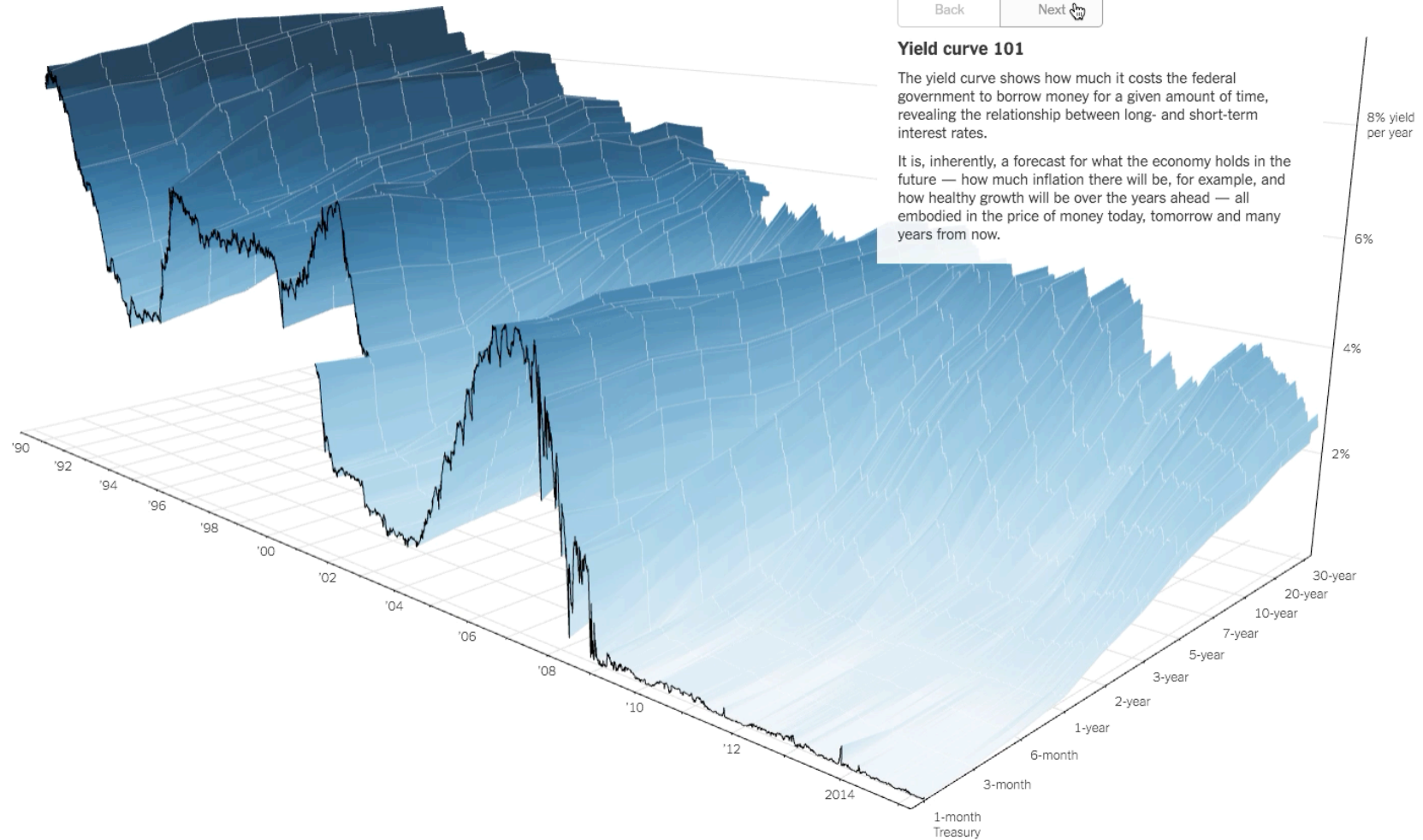


Back Next

## Yield curve 101

The yield curve shows how much it costs the federal government to borrow money for a given amount of time, revealing the relationship between long- and short-term interest rates.

It is, inherently, a forecast for what the economy holds in the future — how much inflation there will be, for example, and how healthy growth will be over the years ahead — all embodied in the price of money today, tomorrow and many years from now.



# DIRECT ATTENTION

DRAW ATTENTION  
TO ONE THING FIRST.  
THEN USE COLOR, SIZE,  
SPACE, AND PLACEMENT  
TO DIRECT VIEWERS TO  
THE NEXT IMPORTANT  
POINT.

Walking Skyscrapers  
New York City Walking Tours  
NYU School of Architecture  
Continuing Education Program  
Fall 2004

Experience the history and variety of Manhattan's noteworthy architectural wonders—the skyscrapers that have given the city its signature skyline and inspired its residents for nearly one hundred years.

#### Tour Programs

The Flatiron District September 17  
New York's first skyscraper and the industrial buildings of the early 20th Century

Lower Manhattan September 24  
Explore the concrete canyons that rose up on the site of New Amsterdam

Midtown October 5  
The corporate megaliths of the 1970s and 1980s

Sign up now! Space is limited.  
\$125 per three-hour tour. Purchase the package of three for \$275

Call the office of Continuing Education at NYU:  
212.555.2259 or visit us on the Web at  
[www.nyu.edu/arch/walk.html](http://www.nyu.edu/arch/walk.html)  
One academic credit  
Tours are open to the public

## Walking Skyscrapers

New York City Walking Tours  
NYU School of Architecture  
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*One academic credit  
Tours are open to the public*

Fall 2004

NYU School of Architecture  
Continuing Education Program

*Experience the history and variety of Manhattan's noteworthy architectural wonders—the skyscrapers that have given the city its signature skyline and inspired its residents for nearly one hundred years.*

# Walking Skyscrapers

## New York City Walking Tours

### Tour Programs

September 17 **The Flatiron District**  
*New York's first skyscraper and the industrial buildings of the early 20th Century*

September 24 **Lower Manhattan**  
*Explore the concrete canyons that rose up on the site of old New Amsterdam*

October 5 **Midtown**  
*The corporate megaliths of the 1970s and 1980s*

**Sign up now!**  
**Space is limited.**

Call the office of  
Continuing Education at NYU:  
**212.555.2259**  
or visit us on the Web:  
**[www.nyu.edu/arch/walk.html](http://www.nyu.edu/arch/walk.html)**



**WE TEND TO SCAN TOP TO BOTTOM  
THEN LEFT TO RIGHT**

BUT...

**SIZE & COLOR**

CAN PREEMPT THAT ORDER

# BEGINNING



Lines are cumulative home runs.

**Hank Aaron**  
755 homers  
23 seasons

**Babe Ruth**  
714 homers  
22 seasons

**Barry Bonds**  
708 homers  
20 seasons

**Bonds takes lead**  
Home runs  
after 16 seasons

Bonds 567  
Ruth 554  
Aaron 516

755

714

23 seasons

22 seasons

20 seasons

Bonds was injured last season. He played 14 games and hit 5 homers.

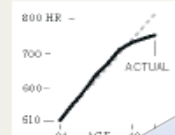
## Homer Pace After Age 34

If the accusations are correct, Bonds was 34 in his first season on steroids. Here are projected home run paces for each player after age 34.

----- PROJECTED PACE BASED ON AVERAGE OF PREVIOUS FIVE SEASONS

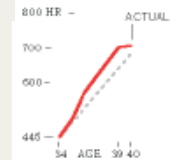
### Aaron

Actual homers slightly outpace projected homers for five seasons.



### Ruth

From age 35 to 39, he averaged 14 more homers a season than projected.



Note: Ages as of July 1 of each season.

**Others Taking Aim**



**Alex Rodriguez**

# END

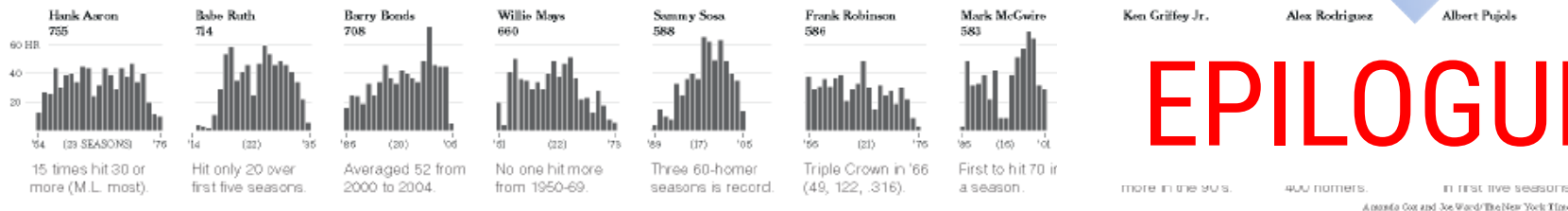
# MIDDLE

**Albert Pujols**  
Averaging 40 homers a season, he has started stronger than the three leaders did.

**Ken Griffey Jr.**  
Many thought he would be the first to catch Ruth and Aaron until injuries limited his output.

## Differing Paths to the Top of the Charts

The top seven players on the career home run list, along with a look at Griffey (12th), Rodriguez (37th) and Pujols (tied 257th).

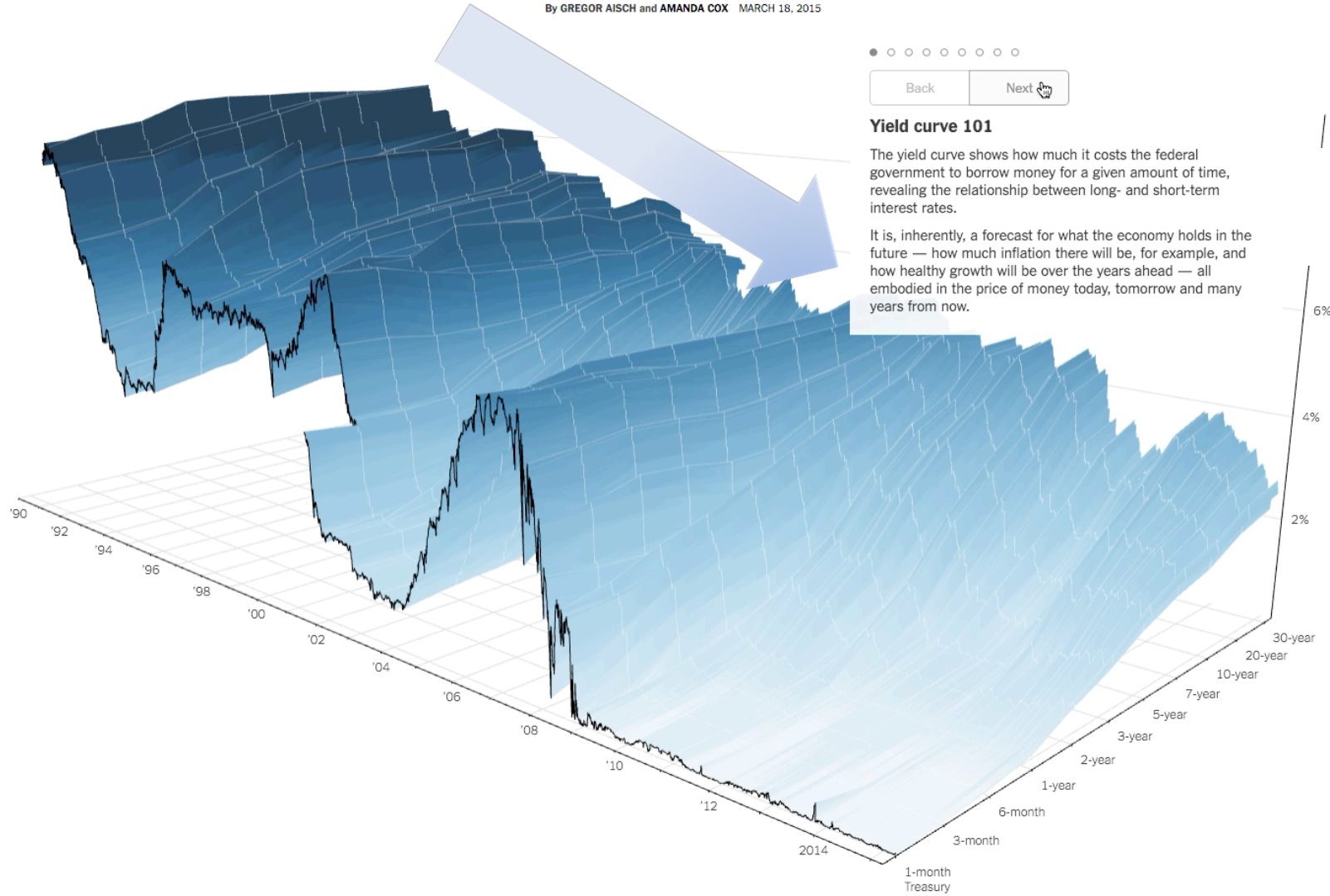


# EPILOGUE

# BEGINNING

## A 3-D View of a Chart That Predicts The Economic Future: The Yield Curve

By GREGOR AISCH and AMANDA COX MARCH 18, 2015



# NEXT

# MINIMALISM

IF YOU CAN DO IT WITH LESS, DO IT!

TRY TO SHOW ONLY WHAT'S NECESSARY.

USE DESIGN TO COMMUNICATE, NOT DECORATE.

# TYPOGRAPHY



**ALMOST EVERY VISUALIZATION  
USES TEXT**

**...AND ALMOST EVERY VISUALIZATION  
CAN BENEFIT FROM GOOD USE OF  
TYPOGRAPHY**

# THE BASICS

Serif

Sans Serif

# TYPE ON THE WEB

USED TO BE VERY  
LIMITED

Arial

**Arial Black**

Comic Sans MS

Courier New

Georgia

**Impact**

Times New Roman

Trebuchet MS

Verdana

# NOW...LOTS OF GREAT OPTIONS

Normal 400  
Grumpy wizards make toxic brew for the evil Queen and Jack.

Open Sans, 10 Styles by [Steve Matteson](#)

Normal 400  
Grumpy wizards make toxic brew for the evil Queen and Jack.

Roboto, 12 Styles by [Christian Robertson](#)

Normal 400  
Grumpy wizards make toxic brew for the evil Queen and Jack.

Lato, 10 Styles by [Lukasz Dzedzic](#)

Normal 400  
Grumpy wizards make toxic brew for the evil Queen and Jack.

Slabo 27px, 1 Style by [John Hudson](#)

Normal 400  
Grumpy wizards make toxic brew for the evil Queen and Jack.

Roboto Condensed, 6 Styles by [Christian Robertson](#)

Normal 400  
**Grumpy wizards make toxic brew for the evil Queen and Jack.**

Normal 400  
Grumpy wizards make toxic brew for the evil Queen and Jack.

Noto Sans, 4 Styles by [Google](#)

Normal 400  
Grumpy wizards make toxic brew for the evil Queen and Jack.

PT Serif, 4 Styles by [ParaType](#)

Normal 400  
Grumpy wizards make toxic brew for the evil Queen and Jack.

Alegreya Sans, 14 Styles by [Juan Pablo del Peral](#)

Normal 400  
Grumpy wizards make toxic brew for the evil Queen and Jack.

Titillium Web, 11 Styles by [Multiple Designers](#)

Normal 400  
**Grumpy wizards make toxic brew for the evil Queen and Jack.**

Passion One, 3 Styles by [Fontstage](#)

Normal 400  
Grumpy wizards make toxic brew for the evil Queen and Jack.

# NUMBERS

CHOOSE FONTS AND WEIGHTS TO MAXIMIZE LEGIBILITY AT THE SIZE THEY'LL BE DISPLAYED

For Numbers...

Din

**0123456789**

Helvetica Neue

0123456789

Myriad

0123456789

Gills Sans

**0123456789**

Tahoma

**0123456789**

Azuro

1 2 3 4 5 6 7 8 9 0

Lucida Sans

**0123456789**

# USE TWO TYPEFACES MAXIMUM

(OFTEN EVEN ONE IS ENOUGH.)

YOU CAN ALSO USE:

WEIGHT

COLOR

*Italics*

SIZE

KEEP TYPE LARGE AND LEGIBLE

**40-60pt (or Bigger) for Headlines**

12-16 for body text, captions, and visualization text.

You should almost **never** use 10pt or smaller.  
(Even IN your visualizations.)

# TYPE AND CONTRAST

Be careful with small differences in luminosity.

**What works on your display may not work in general.**



# TYPE CAN SUGGEST INTERACTION



[Web](#) [Images](#) [Video](#) [News](#) [Maps](#) [more »](#)

Google Search

I'm Feeling Lucky

[Advertising Programs](#) - [Business Solutions](#) - [About Google](#)

[Make Google Your Homepage!](#)

©2007 Google

10 YEARS AGO



Google Search

I'm Feeling Lucky

Google.ca offered in: [Français](#)

TODAY  
(CUES CAN BE SUBTLE)

# COLOR


( WE'VE SEEN THIS BEFORE.)

Number of data classes: 10 i [how to use](#) [updates](#) [downloads](#) [credits](#)

**COLORBREWER 2.0**  
color advice for cartography

Nature of your data: i  
 sequential  diverging  qualitative

Pick a color scheme:



Only show: i  
 colorblind safe  
 print friendly  
 photocopy safe

Context: i  
 roads  
 cities  
 borders

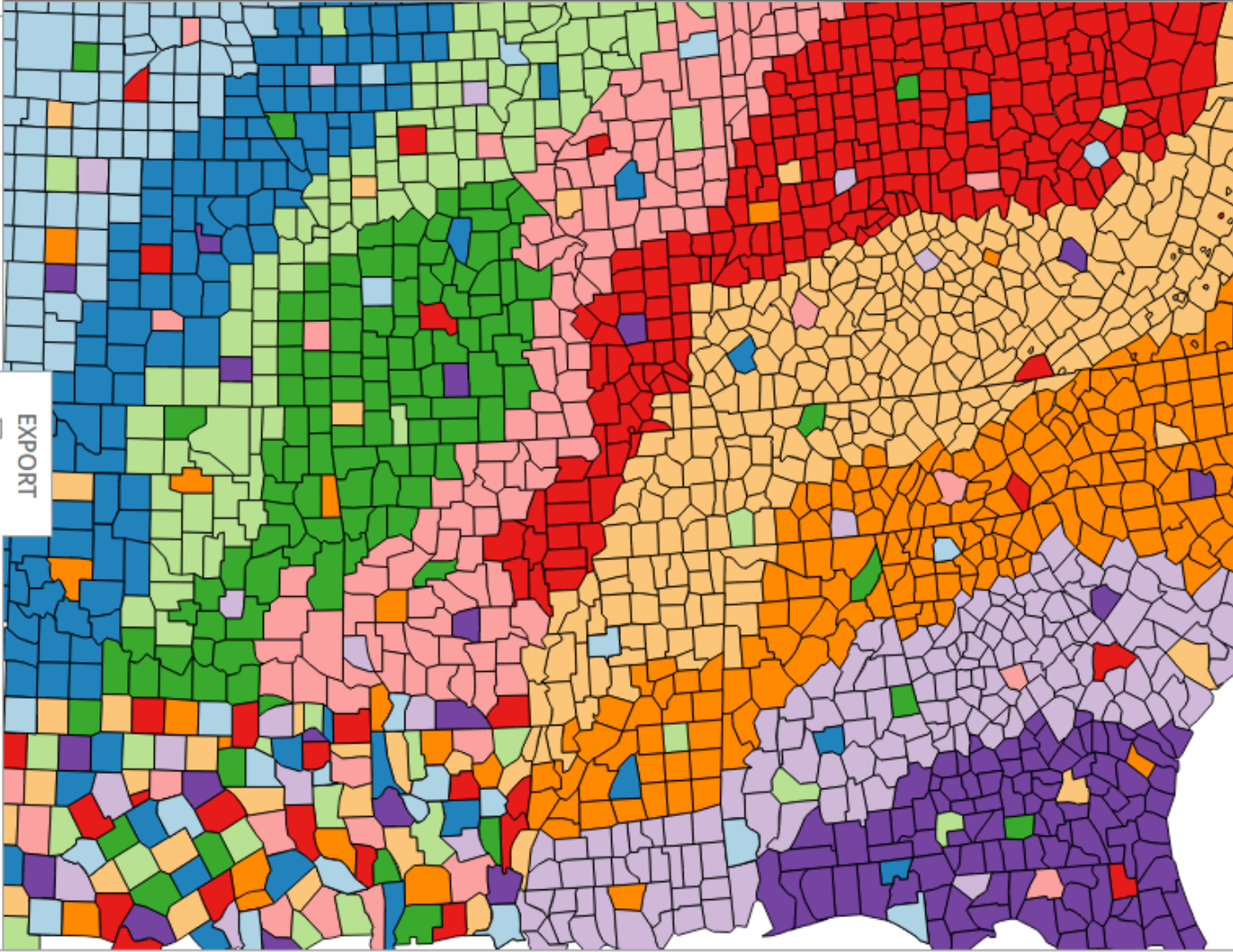
Background: i  
 solid color  
 terrain  
 color transparency

**10-class Paired**

EXPORT

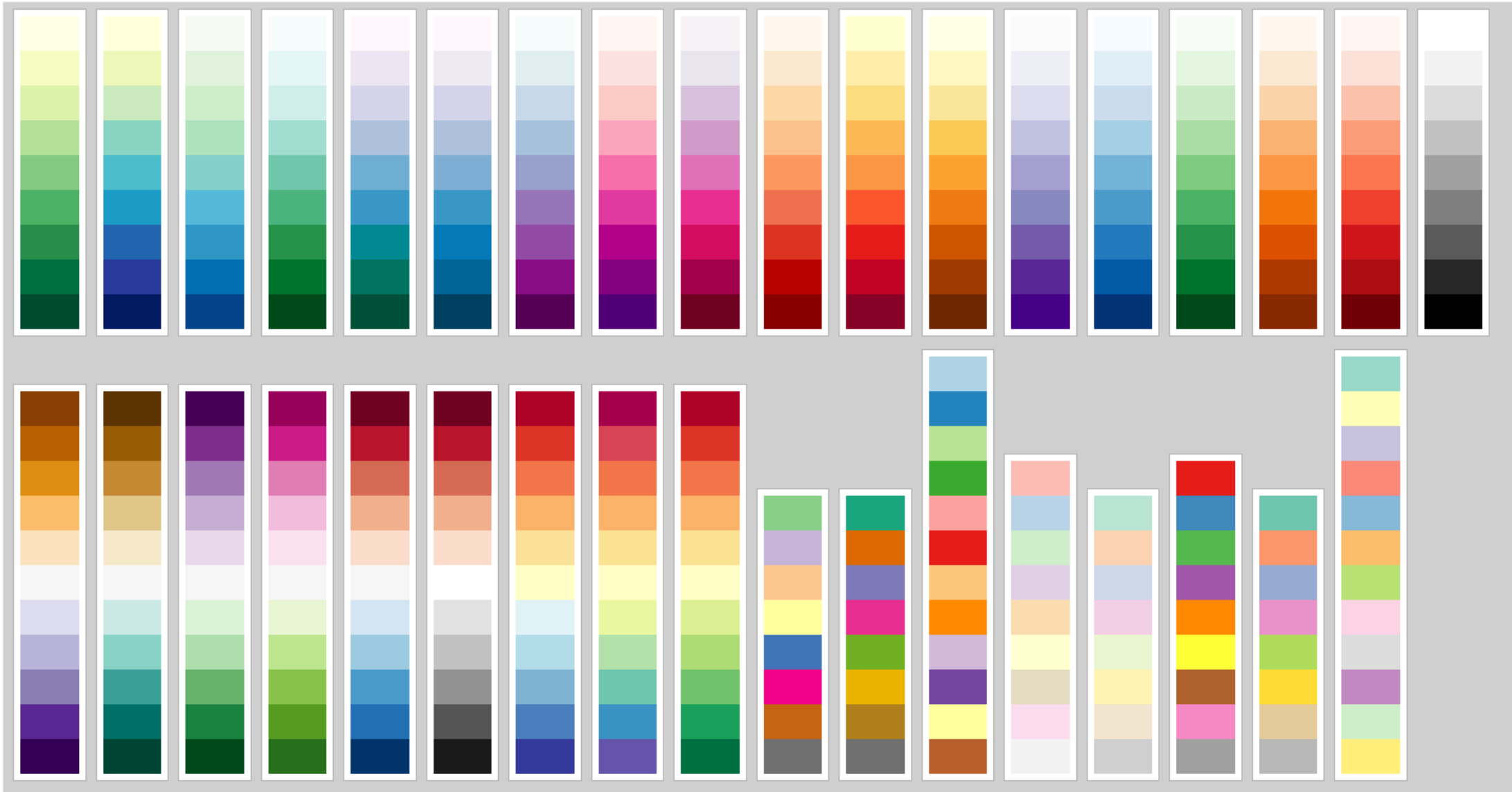
HEX i

- #a6cee3
- #1f78b4
- #b2df8a
- #33a02c
- #fb9a99
- #e31a1c
- #fdbf6f
- #ff7f00
- #cab2d6
- #6a3d9a



USE [COLORBREWER!](#)

# Every ColorBrewer Scale



[MIKE BOSTOCK](#)

# SYMBOLS AND ICONOGRAPHY

# SEMIOTICS (THE STUDY OF SIGNS)



SIGNIFIED  
A THING OR IDEA

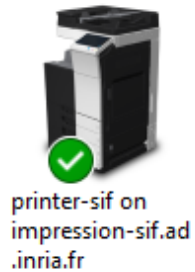


SIGNIFIER  
A REPRESENTATION  
OF THE THING OR IDEA  
(A WORD, PICTURE, SOUND, ETC.)

warmth  
heat  
danger  
etc.

SENSE  
THE UNDERSTANDING A  
VIEWER GETS FROM  
SEEING THE SIGNIFIED  
(OR THE SIGNIFIER!)

# TYPES OF SIGNS



ICON  
PHYSICALLY  
RESEMBLES  
WHAT IT STANDS  
FOR



INDEX  
IMPLIES / POINTS TO  
SOMETHING  
(CORRELATION)



SYMBOL  
POINTS TO  
SOMETHING  
RELATIONSHIP HAS  
TO BE LEARNED

# USING SIGNS TO ILLUSTRATE AND PROMPT RECOGNITION

















## Common MythConceptions

World's most contagious falsehoods



Bubbles size= virulence of idea (google hits)

New BODY FOOD HISTORY LAW MIND NATURE RELIGION SCIENCE SPORT Reset

 <p><b>The Vomitorium</b> Not a room Romans used for Bacchanalian binges, but the name for the entrance to a stadium.</p>	 <p><b>Different tongue parts</b> There are no different sections for each taste: bitter, sour, salty, sweet &amp; umami (savory/meaty).</p>	 <p><b>Electric fan @ night</b> Big myth in South Korea that this is deadly. Very unlikely to harm you. Unless you put the fan in the bed.</p>	 <p><b>Steep Learning Curve</b> Actually means a skill that is easy and quick to learn. Think about it. The curve just goes up and up.</p>
 <p><b>Sharks = no cancer</b> Oh yes they do get cancer. Particularly skin cancer.</p>	 <p><b>Black holes</b> Not really 'holes' but hugely dense objects with massive gravitational pull.</p>	 <p><b>Wake sleepwalkers?</b> They'll be really confused, but it's okay. They're more likely to hurt themselves if they're not awoken.</p>	 <p><b>Chemical Imbalance</b> Simplistic. Thank pharma for the idea that major depression is caused by an imbalance of neurotransmitters like serotonin.</p>
 <p><b>Napoleon was short</b> A tall tale. At 5'7", he was actually above average height for a Frenchman of the time.</p>	 <p><b>The 5 Second Rule</b> Amount of bacteria transferred to fallen food depends on how contaminated the floor is, not how long the food stays there.</p>	 <p><b>Bulls hate red</b> Bulls are colour-blind. They actually react to motions of the bull fighter's cloth as a perceived threat.</p>	 <p><b>Great Wall of China</b> Not visible from space. Myth. Now stop saying it!</p>
 <p><b>Missing persons reports</b> Police don't demand a 24-hour period before</p>	 <p><b>Bananas grow on trees</b> Actually grow on massive herbs that resemble trees. Bet</p>	 <p><b>Oil stops stuck pasta</b> Nope. But it can stop the water foaming</p>	 <p><b>A gene for...</b> Genes code for proteins, so there are actually no genes</p>

DAVID  
MCCANDLESS  
[LINK](#)

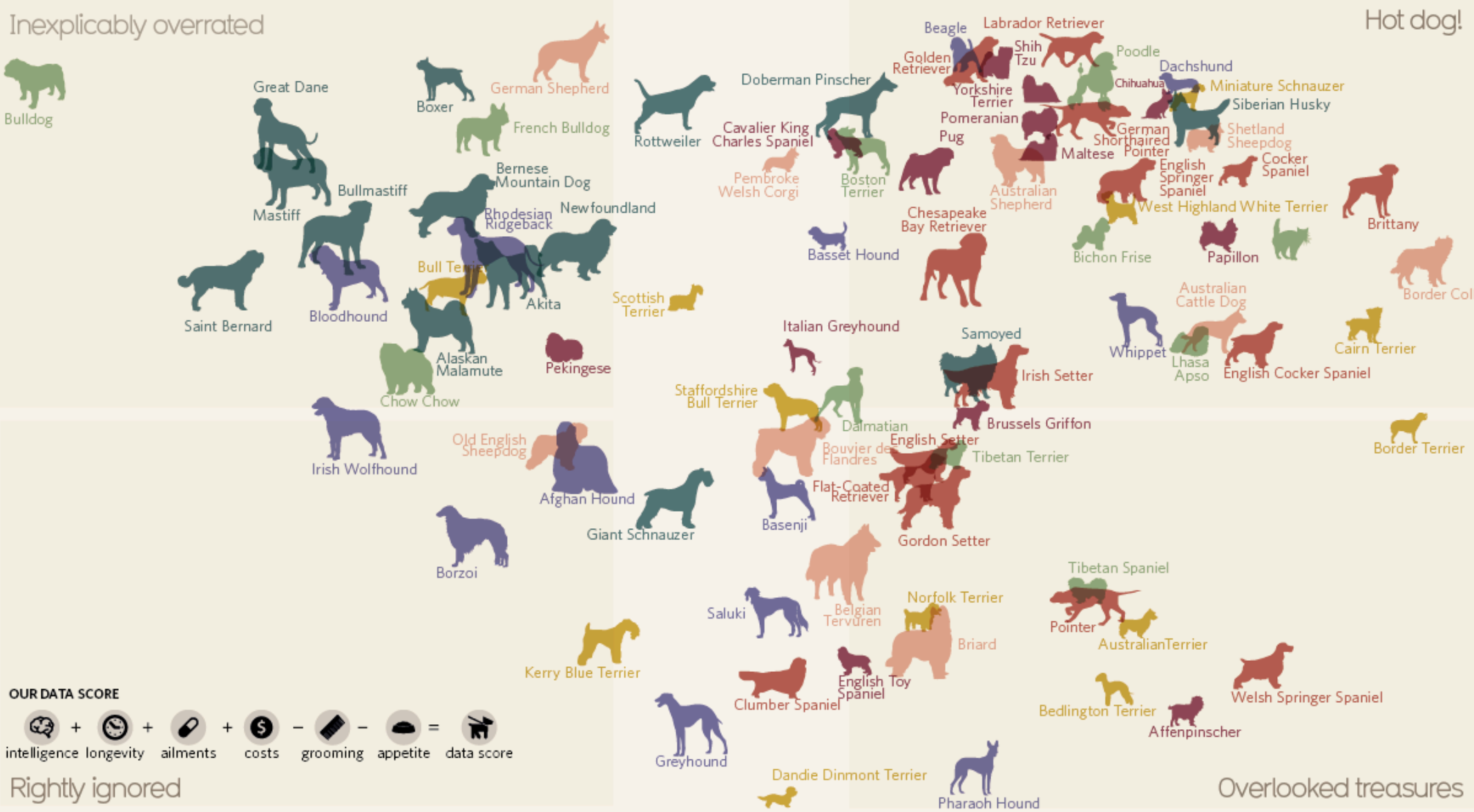


# Best in Show

The ultimate data-dog

**INTELLIGENCE** dumb clever  
**SIZE** sml med lrg  
**TYPE** Herding Hound Non-sporting Sporting Terrier Toy Working

public popularity

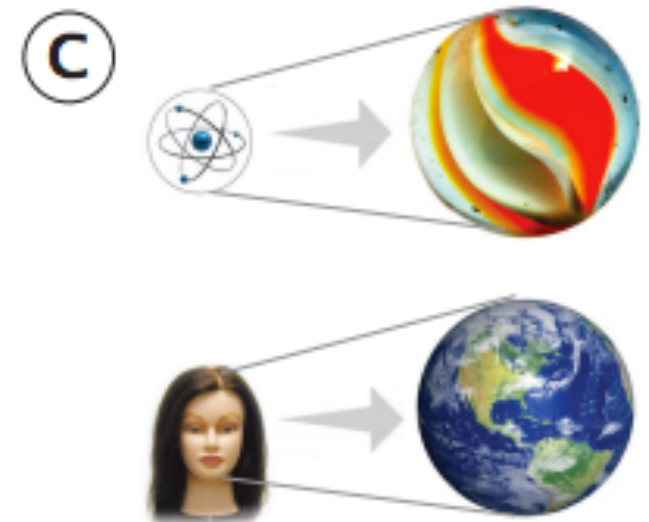
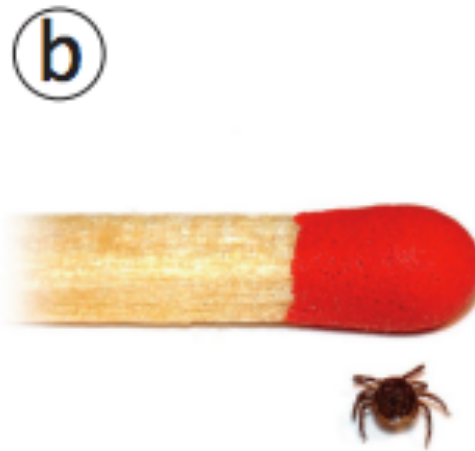
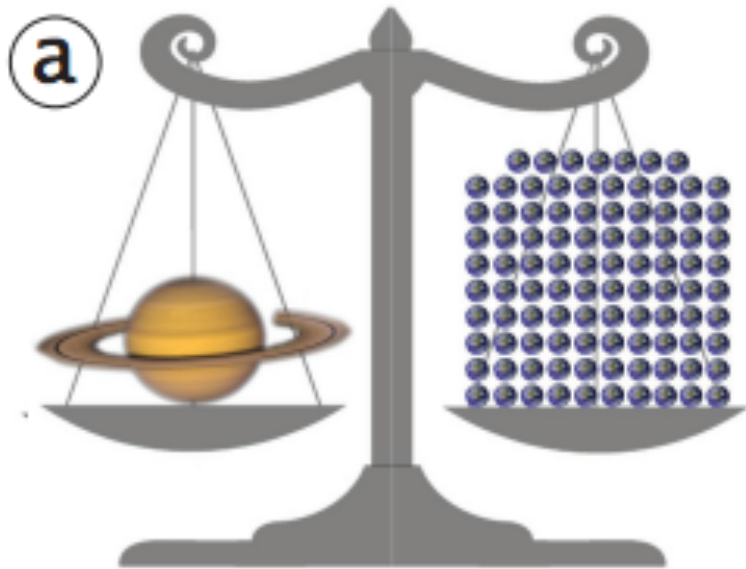


**OUR DATA SCORE**

intelligence + longevity + ailments + costs - grooming - appetite = data score

our data score

# USING SIGNS TO MAKE DATA RELATABLE



USING CONCRETE SCALES  
CHEVALIER ET AL. 2013 [LINK](#)



BUYING POWER

Here are 120 million  
Monopoly pieces, roughly  
one for every household  
in the United States.

# Mainly in Finance and Energy



**Finance** 64  
Majority in hedge funds, private equity or venture capital.



**Energy and natural resources** 17  
Mostly oil and gas.



**Real estate and construction** 15



**Media and entertainment** 12  
Hollywood moguls like Steven Spielberg, J.J. Abrams and Jeffrey Katzenberg.



**Health** 12  
Woody Johnson, owner of the New York Jets, whose family founded Johnson & Johnson.



**Technology** 10



**Transportation** 9  
Trucking, autos, cruise ships.



**Retail and manufacturing** 6



**Food, beverage, agriculture** 5  
Includes citrus, poultry and sugar magnates.



**Insurance** 3



**Other/unknown** 5

## DEATH IN SYRIA

By KAREN YOURISH, K.K. REBECCA LAI and DEREK WATKINS

SEPT. 14, 2015

More than **200,000** people  
have been killed in the four-and-a-half-year Syrian civil war.

# The death toll in the Gaza-Israel conflict

By Lazaro Gamio and Richard Johnson, Updated: Aug 7, 2014

Statistics on death tolls during active conflict are often difficult to track accurately. A note on our sourcing:

For death toll numbers from within Gaza, we receive daily or sometimes twice daily updates from the head of the Information Management Unit in the United Nations Office for the Coordination of Humanitarian Affairs in the Occupied Palestinian Territories field office in the West Bank. The field office gets updates from multiple sources within Gaza, including U.N. agencies and the Palestinian Medical Authorities. They then create and continually update a spreadsheet of all available data. These numbers are often not complete, but represent the best available data and do tend to clarify over time. Israel disputes the numbers provided by the United Nations, saying that a large number of those killed, particularly males over 18, were armed terrorists and not civilians.

For death toll numbers of Israeli soldiers, we rely on Israel Defense Forces press releases and their [Twitter account](#). For Israeli civilian deaths, we rely on news reports and our reporters in Israel and Gaza. These numbers are similarly tentative initially but clarify over time.

**Related articles:** Reporters grapple with politics, erratic sources in reporting Israeli/Gaza death toll (Washington Post) | Caution needed with Gaza casualty figures (BBC) | Civilian or Not? New Fight in Tallying the Dead From the Gaza Conflict (New York Times)

1,958 Deaths up to Aug. 6



65 were Israeli soldiers.



3 were Israeli civilians.



217 were armed Palestinian militants. Of those, 2 were children.



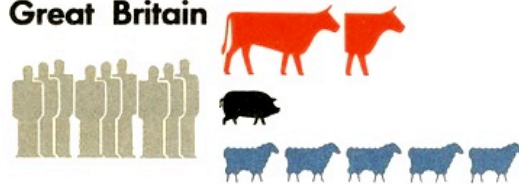
1396 were Palestinian civilians. Of those, 222 were women and 418 were children.



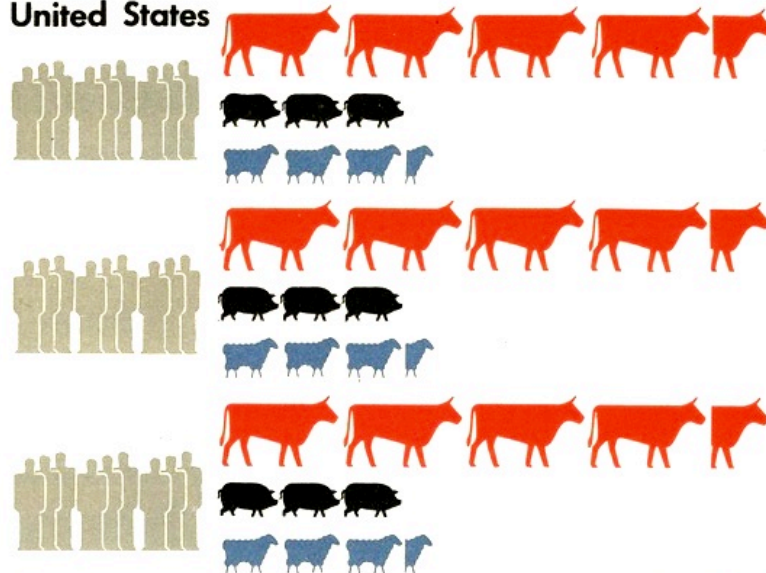
# ISOTYPE VISUALIZATION

## Population and Live Stock

Great Britain



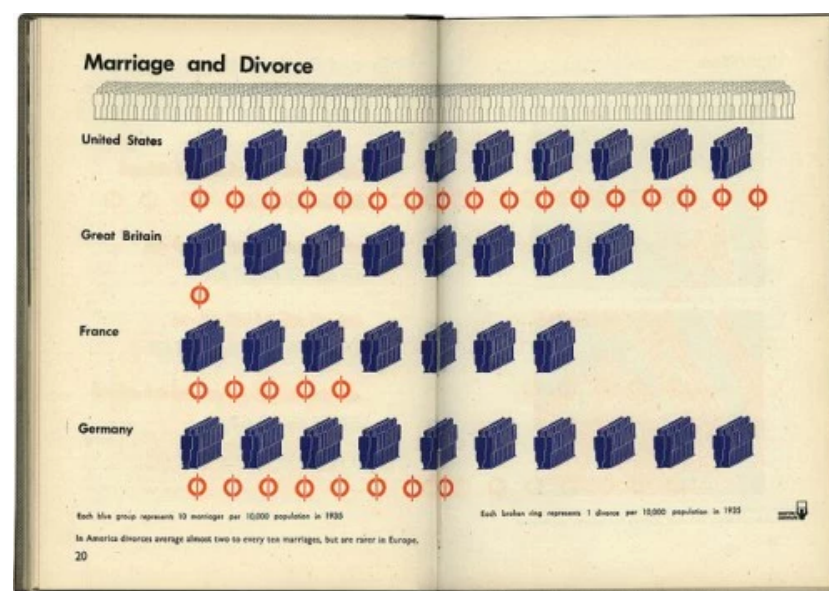
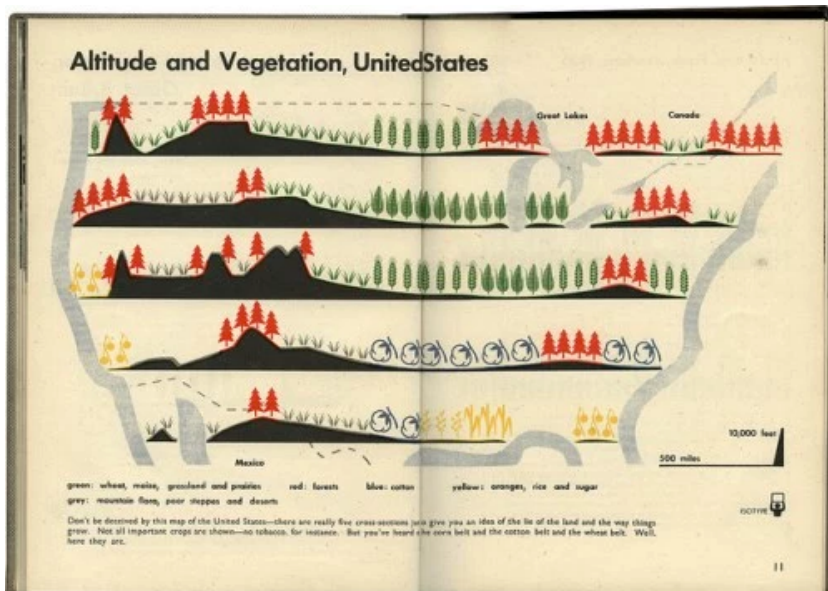
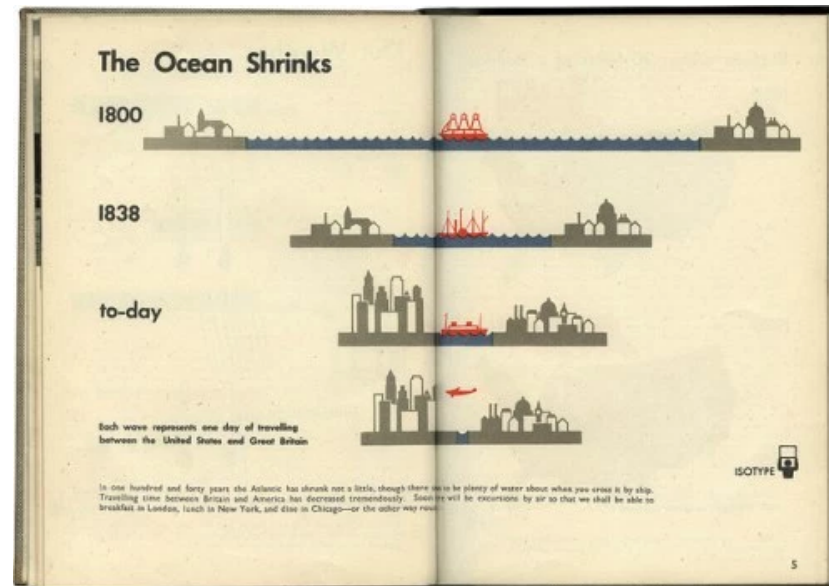
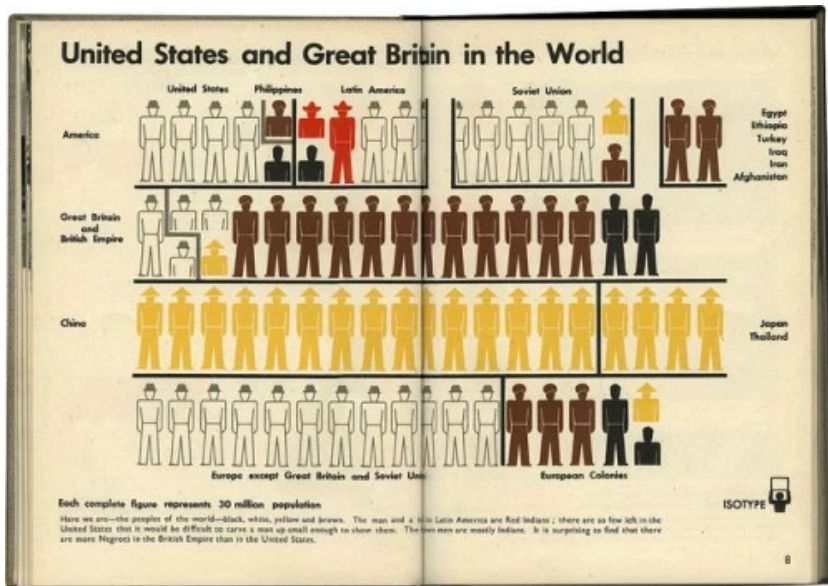
United States



Each grey figure represents 5 million population  
Each complete red symbol represents 5 million cattle  
Each complete black symbol represents 5 million pigs  
Each complete blue symbol represents 5 million sheep

Average for 1935 - 1939

OTTO & MARIE NEURATH 1948



OTTO & MARIE NEURATH 1948 [MORE EXAMPLES](#)



# ISOTYPE Visualization – Working Memory, Performance, and Engagement with Pictographs

Steve Haroz  
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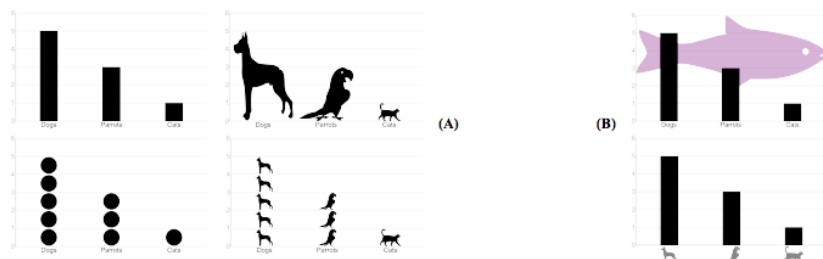


Fig. 1. Pictographic charts have been used for decades. (A) Which chart above most effectively conveys information? Which data is easiest to remember during a demanding task? Which is most engaging? (B) How integrated must a pictograph be to benefit the user? Do purely decorative background images offer the same benefits as simple axis labels? Or must they be used to convey data?

## ABSTRACT

Although the infographic and design communities have used simple pictographic representations for decades, it is still unclear whether they can make visualizations more effective. Using simple charts, we tested how pictographic representations impact (1) memory for information just viewed, as well as under the load of additional information, (2) speed of finding information, and (3) engagement and preference in seeking out these visualizations. We find that superfluous images can distract. But we find no user costs – and some intriguing benefits – when pictographs are used to represent the data.

## Author Keywords

Visualization; Psychophysics; Working Memory; User Performance; Pictograph; Embellishment; ISOTYPE

## INTRODUCTION

The International System Of Typographic Picture Education (ISOTYPE) uses simple pictographic elements to convey many types of information, including numerical data. Otto and Marie Neurath defined the term in the 1920s [21], though this type of chart was first described by Willard Brinton in

1914 [6]. Together with Gerd Arntz, the Neuraths created many ISOTYPE designs over several decades [1].

The goal was a universally understandable system for communicating quantities of commercial, social, or economic information (e.g., automobile production or number of children born per year). Symbols, each representing a fixed quantity, were stacked to provide an intuitive representation of a total amount (Fig. 2). Gerd Arntz’s pictographs – simplified icons with minimal color – are highly recognizable and are still used in signs, traffic icons, and warning labels.

While the design community has largely embraced the simple style of ISOTYPE for pictographic embellishments [7, 17], the visualization and HCI communities tend to regard pictographs as ‘chart junk’ – a distraction from the data itself [24]. Here we examine how ISOTYPE-style embellishment affects viewer memory, speed, and engagement within simple visualizations.

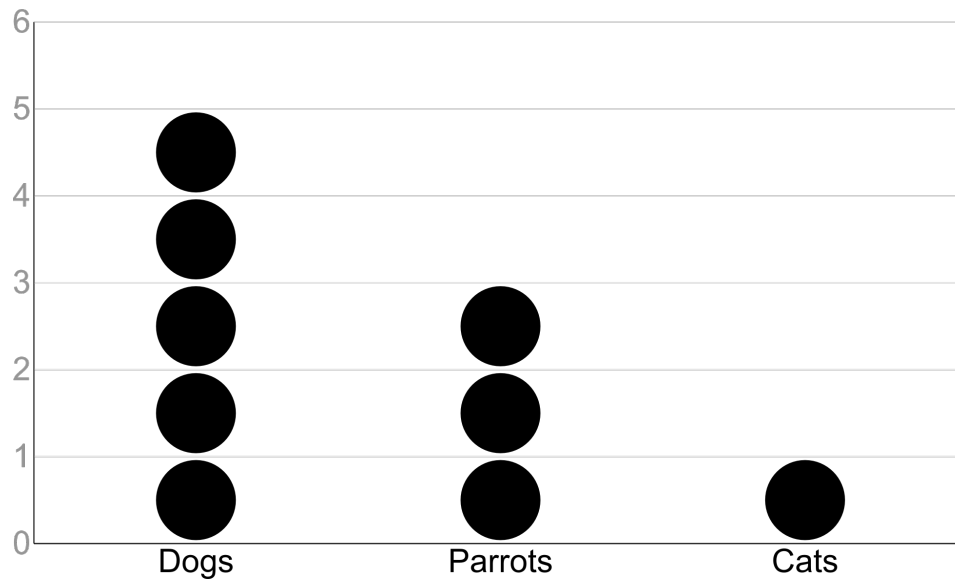
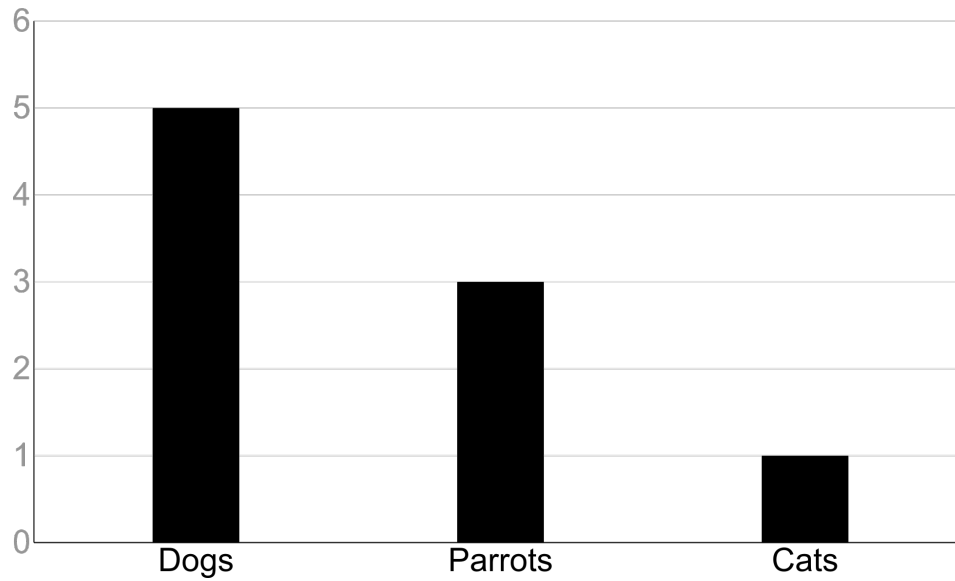
Recent work suggests that extraneous pictographic information can indeed improve the effectiveness of visualizations. Bateman et al. found that visualizations that integrate data with illustrations yielded better memory of the data compared to minimalistic outlines of bar charts [2]. Borkin et al. found a related result – that people can better recall having seen a visualization that includes pictures [4], though it is not clear if they would better recall the data, per se. When images and clip-art are embedded in the visualization’s data representation, Borgo et al. found occasional impact to work-

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http://dx.doi.org/10.1145/2702123.2702275

# STACKED ICONS CAN:

HAROZ ET AL. 2015 [LINK](#)

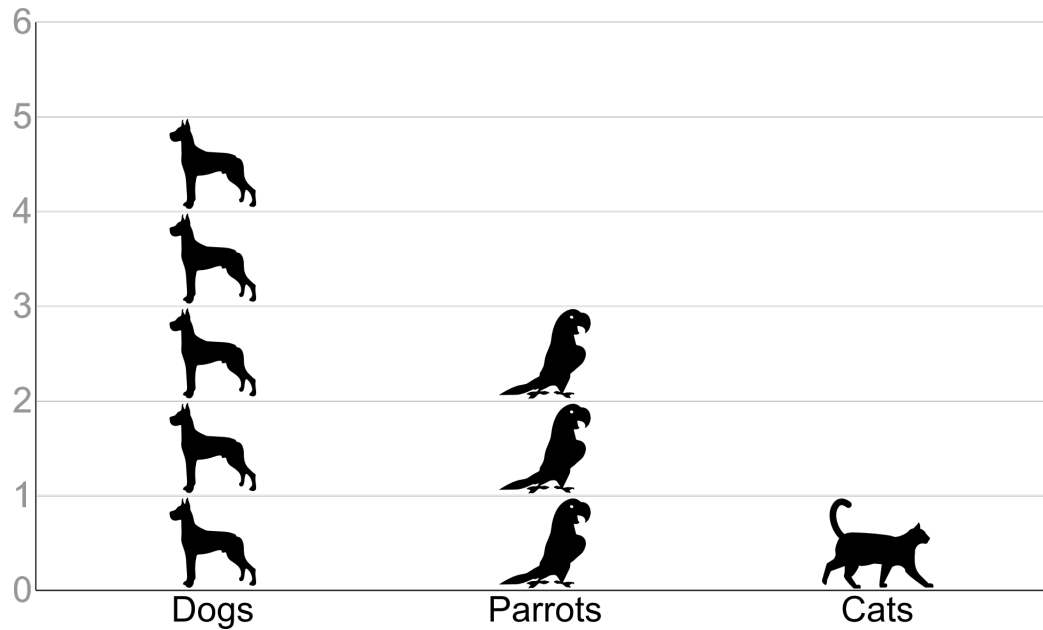
STACKED ICONS CAN:  
ENCODE DATA AS BOTH  
LENGTH AND QUANTITY



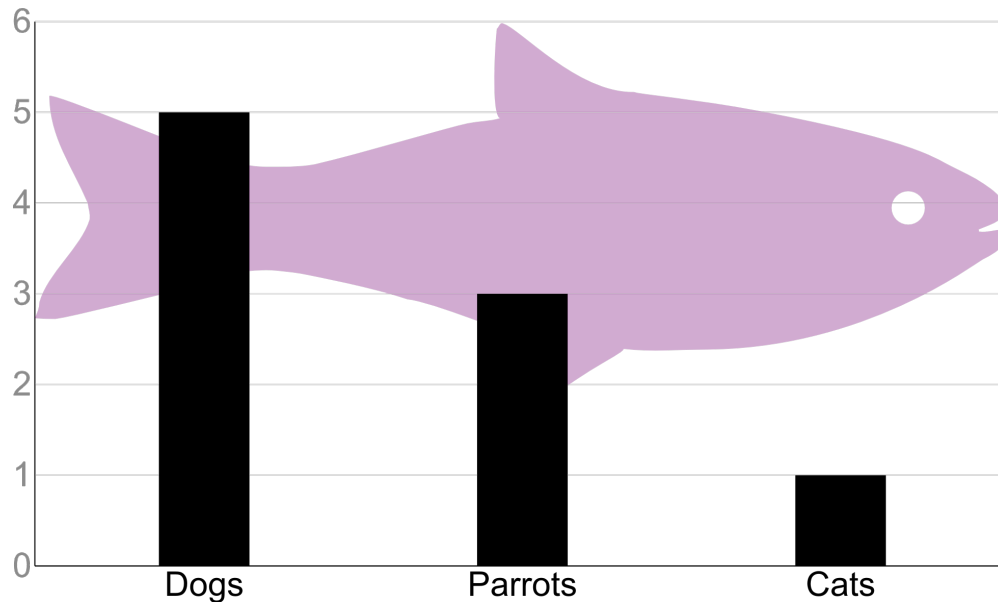
HAROZ ET AL. 2015 [LINK](#)

STACKED ICONS CAN:  
ENCODE DATA AS BOTH  
LENGTH AND QUANTITY

(WHERE THIS WORKS)  
ICONS CAN SUPPORT  
MEMORY & ENGAGEMENT



HAROZ ET AL. 2015 [LINK](#)



STACKED ICONS CAN:  
ENCODE DATA AS BOTH  
LENGTH AND QUANTITY

(WHERE THIS WORKS)  
ICONS SUPPORT MEMORY  
& ENGAGEMENT

**BUT!** OTHER IMAGES ARE  
DISTRACTING

HAROZ ET AL. 2015 [LINK](#)

# HOW TO USE DATA TO TELL A STORY?

(THERE ARE MANY, MANY CHOICES TO MAKE.)



Britain's "broken society"

## Through a glass darkly

**Crime, family break-up, drunks and drugs: the Conservatives—and apparently plenty of voters—think that Britain has a “broken society”. Does the claim stand up?**

IT IS hard to believe that such appalling crimes could have been committed by anyone so young. Two boys in the north of England were subjected to a sadistic attack that caused parents across the country to shudder. The anguish of the children was awful enough. But in a grotesque twist, their tormentor was also a child, not yet even a teenager. The attacks had been carried out “solely for the pleasure and excitement” of it, the judge in the case said. What has society come to when such evil is found in those so young?

That was in 1968. Mary Bell, the daughter of a Tyneside prostitute and supposedly the victim of repeated abuse herself, became Britain's most famous child-killer when, just 11 years old, she was convicted of strangling two young boys. Now, a similar case is causing people to wonder again whether society has gone to the dogs. Two brothers from the South Yorkshire village of Edlington, aged ten and 11, were convicted on January 22nd of torturing and sexually abusing two younger boys in an ordeal that left one of them close to death.

The case was highlighted by David Cameron, the leader of the opposition, who on the day the boys were sentenced launched a chapter of his Conservative Party's election manifesto dedicated to dealing with what he calls Britain's “bro-

ken society”. The Edlington case was not “just some isolated incident of evil”, Mr Cameron said. Connecting it to four other infamous examples of callous brutality, he declared that it raised “deep questions about what is going wrong in our society”. Britain is experiencing a social recession to match the economic one, he reckons.

### Those good old days in full

Was Mary Bell's Britain better than today's version? An increasing number of people seem to think so. Opinion pollsters around the world find that people are usually gloomy about the future, perhaps because it is inherently more uncertain than the past. But Britons are getting even more downbeat. When Labour came to power in 1997, 40% of the population thought the country was becoming a worse place to live in. By 2007 that had risen to 60%. A year on, and a year into Gordon Brown's spell as prime minister, the malcontents numbered 71%—and that was before the financial crash. There has been a “surge of nostalgia” for the good old days, says Ben Page, head of Ipsos-Mori, a polling firm.

Chief among people's worries is their security. Under Labour, fear of crime climbed until by 2007 it had become the issue that pollsters identified as the main complaint among voters. (Since then wor-

Also in this section

64 [Bagehot: Electoral reform](#)

More articles about Britain are available to subscribers at [economist.com/britain](http://economist.com/britain)

ries about the economy have eclipsed all else.) The heightened fears are a puzzle to criminologists, who point out that over the past 15 years Britain has experienced a steady, deep fall in crime. The statistics are notoriously hard to interpret, but according to the British Crime Survey, the Home Office's most reliable measure though still far from perfect, crime overall has dropped by 45% since its peak in 1995. A big chunk of that fall is owing to reductions in vehicle theft and domestic burglary, for which alarm manufacturers and increased householder vigilance probably deserve as much credit as the police. But violent crime has fallen too. It is now almost half what it was in 1995, and no higher than in 1981 (see chart).

Looking more carefully, the big fall in brutality has been in domestic violence, which has dropped by a staggering 70%. (No one is sure why; the best guess is that an improving economy has kept men out of the house and given women enough money to escape if they need to.) Violence



SMALL SUPPORT AFTERTHOUGHT BORING?



Published: February 2, 2010

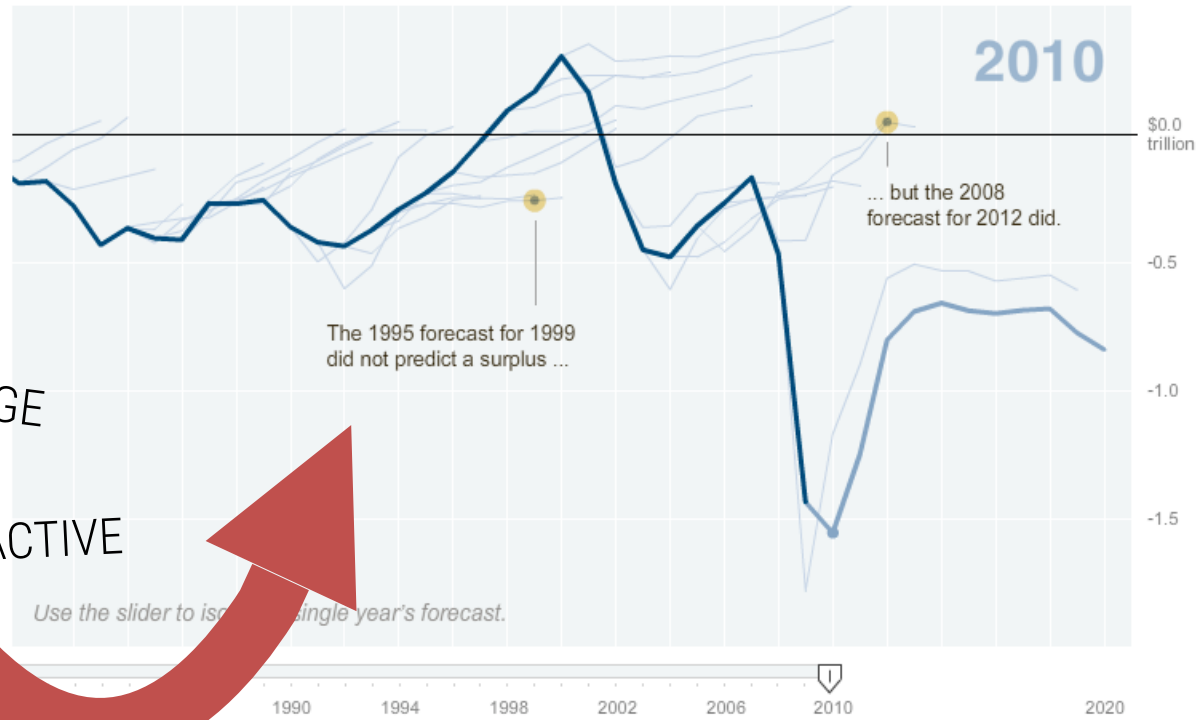
## Budget Forecasts, Compared With Reality

Just two years ago, surpluses were predicted by 2012. How accurate have past White House budget forecasts been?

1 2 3 4 5 6 NEXT ▶

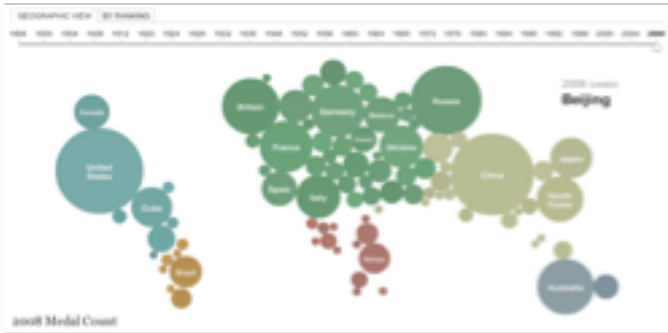
### Latest forecast

Today, with a better understanding of the severity of the economic downturn, the deficit situation is much more dire.



CENTER STAGE  
STANDALONE  
INTERACTIVE  
GUIDED



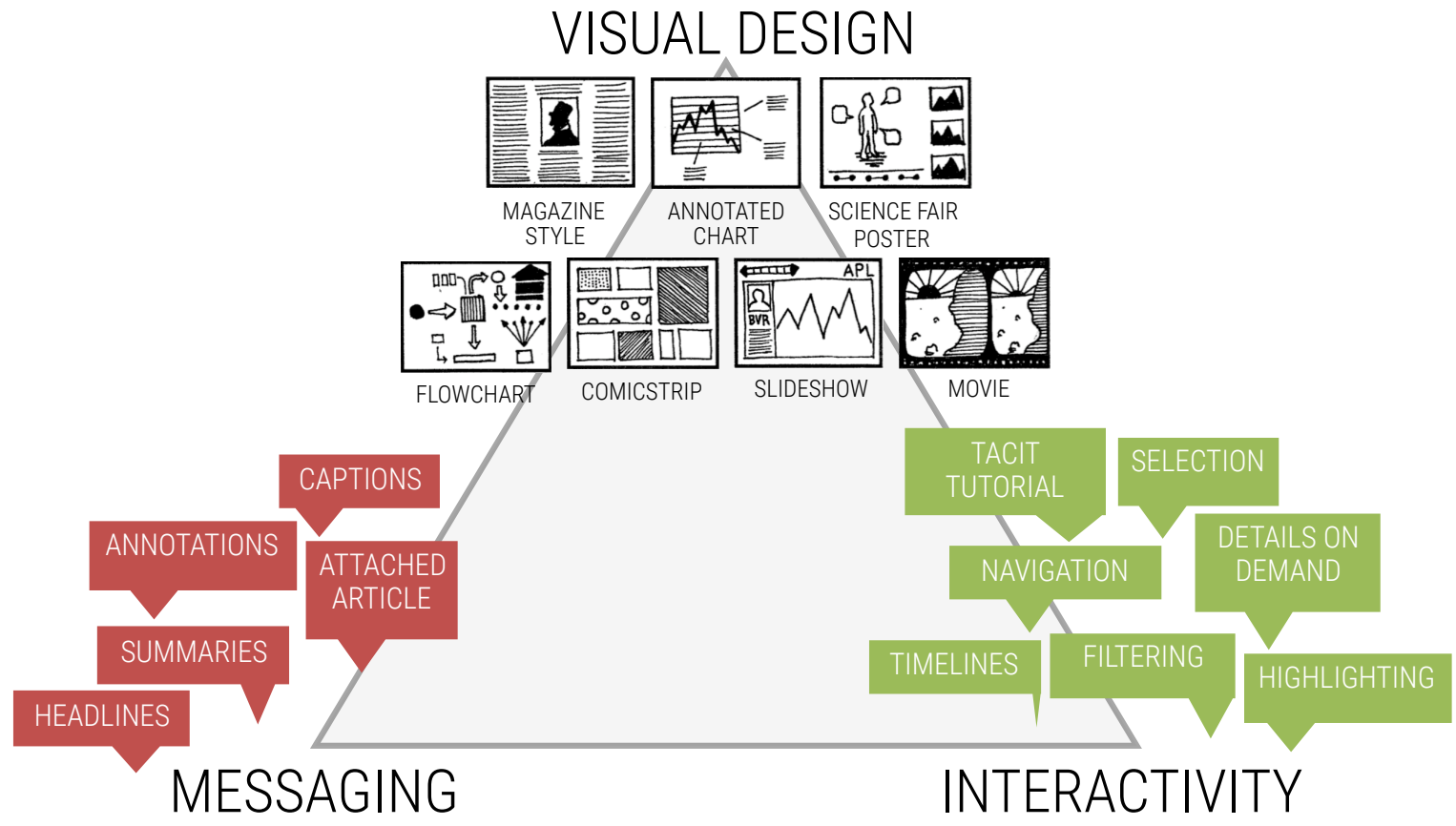


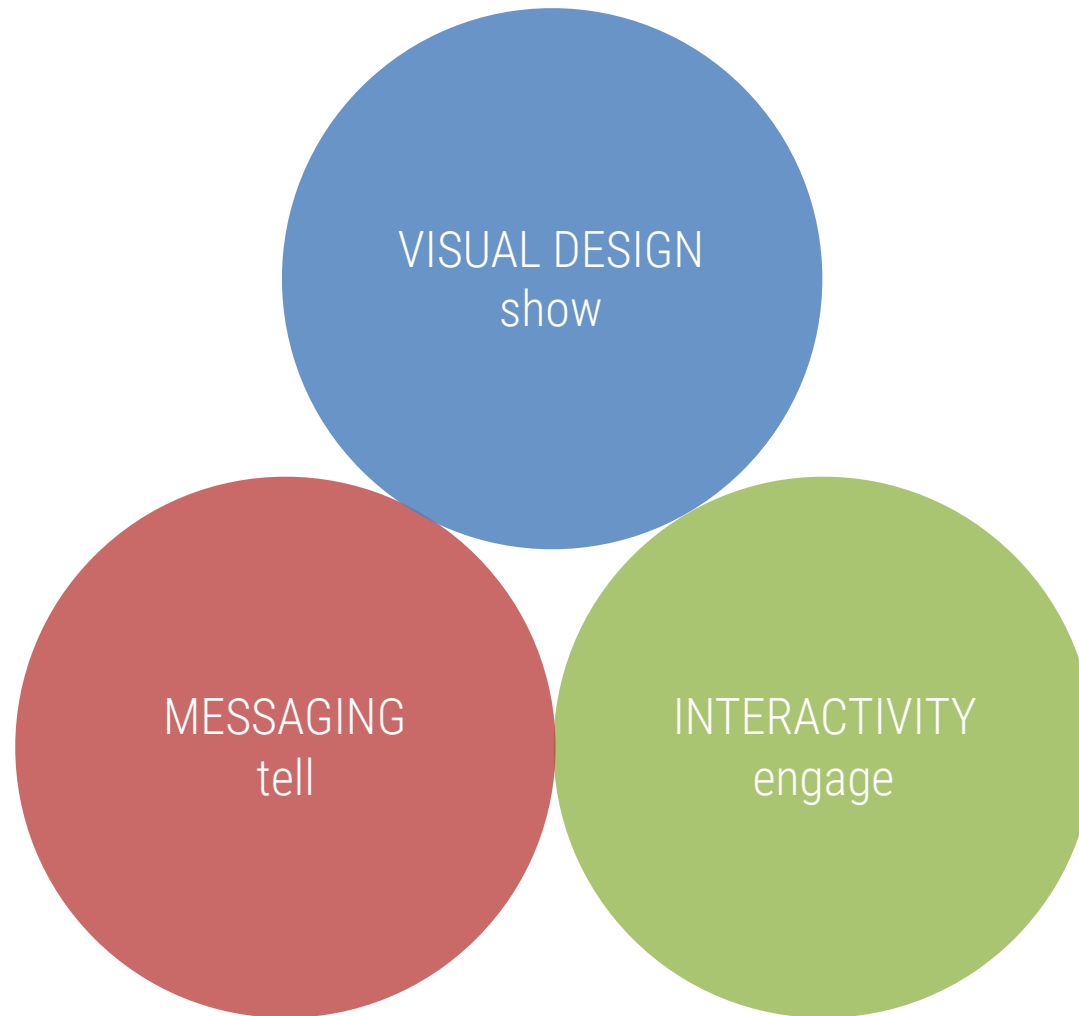
# 58 CASE STUDIES

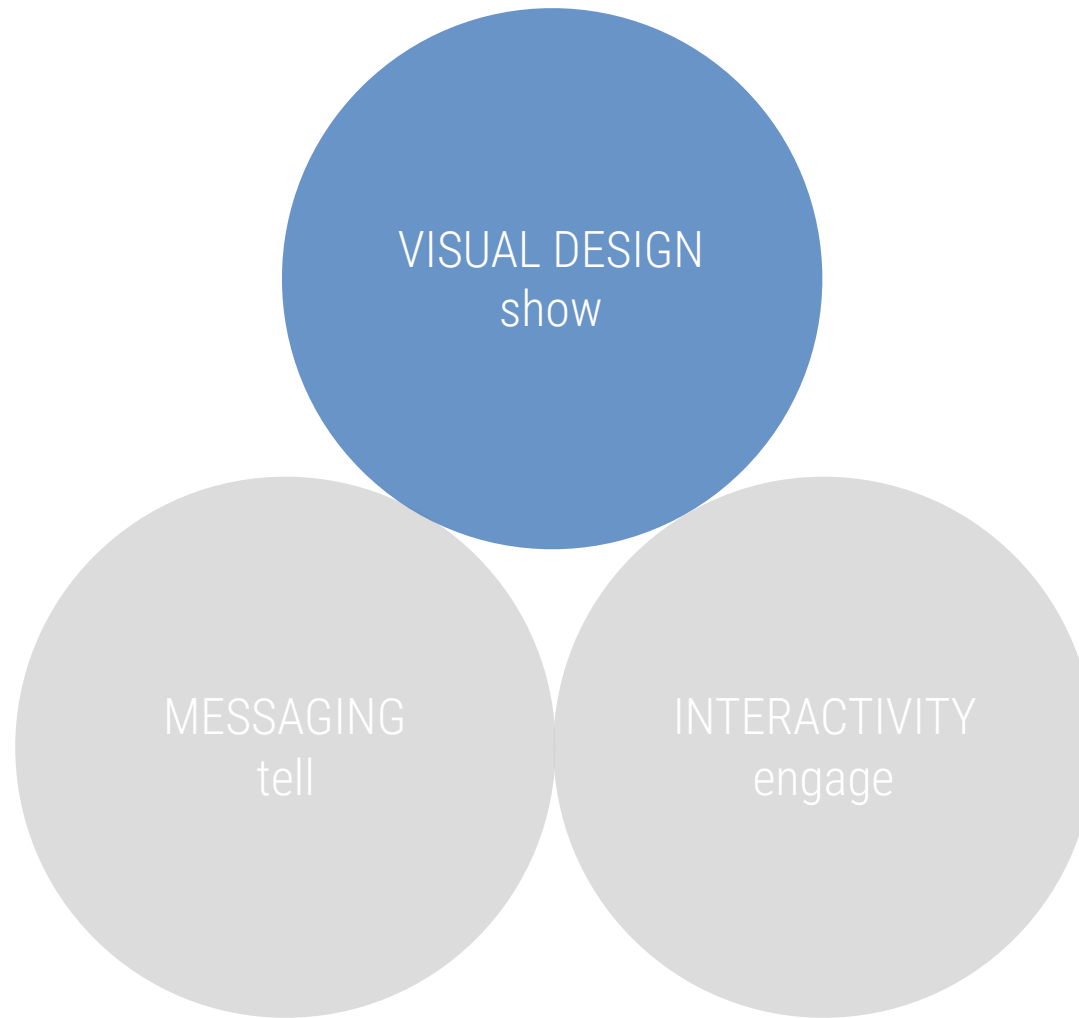
70% JOURNALISM  
20% BUSINESS  
10% RESEARCH

EDWARD SEGEL &  
JEFFREY HEER 2010









### Taking the Corners

A look at the technique of American speedskater Shani Davis, who won gold in the 1,000 meters and silver in the 1,500.

1 2 3 4 5 6 7 8 NEXT

**Eric Heiden**, the American speedskater who captured five golds in 1980 and is now the doctor for the 2010 U.S. team, explains how Shani Davis uses turns to his advantage.



By Graham Roberts, Bedel Sager and Michael W. Schmidt | Send Feedback

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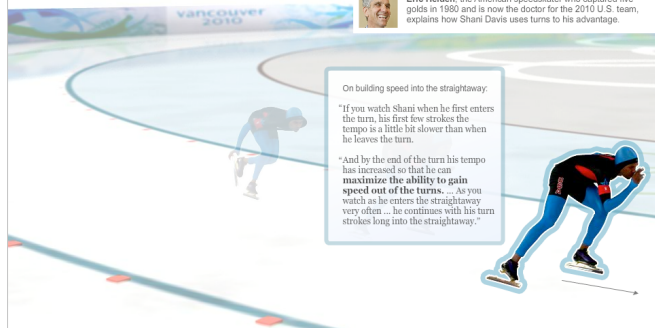


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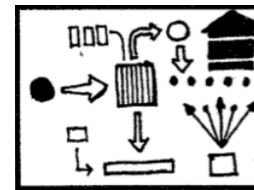
1 2 3 4 5 6 7 8 NEXT

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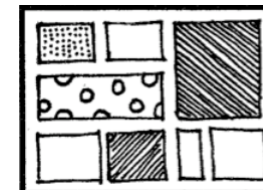


# THE MORE LINEAR, THE MORE LIKE A TRADITIONAL STORY.

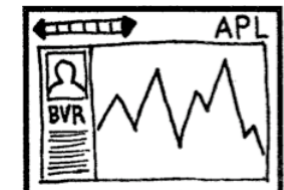
# WITH A BEGINNING, MIDDLE, AND END.



FLOWCHART



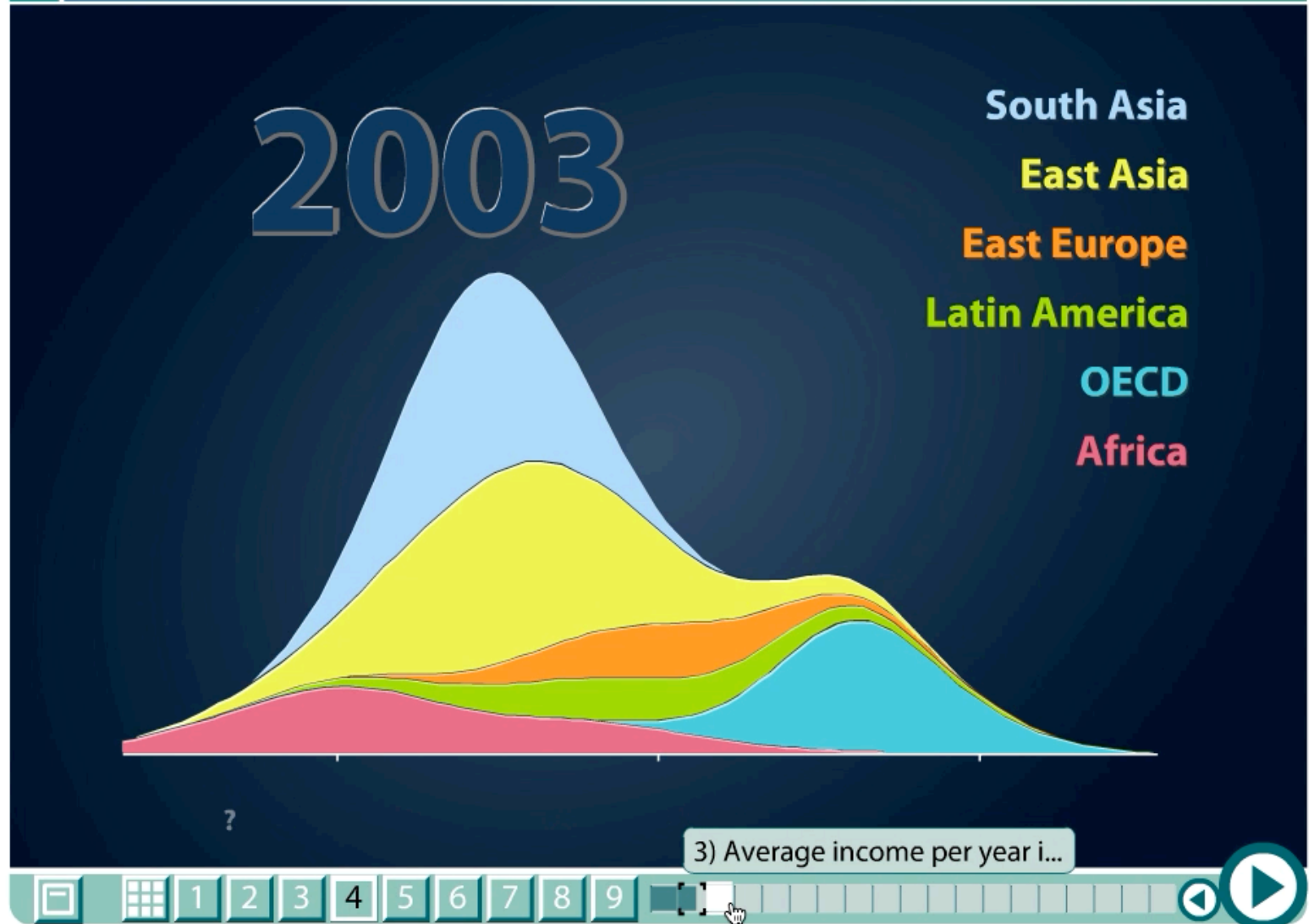
COMICSTRIP



SLIDESHOW

4 Regional differences in health and income

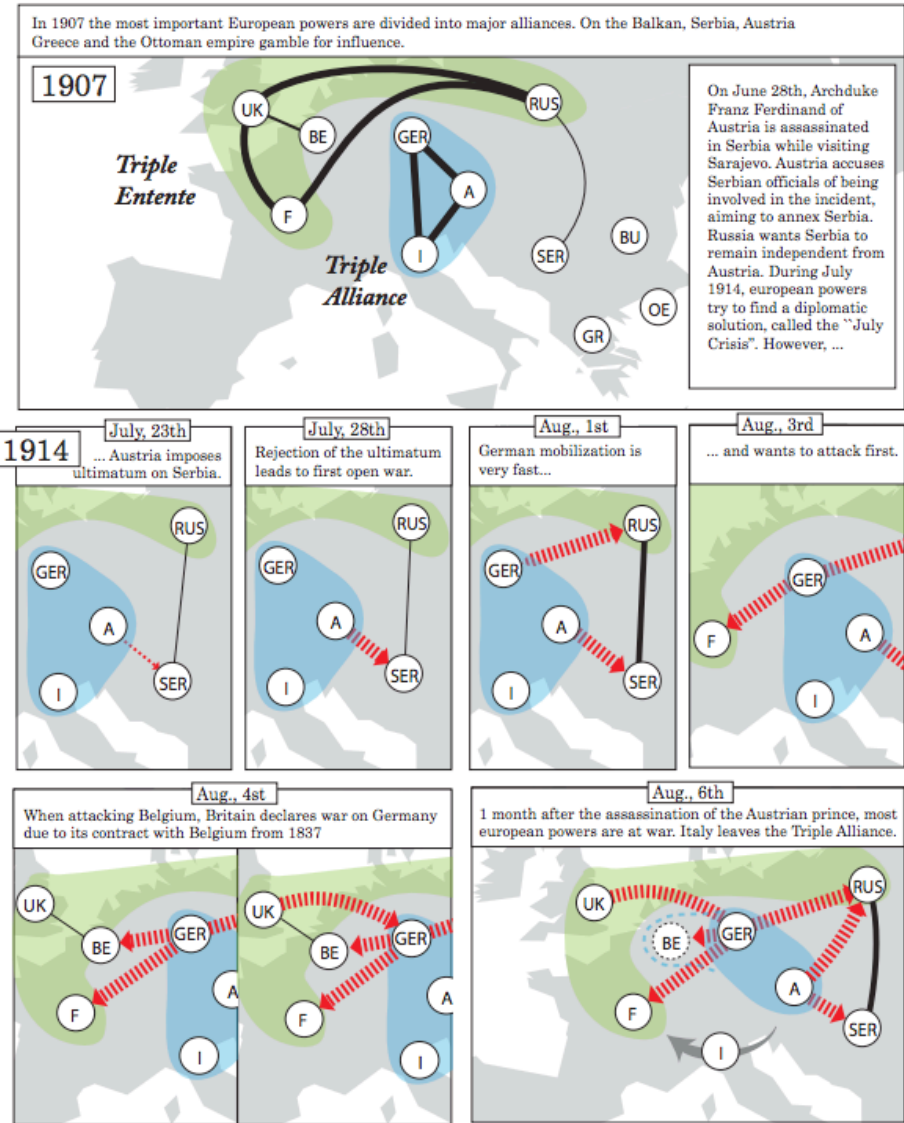
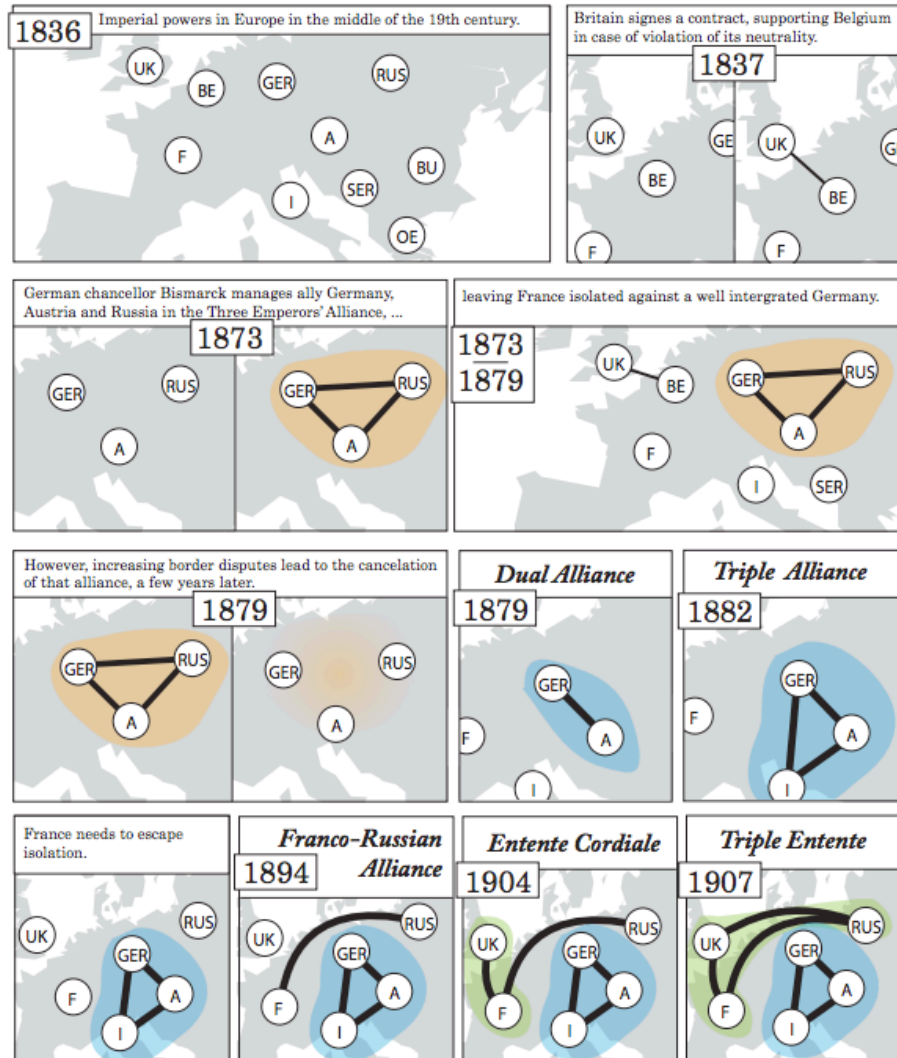
USE STAGING AND ANIMATION FOR COMPLICATED TRANSITIONS TO AVOID CONFUSING READERS



# USE ESTABLISHING SHOTS SITUATE THE VIEWER BEFORE DIVING IN.



# European Alliances before World War I (1836-1914)





# Users find themselves

## Your Olympic athlete body match

Olympic athletes come in all shapes and sizes, from the lithe limbs of Japan's Asuka Teramoto to the gargantuan frame of China's Zhaoxu Zhang. But how do you measure up in comparison? Try our app below and find out. Why not then share your results with your friends?

The screenshot shows a web application interface with two columns: 'TALLEST' and 'LIGHTEST'. The 'TALLEST' column features a basketball player (Zhaoxu Zhang) with a height of 2.19m and weight of 110kg. The 'LIGHTEST' column features a gymnast (Asuka Teramoto) with a height of 1.36m and weight of 30kg. A central vertical scale ranges from 1m to 2.25m. Below the scale, there is a form titled 'Where do you stand?' with input fields for 'Height' (Metres | Feet) and 'Weight' (Kilograms | Pounds | Stone). A 'COMPARE' button is located at the bottom of the form.

Category	Height	Weight
TALLEST	2.19m	110kg
LIGHTEST	1.36m	30kg

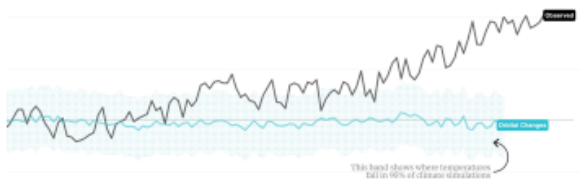
HELPS ANCHOR  
VIEWER IN THE PIECE.  
MAKES DATA MORE  
PERSONALLY  
RELEVANT.

2016 LYN BARTRAM, BENJAMIN BACH, JEREMY BOY, PAULO CIUCCARELLI, STEVEN DRUCKER, YURI ENGELHARDT, ULRIKE KOEPPEN, MORITZ STEFANER, BARBARA TVERSKY, & JO WOOD.

# Again, and again...

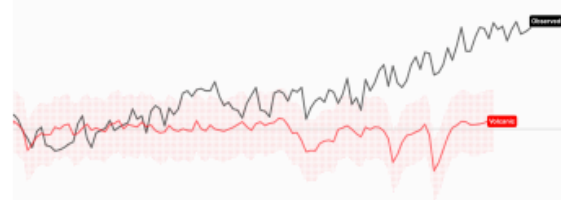
## Is It the Earth's Orbit?

The Earth wobbles on its axis, and its tilt and orbit change over many thousands of years, pushing the climate into and out of ice ages. Yet the influence of orbital changes on the planet's temperature over 125 years has been negligible.



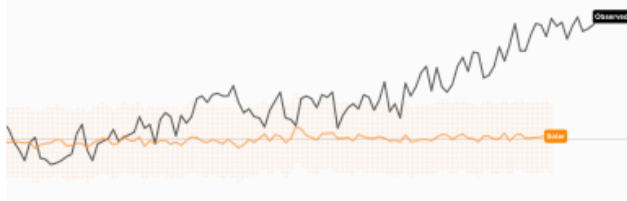
## Is It Volcanoes?

The data suggest no. Human industry emits about 100 times more CO<sub>2</sub> than volcanic activity, and eruptions release sulfate chemicals that can actually cool the atmosphere for a year or two.



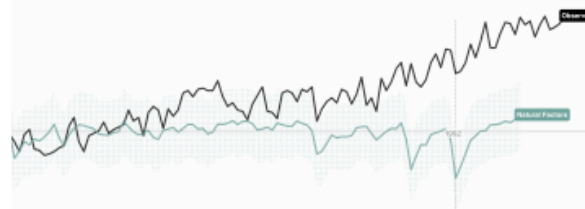
## Is It the Sun?

The sun's temperature varies over decades and centuries. These changes have had little effect on the Earth's overall climate.



## Is it All Three of These Things Combined?

If it were, then the response to natural factors should match the observed temperature. Adding the natural factors together just doesn't add up.



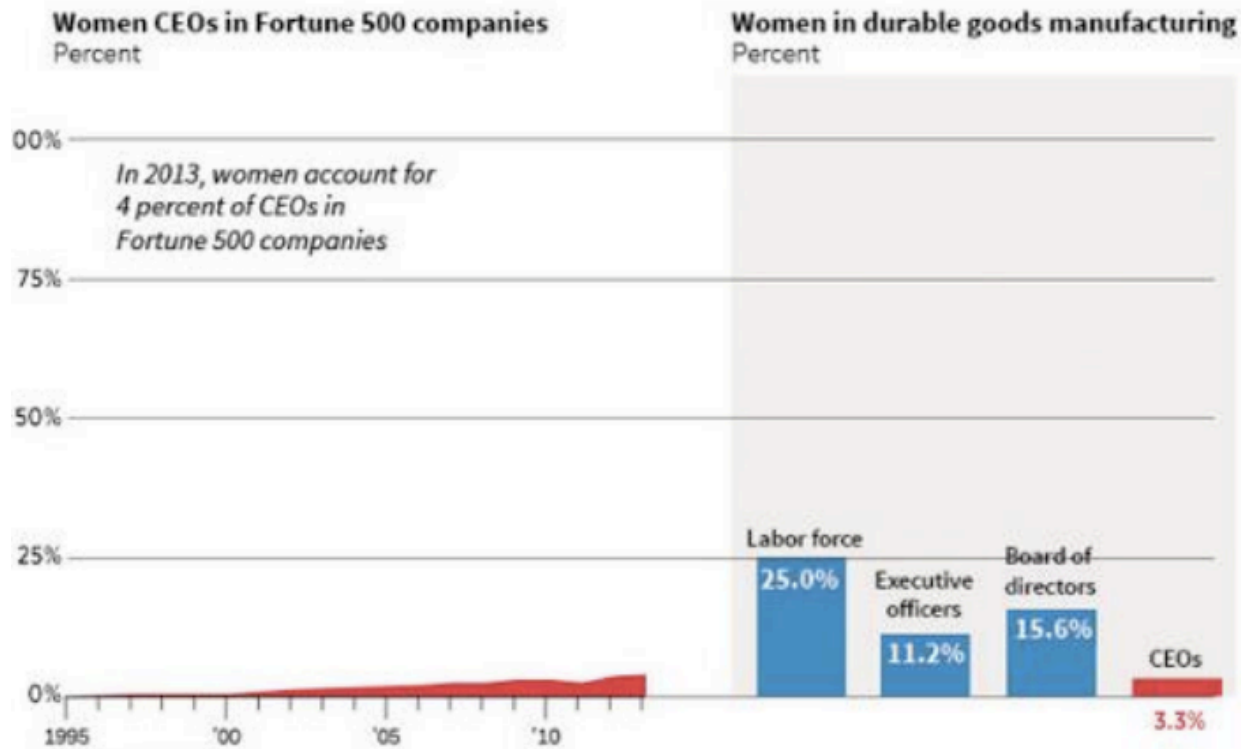
SHOW SAME  
PHENOMENON OVER AND  
OVER, CHANGING ONLY  
ONE VARIABLE.  
RHYTHM STRENGTHENS  
THE NARRATIVE.  
REPEATED  
DISAPPOINTMENT SETS UP  
THE FINAL REVEAL.

2016 LYN BARTRAM, BENJAMIN BACH, JEREMY BOY, PAULO CIUCCARELLI, STEVEN DRUCKER, YURI ENGELHARDT, ULRIKE KOEPPEN, MORITZ STEFANER, BARBARA TVERSKY, & JO WOOD.

# Break conventions

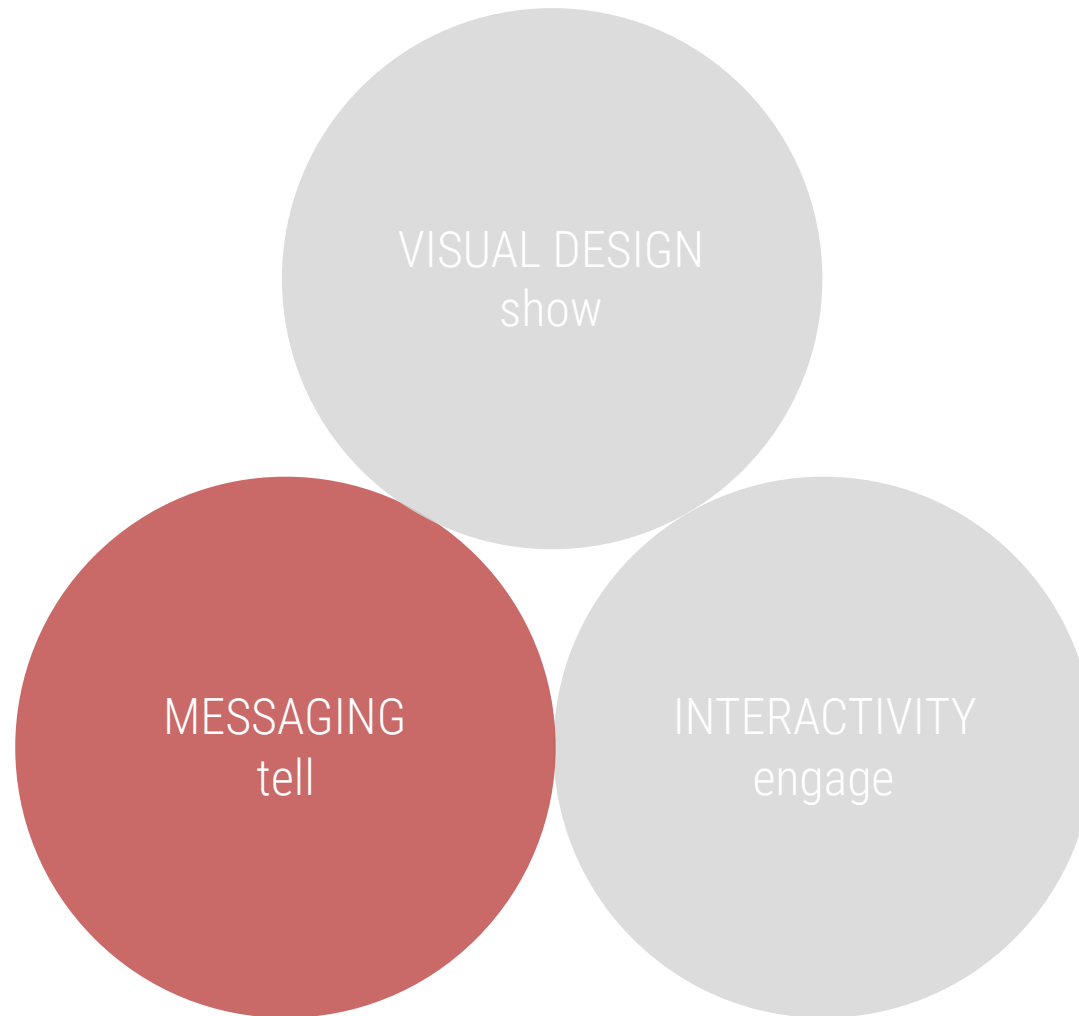
## The glass ceiling persists

General Motors named Mary Barra as its next CEO, replacing Dan Akerson. Here's a look at how women are faring in their advancement to the top of Fortune 500 companies and the durable goods sector.



PURPOSEFULLY  
BREAK CONVENTIONS  
OF  
CHART DESIGN.  
BREAKING  
EXPECTATIONS CAN  
BE USED TO  
UNDERLINE  
PARTICULAR  
INTERPRETATIONS.

2016 LYN BARTRAM, BENJAMIN BACH, JEREMY BOY, PAULO CIUCCARELLI, STEVEN DRUCKER, YURI ENGELHARDT, ULRIKE KOEPPEN, MORITZ STEFANER, BARBARA TVERSKY, & JO WOOD.



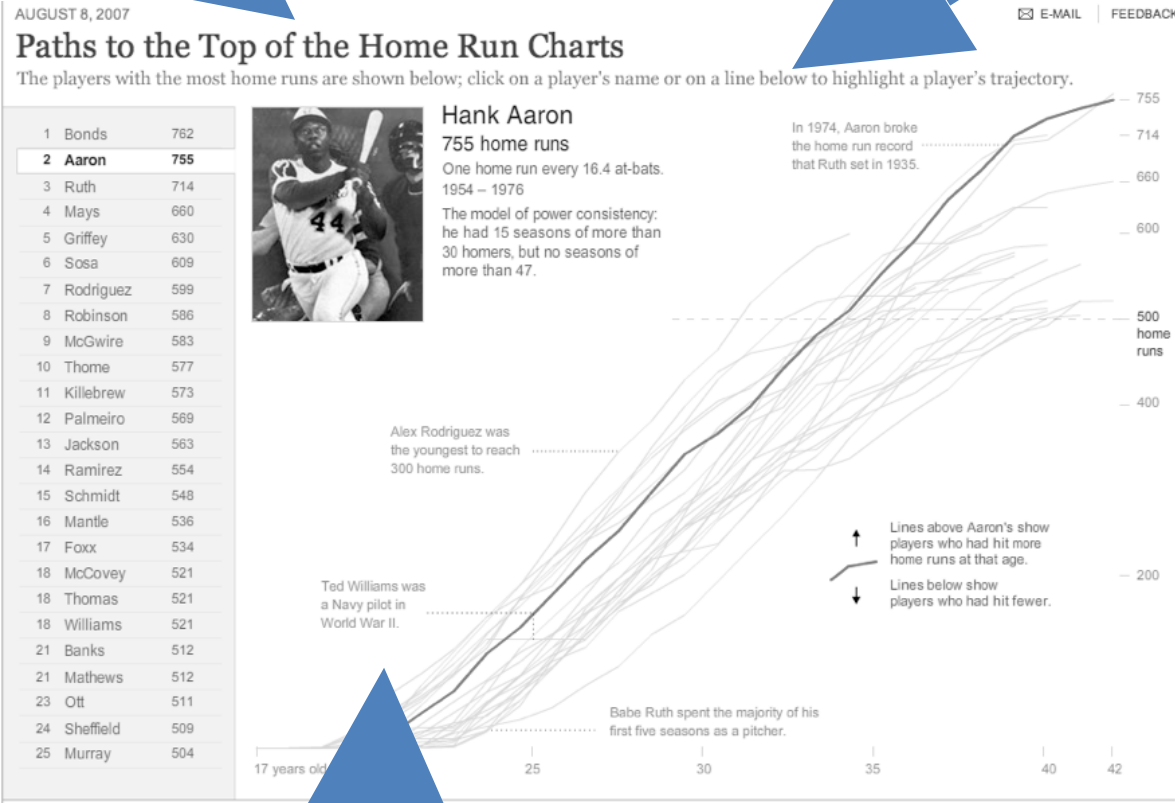
HEADLINE



CAPTION



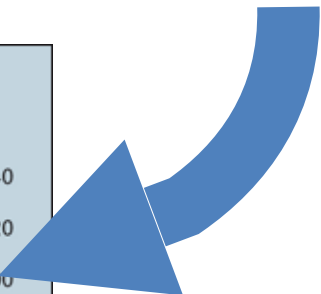
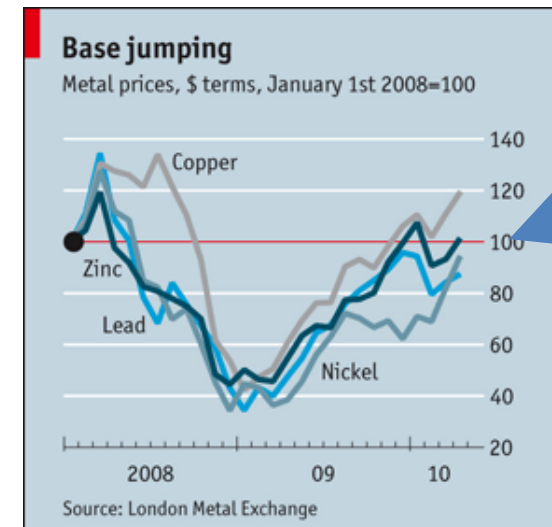
USE HEADLINES, CAPTIONS, & ANNOTATIONS QUICKLY DRAW ATTENTION TO WHAT'S IMPORTANT.



ANNOTATION

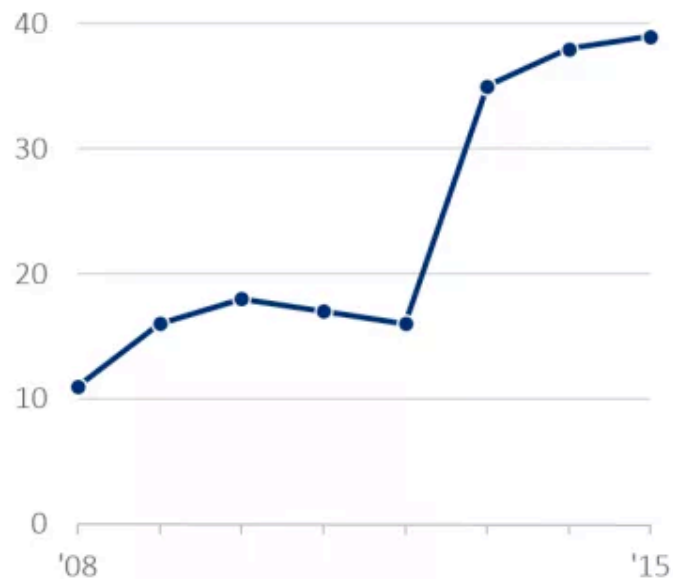


MARK FOR EMPHASIS



# DESCRIPTIVE TITLES AND ANNOTATIONS CAN BE THE DIFFERENCE BETWEEN A CHART AND A STORY

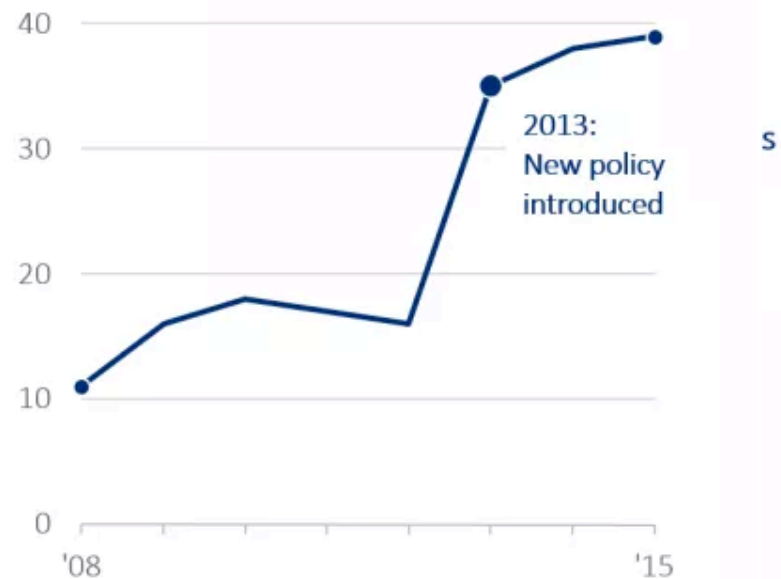
Number of studies funded each year



or

We're funding more studies each year

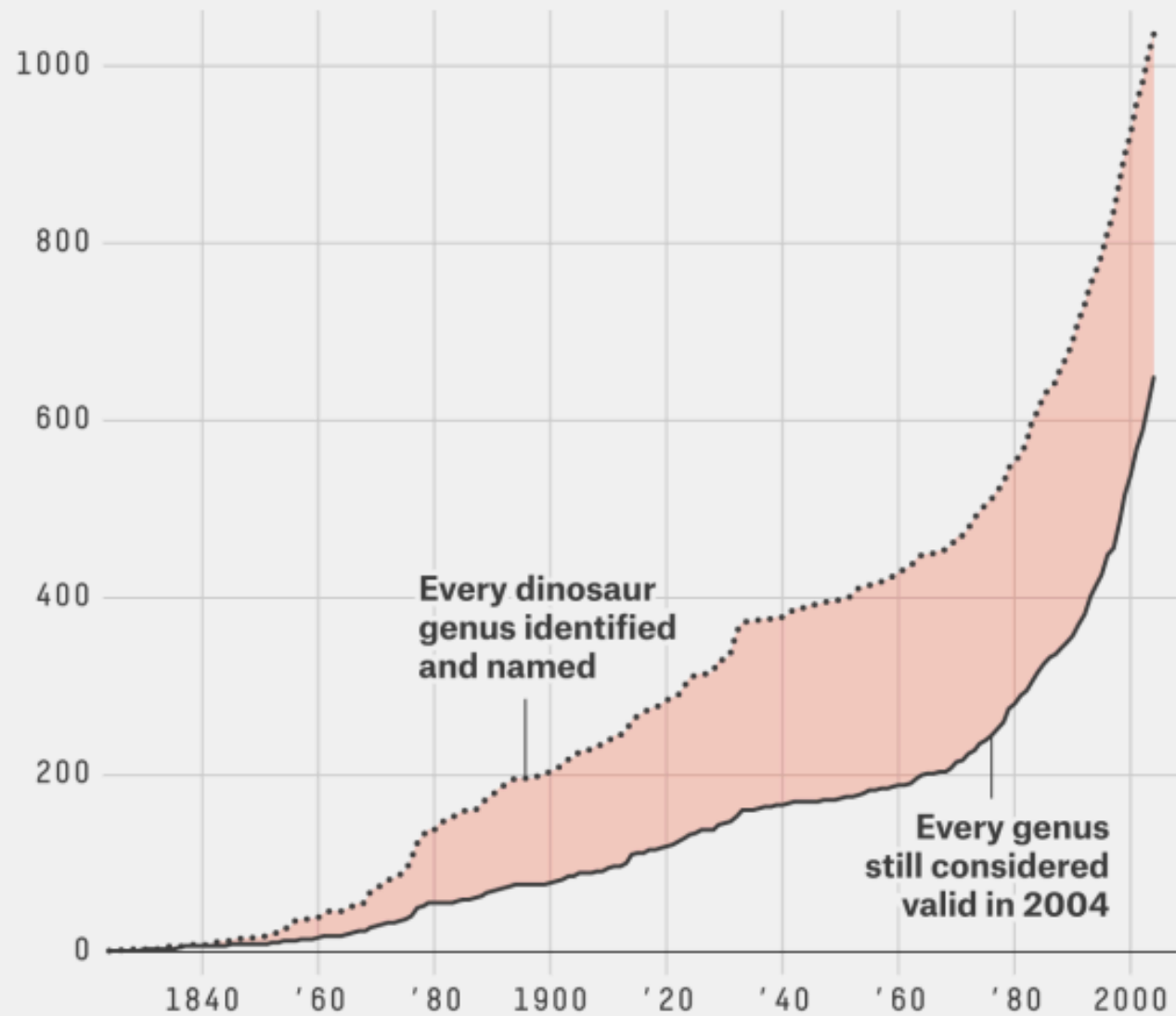
Beginning in 2013, we set aside new funding to measure the effectiveness of our initiatives – and we evaluated 39 of our programs in 2015 alone.

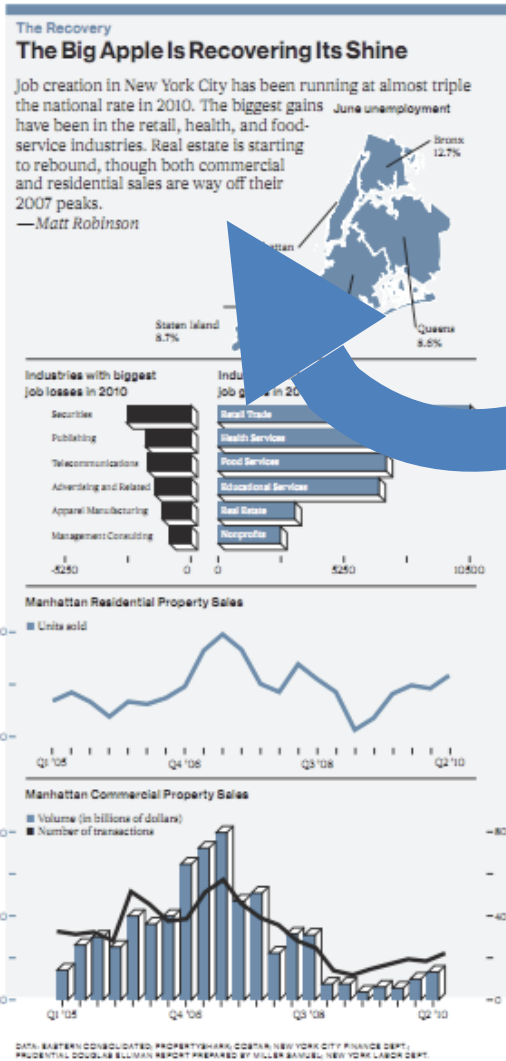


ANN K. EMERY 2016

## Dinosaurs named, then unnamed

By 2004, about 37 percent of every dinosaur genus ever identified and named had had its genus status revoked

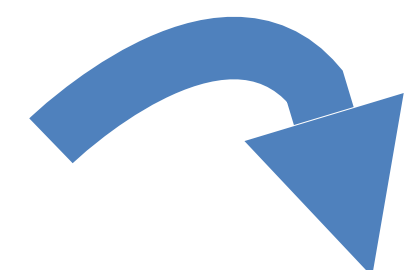




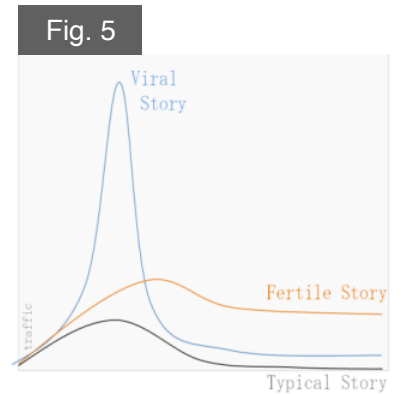
ISOLATED

WEAVE TEXT INTO THE GRAPHIC,  
 NOT JUST AT THE BEGINNING.  
 TEXT AND GRAPHICS WORK  
 BETTER TOGETHER THAN APART.

CONNECT THE  
 TEXT TO  
 RELEVANT  
 GRAPHICS  
 "SEE FIG. 5"



...ity more work than traditional  
 this work economical, visualizations  
 that are either *persistent* or *viral* in order  
 to get traffic. **Persistent stories** cover  
 issues that maintain relevance over time  
 (economics, the housing market).  
**Persistent themes** "fattens and elongates"  
 the traffic (which are already fatter and longer  
 lived). **Fertile stories** are slow-burn, these visualizations  
 of stories over several months and  
**Viral stories** achieve heavy traffic  
 spikes of popularity. These stories tend  
 to be about celebrities, or sensational news. To get the  
 best visualizations for editorial content





## The Endorsement Primary

In presidential primaries, endorsements have been among the best predictors of which candidates will succeed and which will fail. So we're keeping track.

By AARON BYCOFFE

UPDATED 11:27 A.M. EST | MAR 3



CANDIDATE	REPRESENTATIVES 1 POINT EACH	SENATORS 5 POINTS EACH	GOVERNORS 10 POINTS EACH	TOTAL POINTS
Marco Rubio				168
Ted Cruz				34
John Kasich				31
Donald Trump				29
CANDIDATE	REPRESENTATIVES 1 POINT EACH	SENATORS 5 POINTS EACH	GOVERNORS 10 POINTS EACH	TOTAL POINTS
Hillary Clinton				478
Bernie Sanders				5

Before any votes are cast, presidential candidates compete for the support of influential members of their party, especially elected officials like U.S. representatives, senators and governors. During the period

REMOVE  
DETAIL TO  
CREATE SPACE  
FOR THE  
STORY.

9. Beetroot soup and a chocolate milkshake at Pete's Eats in Llanberis. Hummers remarks that to have willingly chosen the beetroot must mean my body has developed an immunity to it. There is talk in the cafe from veterans of the Snowdon and Coasts of taking the long way round to avoid a gratuitous climb out of town. I decide to take the official route and am rewarded with stunning views of Snowdon and coasts.

**Llanberis**

8. Magnificent views of Snowdon as we begin the steady climb from Betws Y Coed to Pen-y-pass. Sun is out, little wind to bother us. The last part of the climb overlaps with the Brian Chapman route, but feels much easier today with fresher legs and benign weather.

7. Have run out of water and am feeling increasingly thirsty. Fill water bottles up in mountain stream. More eco-friendly than Evian.

6. The climb up above Ffestiniog starts to feel increasingly remote. In this weather it's beautiful, surrounded by the higher peaks of Snowdonia. In poor weather this could be a bit of a brute.

10. Interesting to ride a bit more of the Brian Chapman here, but earlier in the day with better weather and fresher legs. A novelty not to get minor hassle from drunken locals in Penrhyndeudraeth. A slight tail wind helps speed me on my way.

11. Get the beginnings of the bonk, so munch through two Snickers flatjacks (very good on the bike comfort eating) and a Magnum with views of holiday folk on the beach.

5. Climbing proper begins up to Bwlch y Groes. Highest point on the ride, but not the hardest climbing. We ascend the "easy" way. At the t-junction near the top, get precipitous views of the 25% climb to our left that thankfully we avoid.

2. Welsh place names seem to arrive remarkably quickly. The pace is quite fast, with a fairly organised peloton and turns at the front. This is a new part of the country for cycling for me. The good weather, clear, dry, little wind, brings out the best in the landscape.

4. Wonderful wooded road along the banks of Lake Vyrnwy. Not a car (or cyclist) in sight.

**Dolgellau**

12. Barmouth bridge as delightful as ever. Man at toll booth very careful to make sure I have my ticket. I wonder how much they've made in tolls from the various Brian Chapmans and other audaxes over the years.

13. Decide to take the road rather than NCN route to Dolgellau. Relief not to have to climb up to Kings YHA.

14. Civilised food stop and in Dolgellau. Apparently about 'half the field' have already controlled here.

15. Great to climb Cross Foxes and descend Dinas Maowddwy on gears for a change. Seems easier than at 5am on day two of the Brian Chapman. A novelty to experience overheating on this climb. Could do with less traffic though.

**Lake Vyrnwy**

16. MattH catches me on the descent. We end up riding the rest of the MC together. Your company is much appreciated.

3. Climbing begins in earnest through stunning landscape. Unexpected surprise to see the magnificent dam at Lake Vyrnwy - and then to cycle over it. The first control does generous beans on toast - the first of about ten. I'll get through on this long weekend.

**Upton Magna**

1. Arrived Thursday evening for a pre-ride meal. Fellow audaxers looking intimidatingly fit in their non-lycra civvies. A sense of foreboding and onion soup pervades the village hall.



JO WOOD 2016

## A Peek Into Netflix Queues

Examine Netflix rental patterns, neighborhood by neighborhood, in a dozen cities. Some titles with distinct patterns are *Mad Men*, *Obsessed* and *Last Chance Harvey*. [Comments \(135\)](#)

100 titles that were frequently rented from Netflix in 2009

Change how movies are sorted

[Previous](#)
[Next](#)
[Most rented](#)
[Least rented](#)
[Most rented](#)
[Alphabetical](#)
[By metascore](#)

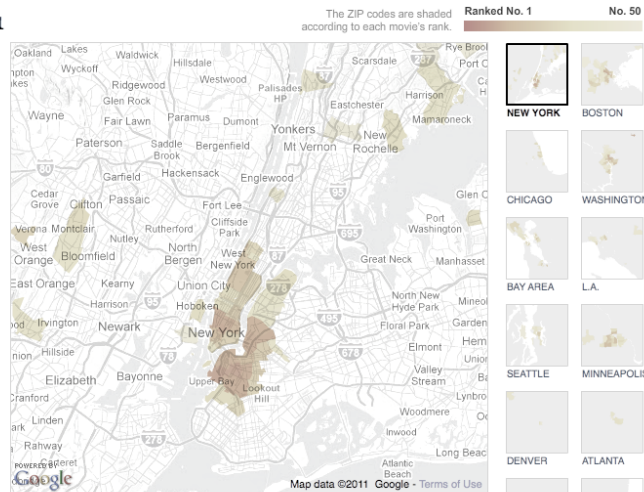
### Mad Men: Season 1: Disc 1



Metacritic score  
100-loved by critics, 0-hated

There were seven deadly sins practiced at the dawn of the 1960s: smoking, drinking, adultery, sexism, homophobia, anti-Semitism and racism. The magic of "Mad Men" is that it softly spoofs those cruel, antiquated mores without draining away the romance of that era: the amber-lit bars and indigo nightclubs, soaring skyscrapers, and the brash confidence that comes with winning a war and owning the world.

[Read Rest of NYT Review »](#)



Sources: Netflix provided data on the top 50 rentals in 2009 in each ZIP code. Titles are listed in the approximate order of popularity across selected metropolitan areas. Metascores are from metacritic.com.

START WITH AN INTERESTING VIEW.  
CURATE THE EXPERIENCE  
FROM THE BEGINNING.

## Wetlands Destruction



Coastal marshes absorb fertilizer runoff from farms and buffer civilization from Gulf storms.

Losses in coastal watersheds, 1998 to 2004

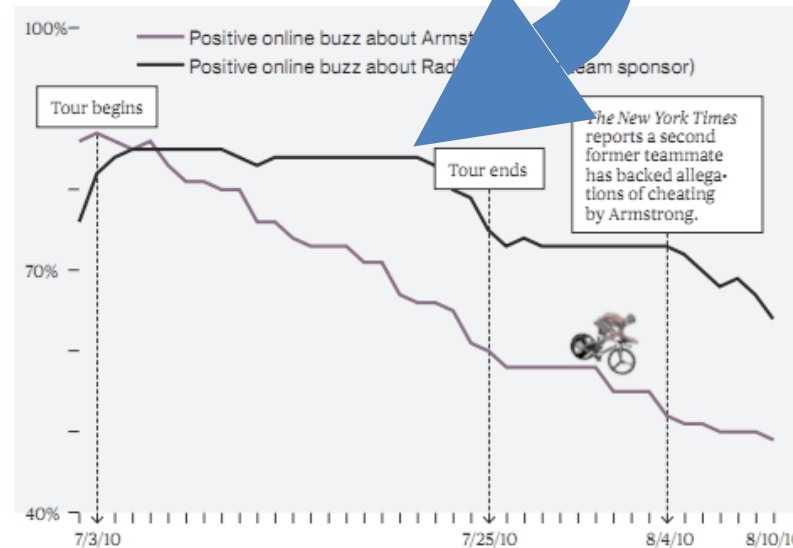
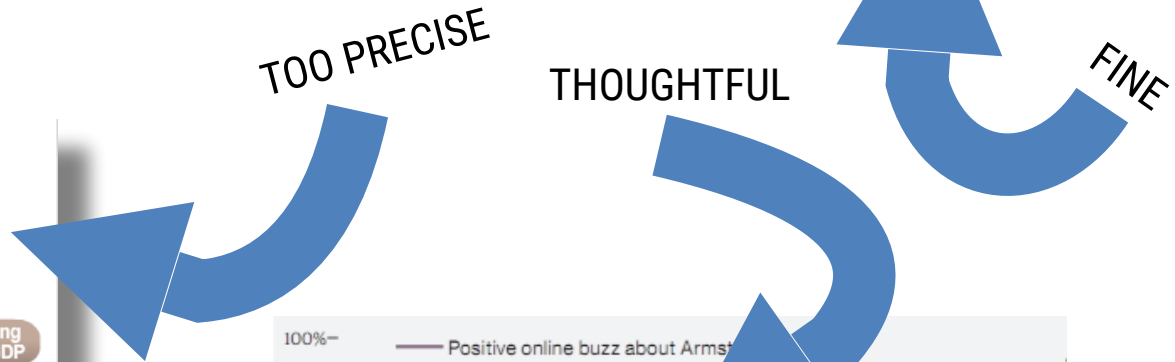
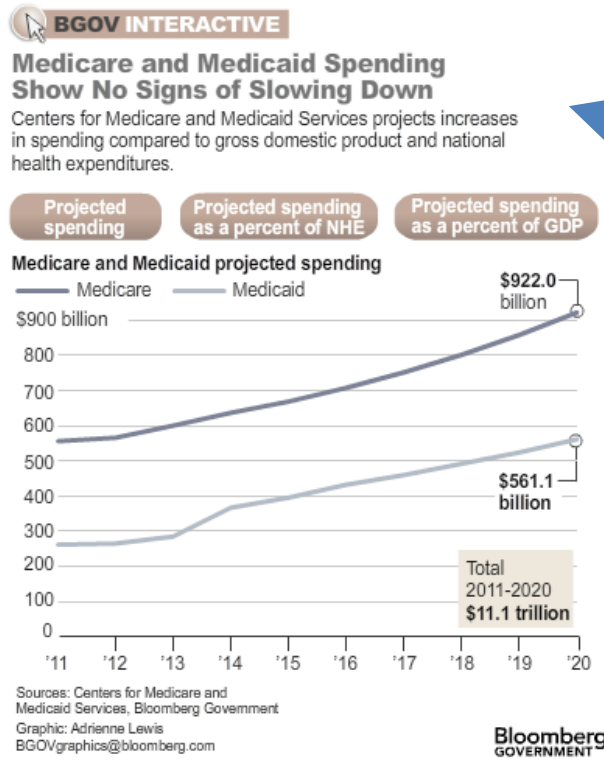
Great Lakes	20,000	acres
Atlantic	110,000	acres

Aug 16, 2010

MAKE DATA RELATABLE & PUT  
NUMBERS AND FACTS IN CONTEXT.  
260 THOUSAND SQUARE MILES?  
"IT'S THE SIZE OF FRANCE!"

MIND YOUR PRECISION.  
SIGNIFICANT DIGITS, TICK  
MARKS, AND LABELS  
SUGGEST WHAT DESERVES  
ATTENTION.

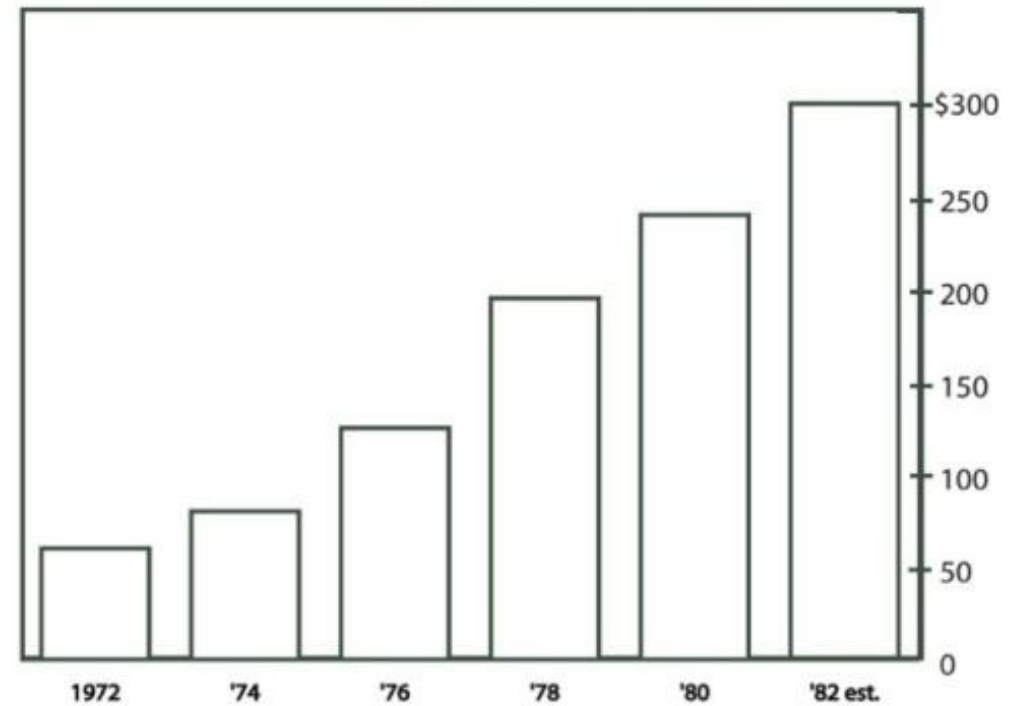
Representative	District	Fiscal 2010 contract spending
Mike Coffman	Colo. 6	\$3.26 billion
Doug Lamborn	Colo. 5	2.98 billion
Rob Bishop	Utah 1	2.76 billion
Kenny Marchant	Texas 24	2.58 billion
Jeff Duncan	S.C. 3	2.40 billion
Sandy Adams	Fla. 24	2.36 billion
Lamar Smith	Texas 21	1.65 billion
Steve Scalise	La. 1	1.49 billion
Jeff Landry	La. 3	1.47 billion
Roscoe Bartlett	Md. 6	1.47 billion
John Carter	Texas 31	1.47 billion



USE EMBELLISHMENTS  
SPARINGLY & CAREFULLY.  
STYLISED VISUALS CAN  
BE ENGAGING BUT ARE  
HARD  
TO GET RIGHT.



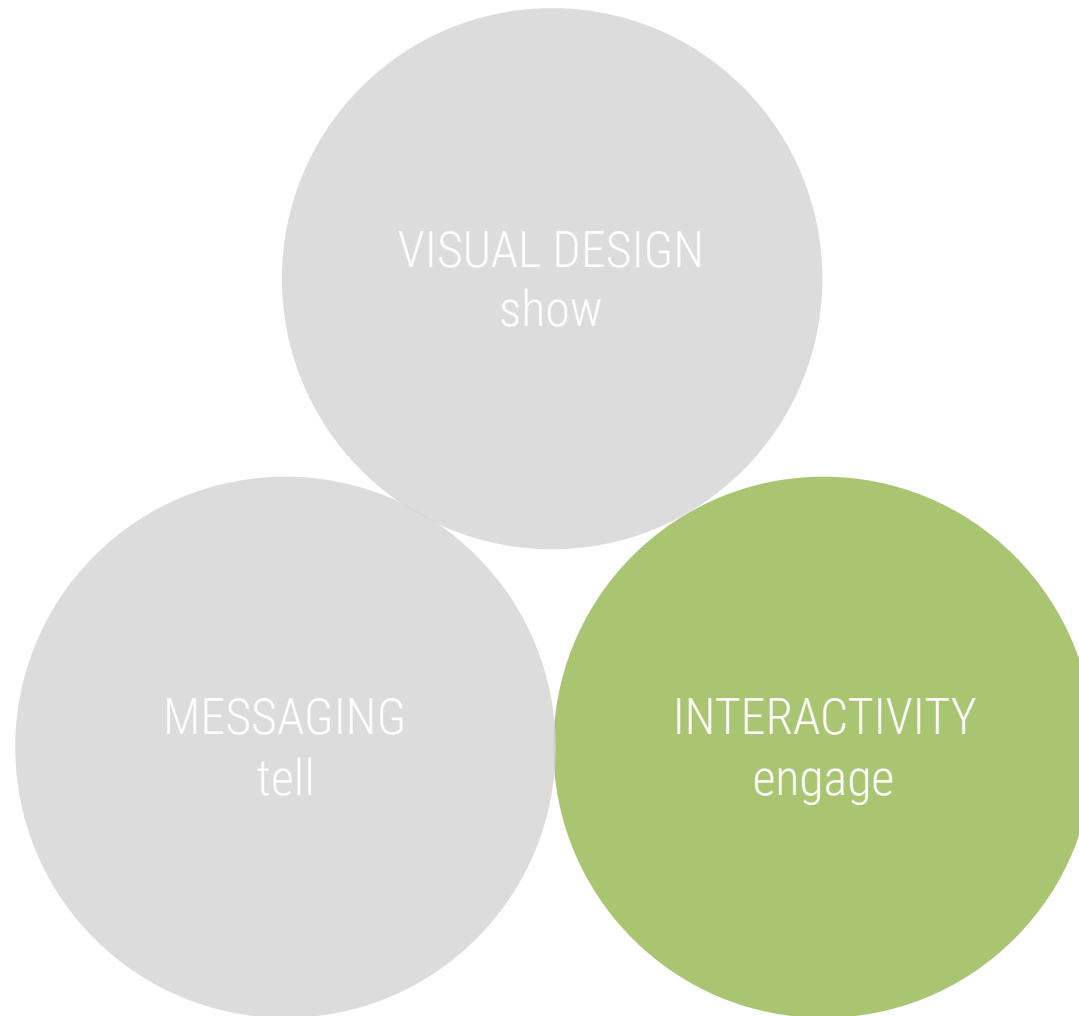
**MONSTROUS COSTS**  
Total House and Senate campaign expenditures, in millions



NIGEL HOLMES

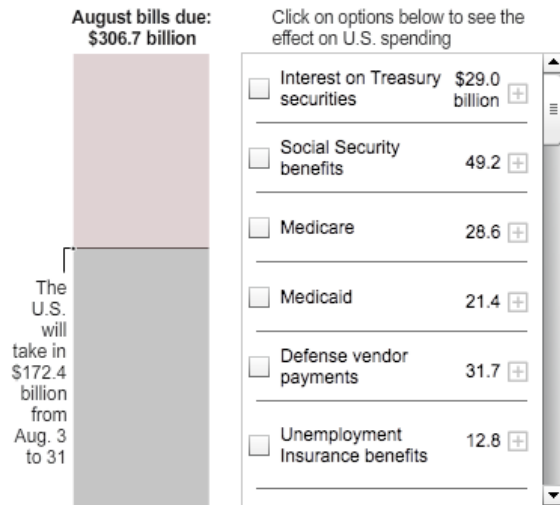


IT'S IMPORTANT TO REALLY  
UNDERSTAND THE RULES OF  
GOOD VISUAL COMMUNICATION  
BEFORE YOU TRY TO BREAK  
THEM.

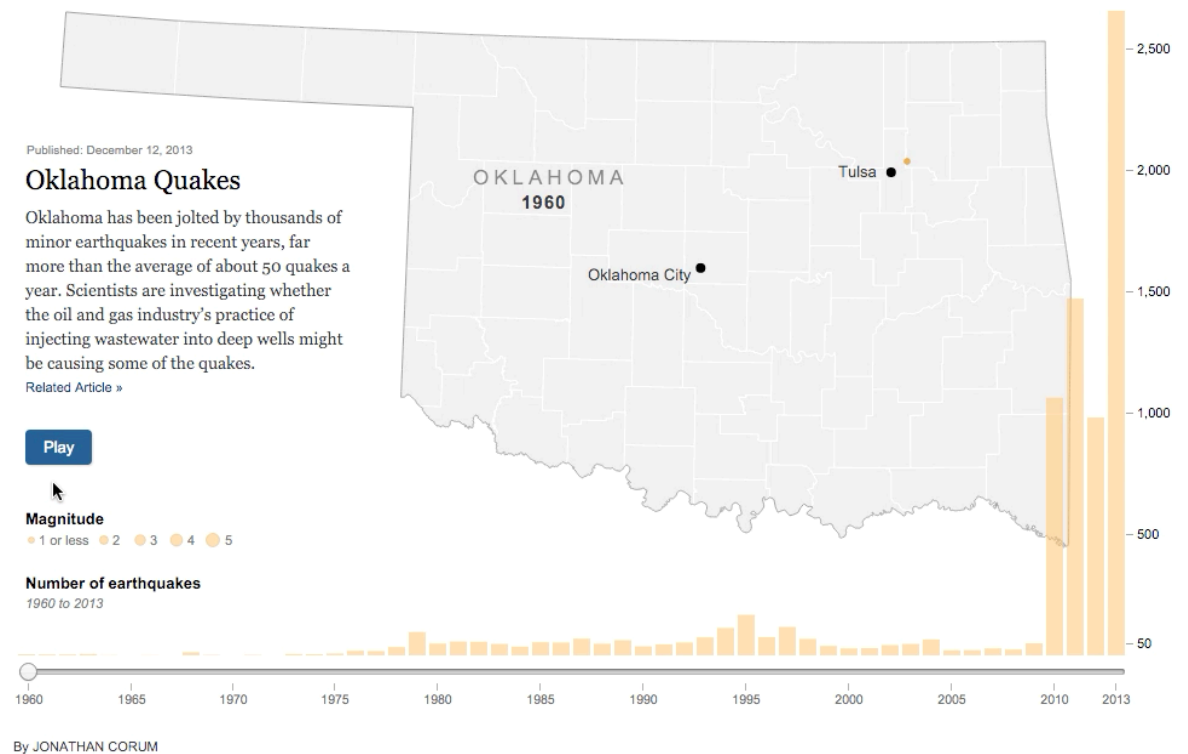


# INTERACTIVE FEATURES SHOULD SUGGEST INTERACTIVITY. AVOID A CLICK-AND-SEEK EXPERIENCE.

## FAMILIAR WIDGETS



## VISUAL FEEDBACK ON PAGE LOAD OR PLAY





INCLUDE EASY WAYS TO  
GO BACK / RESET  
LINEAR NAVIGATION  
CAN SIMPLIFY THIS.

RESTRICT INTERACTION  
TO KEY DIMENSIONS.  
THE MORE  
INTERACTIVITY, THE  
LESS STORY.

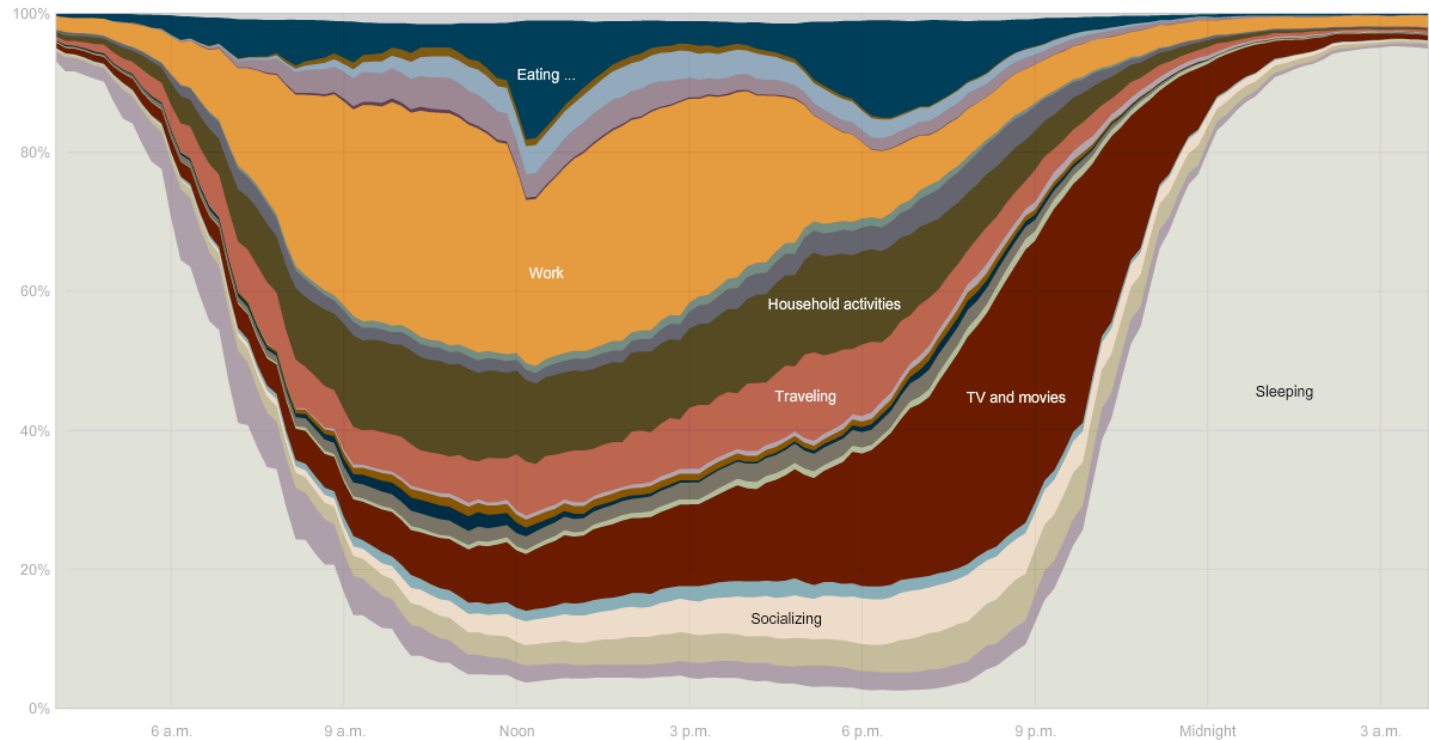
## How Different Groups Spend Their Day

The American Time Use Survey asks thousands of American residents to recall every minute of a day. Here is how people over age 15 spent their time in 2008. [Related article](#)

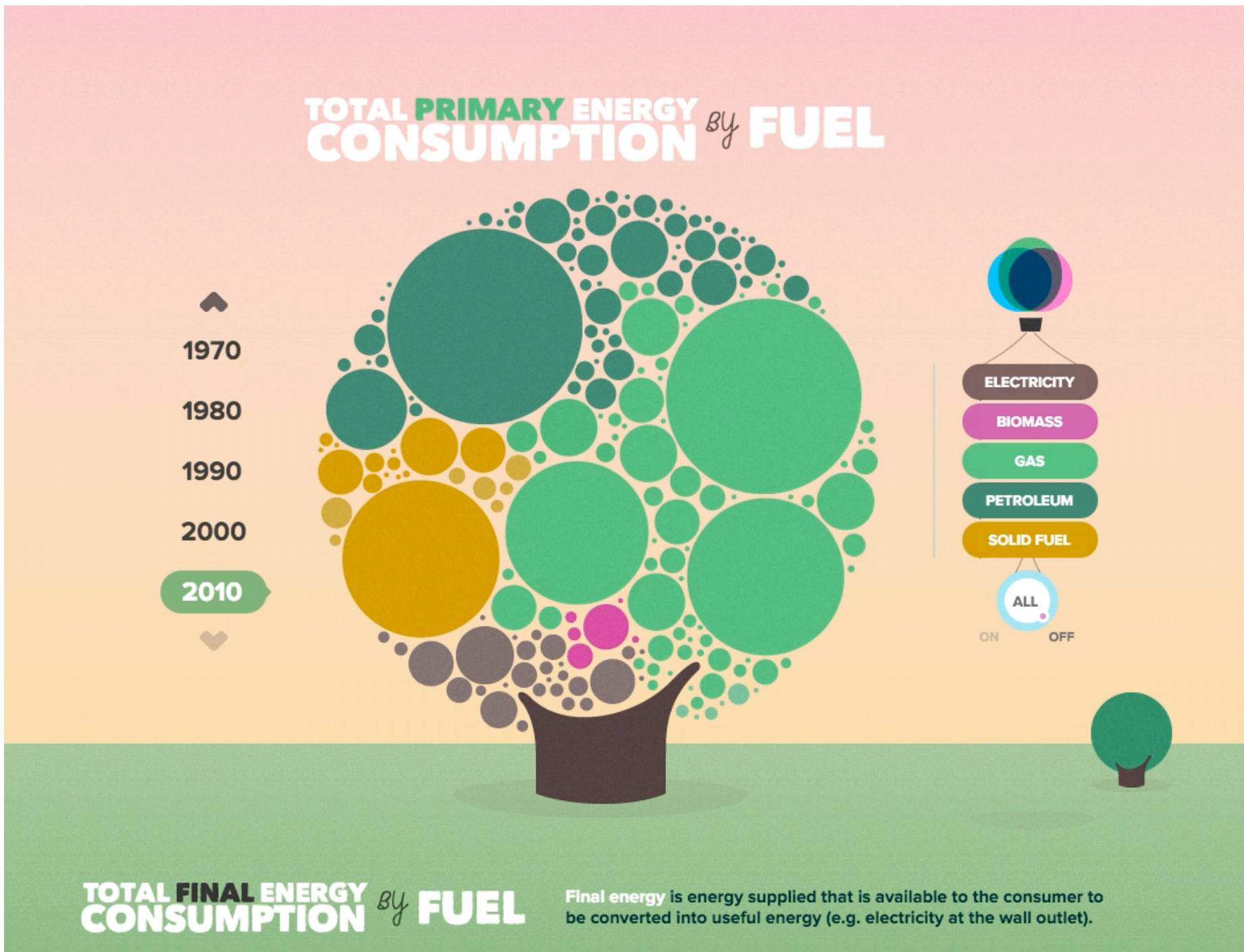
### Everyone

Sleeping, eating, working and watching television take up about two-thirds of the average day.

Everyone	Employed	White	Age 15-24	H.S. grads	No children
Men	Unemployed	Black	Age 25-64	Bachelor's	One child
Women	Not in lab...	Hispanic	Age 65+	Advanced	Two+ children



USE MOTION &  
OTHER CUES  
TO SUGGEST  
INTERACTION



# Suggested Interactivity

			Sicue1	Sicue2	Sicue3	Sicue4	Sicue5	Sicue6	Sicue7	Sicue8	Sicue9	Sicue10	Sicue11	Sicue12	Sicue13	Sicue14	Sicue15	Sicue16	Sicue17	Sicue18	Sicue19	Sicue20	Sicue21	Sicue22	Sicue23	Sicue24	Sicue25	Sicue26	Sicue27	Sicue28	Sicue29	Sicue30	Sicue31	Sicue32	Sicue33	Sicue34	Sicue35	Sicue36	Sicue37	Sicue38	Sicue39	Sicue40	Sicue41	Sicue42	Sicue43	Sicue44	Sicue45																											
Attractor	Object of interest		[Black]																																																																							
Animation	None																																																																									
	Staged	Blink	Unique	[Black]																																																																						
			Looped																																																																							
	Interpolated	Unique																																																																								
			Looped																																																																							
Dynamic																																																																										
Trigger (event)	System	Payload/update																																																																								
	User	Mousemove																																																																								
		Mouseover																																																																								
		Click																																																																								
		Drag																																																																								
Mousewheel																																																																										
Visual attribute	Variable																																																																									
	Extra mark	Non-textual																																																																								
	Textual																																																																									
Persistence																																																																										
Intended interaction	Mouseover																																																																									
	Click																																																																									
	Drag																																																																									
	Mousewheel																																																																									
Feedforward																																																																										

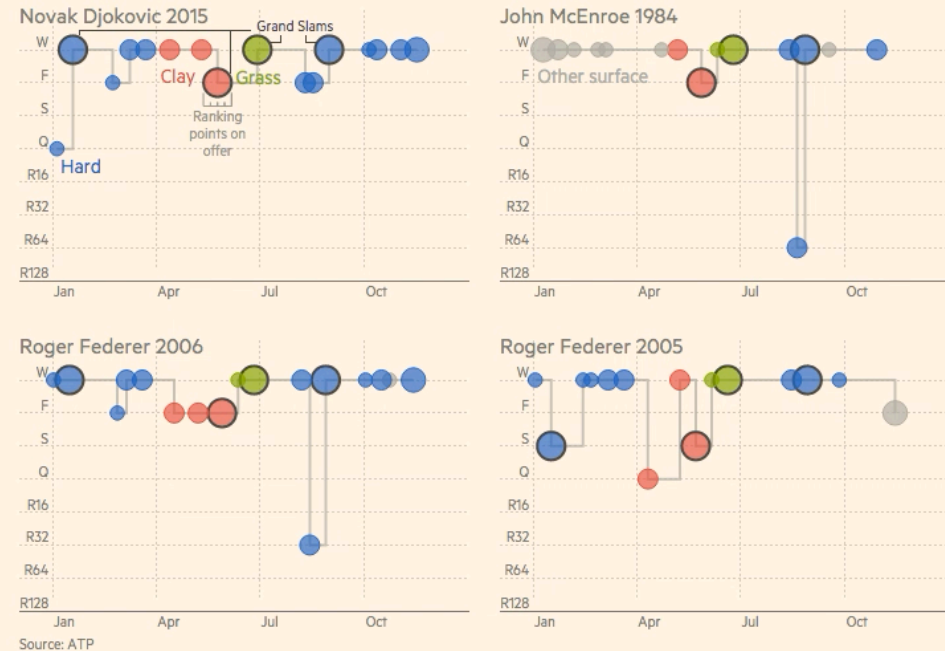
JEREMY BOY ET AL. 2015

LOTS OF INTERACTIVE EXAMPLES AT [http://peopleviz.gforge.inria.fr/trunk/Sl\\_cues/](http://peopleviz.gforge.inria.fr/trunk/Sl_cues/)

“SCROLLJACKING”  
HIJACKING IN-BROWSER  
SCROLLING TO ADVANCE A  
LINEAR NARRATIVE.

SMOOTH AND LINEAR  
EASY FORWARD/BACK  
MORE BROWSABLE THAN VIDEO  
CROSS-PLATFORM  
CAN BREAK THE SCROLLBAR

## Djokovic's 2015 was the greatest ever men's tennis season



John Burn-Murdoch • January 27, 2016



If Novak Djokovic wins the Australian Open title this weekend, he will in doing so extend the most impressive streak ever in men's tennis.

When the current world number one won the Qatar Open earlier this month, it marked the 16th consecutive tournament he had entered in which he reached the final -- a run stretching back exactly one year to a quarter-final defeat at the same event.

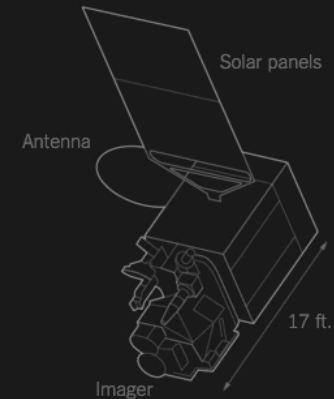
**CLICKING IS A DECISION**  
**SCROLLING IS A CONTINUATION**

JOSHUA PORTER

# Japan's New Satellite Captures an Image of Earth Every 10 Minutes

By DEREK WATKINS JULY 10, 2015

A sense of perspective is unavoidable from 22,000 miles out. Looking down at Earth from that distance — almost three times farther than the diameter of the planet itself — allows a view of the globe as a massive organic system, pulsing with continuous movement. Below, images from the Himawari-8 weather satellite's first official day paint a living portrait of the western Pacific, with Typhoons Chan-hom and Nangka spinning slowly westward.



# What's Really Warming the World?

By Eric Roston  and Blacki Migliozi  | June 24, 2015

Skeptics of manmade climate change offer various natural causes to explain why the Earth has warmed 1.4 degrees Fahrenheit since 1880. But can these account for the planet's rising temperature? Scroll down to see how much different factors, both natural and industrial, contribute to global warming, based on findings from NASA's Goddard Institute for Space Studies.



# Scroll Events

## Detecting The Scroll

**JIM VALLANDINGHAM** [http://vallandingham.me/scroll\\_talk/](http://vallandingham.me/scroll_talk/)



*“Data journalism is not graphics and visualizations. It's about telling the story in the best way possible. Sometimes that will be a visualization ...But sometimes it's a news story. Sometimes, just publishing the number is enough.”*

SIMON ROGERS, THE GUARDIAN // 2011

*“I think people have begun to forget how powerful human stories are, exchanging their sense of empathy for a fetishistic fascination with data... The human stuff is the main stuff, and the data should enrich it.”*

JONATHAN HARRIS // 2008



The Fallen of World War II  
from Neil Halloran

<http://www.fallen.io/ww2/>

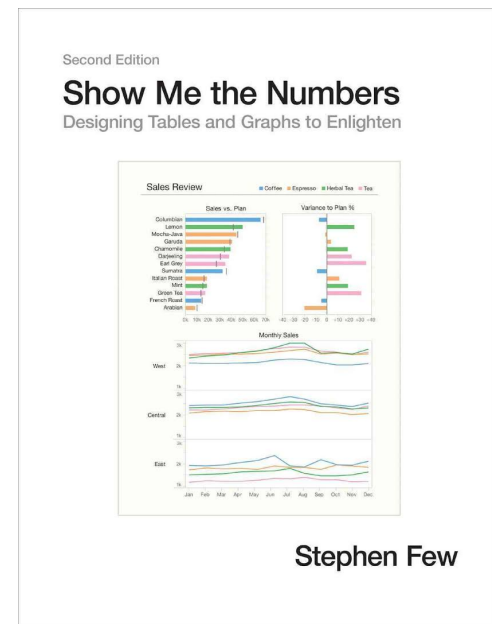
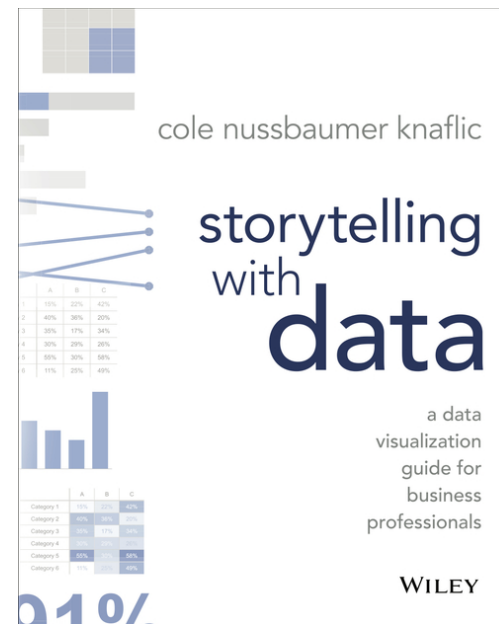


**QUESTIONS?**

# ACKNOWLEDGEMENTS

Slides in were inspired and adapted from

- slides by Wesley Willett (University of Calgary)
- content of the books on the right



# RECAP

- MAXIMIZE THE DATA-INK RATIO
- AVOID CHART JUNK (*SOMETIMES*)
- LAYER INFORMATION
- MAXIMIZE THE DATA DENSITY
  - *SHRINK THE GRAPHICS*
  - *MAXIMIZE THE AMOUNT OF DATA SHOWN (SOMETIMES)*



**EDWARD TUFTE**

# DESIGN PRINCIPLES

MANY MORE EXIST...

