Visualizing Data
Pictures from The Functional Art, pages 120 and 138
LINES

Classic form
Show trends
Good for comparing over time
Continuous data

Common mistakes: Unnecessary legends, 3D, correlations not causation
Exports and Imports to and from Denmark & Norway from 1700 to 1780.

The bottom line is divided into years, the right-hand line into £10,000 each.
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| Euro foreign exchange $ | 121.32 | 130.17 | .8930  | 140.31 | Y 132.54 | 130.17 | 124.80 | 140.31 |
| Euro foreign exchange ¥ | 121.32 | 130.17 | .8930  | 140.31 | Y 132.54 | 130.17 | 124.80 | 140.31 |

| Euro foreign exchange £ | 0.7111 | 0.6665 | .5711  | 0.7235 | £ 0.6914 | 0.6665 | 0.6556 | 0.7235 |
| Euro foreign exchange   |        |        |        |        |          |        |        |        |

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Lunge Feeding

Scientists tracking fin whales have created the first detailed model of how they feed. After gliding to depths of more than 600 feet in search of krill, a fin whale will repeatedly accelerate and open its mouth wide, engulfing about 20 pounds of krill and more than its own weight in water as it grinds to a halt.

10 FEET

START OF LUNGE

After accelerating into a school of krill, the whale opens its mouth.

2 SECONDS

Grooves in the blubber between the lower jaws begin to expand.

3 SECONDS

Now fully open, the mouth causes massive drag and deceleration.

4 SECONDS

The closing mouth continues to drag as the whale pushes forward.

6 SECONDS

The whale starts to filter out the krill and prepare for another lunge.

AN ENERGETIC DIVE FOR FOOD

A fin whale with a tracking device on its back made five or six lungen during this seven-minute foraging dive. Fin whales are capable of longer dives, but the energy required when lunge feeding quickly exhausts their stores of oxygen.

The whale's lungs collapse at depth, allowing it to sink quickly without exertion.

GLIDING DESCENT

LUNGE FEEDING

ACTIVE ASCENT

Fluking pattern
Tail upstrokes and downstrokes

Possible lunge

Five lungen

Speed
Miles per hour

Sources: Jeremy A. Goldbogen; Nicholas D. Pyenson;
Journal of Experimental Biology; Marine Ecology Progress Series
The Jobless Rate for People Like You

Not all groups have felt the recession equally.

For white men age 45 and older with a college degree

UNEMPLOYMENT RATE
12 MONTH AVG. ENDING SEPT. '09

4.1%

BARS

Classic form
Precise comparisons
Distinct data

Common mistakes: Non zero baselines, random ordering of items
Example of bad system: signs of different sizes

Number of men getting married in Germany out of every 10,000 persons

Men Getting Married in Germany in a Year

- 1911-14
- 1915-18
- 1919-22
- 1923-26

1 sign for 100,000 a year
In the mid-2000s, ESPN’s appetite for programming was so voracious that the Justice Department looked into complaints that the network was engaging in anticompetitive practices — an inquiry that ESPN executives first acknowledged in recent interviews. The complaint centered on ESPN’s practice of buying rights to more college games than it had the capacity to televise, leading to accusations that by “warehousing” games, it was depriving colleges of exposure and other networks of potentially valuable programming.

Although no action was taken against ESPN, it began to share programming with the competitor that brought the complaint, and it went on to create ESPNU, a channel dedicated to college sports.

During the same period, Washington was leveling one of its periodic attacks on what Mr. Skipper calls ESPN’s “beautiful business model” — the rising monthly fee that now stands at $5.54, according to the media research firm SNL Kagan, and is paid by homes with expanded basic cable packages, almost all of which include ESPN.

**An Expensive Outlier**

ESPN’s average monthly price is more than four times the monthly fee for the next most expensive national network.

Source: SNL Kagan
The Rise of Men Who Don’t Work, and What They Do Instead

Dec. 11, 2014

Men in 2000 | 2014

- Working
- Retired
- Something else
- Disabled
- Prime-age men without jobs
- Taking care of family or home
- In school, no job
- Officially unemployed
There’s a strand of the data viz world that argues that everything could be a bar chart. That’s possibly true but also possibly a world without joy.

Amanda Cox
Data Types

Categorical/Discrete
- Countries (USA, Canada)
- Dog breeds (Terrier, Dalmation)
- Colors (Red, Blue)

Continuous
- Temperature (50° → 80°F)
- Stock market prices ($4 → $10)
- Weight (100 → 200 lbs)
“The more male a person is, the taller he/she is.”

Bubbles & Pies

Parts of a Whole
Use sparingly

Common mistakes: Too many pieces in a pie chart, Complex legends, Not adding to 100%
2012 PRESIDENTIAL RUN

GOP CANDIDATES

BACK PALIN 70%
BACK HUCKABEE 63%
BACK ROMNEY 60%

SOURCE: OPINIONS DYNAMIC
Note explicative.

La superficie d'un cercle dans un département représente la part de viande de cette espèce qui se trouve dans le département, indiquant l'importance de la consommation de viande dans chaque département. Les cercles de différentes tailles indiquent la quantité de viande consommée dans chaque département. Chaque cercle est divisé en différentes parties qui représentent les différentes espèces de viande. La carte montre que la consommation de viande est plus importante dans certaines régions que dans d'autres. Les zones en gris clair indiquent les départements où la consommation de viande est plus faible. La carte est une représentation visuelle de la distribution de la viande consommée dans les différents départements de la France.
https://www.youtube.com/watch?v=jbkSRLYSojo
Chart FORMS II (the fancier ones)
Scatterplot

Showing relationships
Individual data points

Common mistakes: Drawing dubious conclusions, Not adding a trend line
Why Is Her Paycheck Smaller?

Nearly every occupation has the gap — the seemingly unbridgeable chasm between the size of the paycheck brought home by a woman and the larger one earned by a man doing the same job. Economists cite a few reasons: discrimination as well as personal choices within occupations are two major factors, and part of the gap can be attributed to men having more years of experience and logging more hours.

Sources: Bureau of Labor Statistics; Census Bureau

Hannah Fairfield and Graham Roberts/The New York Times
Long-Lived Greatness

By LARRY BUCHANAN, TIM WALLACE and DEREK WATKINS  FEB. 13, 2014

Among the 185 players who spent more than three-quarters of their career as a shortstop and played at least 500 games in the majors, Derek Jeter not only has one of the highest batting averages, but also has shown extraordinary longevity, logging more than 2,600 games over 19 seasons.
Treemaps

Parts of a whole
Complex divisions
Food and beverages 15%
The high price of oil is a factor that has made food prices rise quickly.

Miscellaneous 3%

Recreation 8%

Education/Communication 6%
Cellphones were added to the index in 1997. Because the Consumer Price Index can be slow to add new goods, which are often cheaper, it may overstate parts of inflation.

Housing 42%
In the C.P.I., home ownership costs track rent prices more closely than housing prices. This means inflation may have been understated when home prices were rising faster than rents.

Transportation 18%
Gas is 5.2 percent of spending nationwide, but only 3.8 percent in the New York area.

Health care 6%
As a group, the elderly spend about twice as much of their budget on medical care.

Apparel 4%
The ratio of spending on women's clothes to that on men's clothes is about 2 to 1.

Sources: Bureau of Labor Statistics; Michael Balzer, University of Konstanz (Germany)  Matthew Bloch, Shan Carter and Amanda Cox/The New York Times
Waffle

Parts of a whole
Showing composition
On the Couch

In one survey conducted in 2001 by the American Psychoanalytic Association, 950 psychoanalysts from 36 states answered general questions about 2,791 of their patients.

**Gender**
- 56% Female
- 44% Male

**Age**
- 15% 29 and younger
- 24% 30 to 39
- 31% 40 to 49
- 22% 50 to 59
- 8% 60 and older

**Annual Income**
- 10% Under $40,000
- 30% $40,000 to $100,000
- 60% Over $100,000

**Reasons for Referral to Therapist**
- 50% Relationship problems
- 18% Work/school
- 26% Other
- 6% Grief

The New York Times

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<th>Year</th>
<th>Military Spending</th>
<th>Veterans Funding</th>
<th>Troops</th>
<th>Special Operations Forces</th>
<th>US Military Fatalities</th>
<th>Drone Flight Hours</th>
<th>MRAPs</th>
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Small Multiples

Repetition

Compare small changes
Mental Health Providers Score Highest in Intensity of Office Visits

Office visits are reimbursed on a scale of 1-5, with 5 being the most intensive and costly. Mental health professionals bill Medicare for level 5 visits most frequently compared to other specialties, with cancer doctors following close behind. Here's the breakdown of office visits by specialty (for patients seen at least once before):

The bigger the slice, the higher percentage of office visits at that level. Hover over each slice to see more detail. Arranged by specialties with highest % of level 5 visits.
Maps & Cartograms

Geographic information
Place & Location is important
Compare countries/states/cities
2000

LOSER: Al Gore (Democrat)
WINNER: George W. Bush (Republican)

2012

LOSER: Mitt Romney (Republican)
WINNER: Barack Obama (Democrat)
What Would It Take To Turn Red States Blue?

Change the settings below to see how shifts in party preference and turnout by different demographic groups would affect the 2016 presidential election.

By Aaron Bycoffe and David Wasserman

**CLINTON**

ELECTORAL VOTES: 332  
POPULAR VOTE: 51.6%

**TRUMP**

ELECTORAL VOTES: 206  
POPULAR VOTE: 46.6%
A TAXONOMY OF TRANSITIONS

racial / ethnic self-identification in Chicago in the year 2010

white    black
asian    hispanic    other

The black lines show Chicago's official community areas.
Each dot represents twenty-five people. Here, Hispanic is exclusive of other categories.
Block-level data from the U.S. Census.
Scale 1:200,000

The same data, aggregated by community area and shown with solid colors.

- >80% white
- majority white
- >80% Hispanic
- majority Hispanic
- >80% Black
- majority Black
- >80% Asian
- majority Asian
- no majority

The same data, aggregated by community area and shown with solid colors.
Name That Chart Form
Proportion of furniture from IKEA:

- A lot: Age 20: X, Age 30: Y
- A little: Age 20: Z, Age 30: W

How much of a fuck I give:

- A lot: Age 20: X, Age 30: Y
- A little: Age 20: Z, Age 30: W

How comfortable my shoes are:

- A lot: Age 20: X, Age 30: Y
- A little: Age 20: Z, Age 30: W

How much of my parents' advice I take:

- A lot: Age 20: X, Age 30: Y
- A little: Age 20: Z, Age 30: W
Driving Safety, in Fits and Starts

Americans drive a staggering number of miles — close to three trillion every year, according to the government. (That is half a light-year, or 120 million trips around the world.) And although traffic accidents remain a major public safety problem, the biggest killer of people ages 5 to 34, vehicle travel is far safer than it was a few decades ago.

Several factors appear to account for the sharp decline in fatalities. Technology (like anti-lock brakes and air bags) and road behavior (like wearing seat belts and driving sober) have both improved greatly since 1960.

Americans almost always drive more each year than the previous one — at least until recently, when the recession curtailed road habits. And the auto fatality rate has been decreasing since the 1960s, when cars with massive engines carried their unseated passengers on primarily two-lane roads.

The safety data is usually charted as deaths per miles traveled. But what happens when the metrics are teased apart, and familiar data is charted in an unfamiliar way? Plotting the two most important variables against each other — miles traveled versus deaths per 100,000 population — yields a pattern that looks like a plateau followed by a steep drop. It evokes the theory of punctuated equilibrium, proposed by the paleontologists Stephen Jay Gould and Niles Eldredge, which suggests that instead of continuous gradual evolution, change occurs abruptly after periods of virtual stasis.

“Yet see fatalities drop after a breakthrough in new technologies or behaviors, and then plateau until the next one,” said David L. Strickland, administrator of the National Highway Traffic Safety Administration. “It takes time for new safety technologies to work their way into the whole fleet of cars on the road.”

Sources: National Highway Traffic Safety Administration; Federal Highway Administration

The New York Times
Barring immigrants from countries where more than 50 percent of the population is Muslim would keep out about 1 million people each year.

Most Middle Eastern countries would be excluded, as well as Afghanistan.

Squares sized by the average number of immigrants and visitors who entered the United States from that country in the last 10 years.
There are large gaps between white children and their black and Hispanic classmates. The gaps are largest in places with large economic disparities.
Mapping 50 Years of Melting Ice in Glacier National Park

By NADJA POPOVICH  MAY 24, 2017

Ice extent for every glacier in Glacier National Park in 1966 and 2015

Lost 50 percent or more coverage area

- **Agassiz**
  - Lost 213 acres (54%)

- **Sperry**
  - Lost 133 acres (40%)

- **Jackson**
  - Lost 129 acres (41%)

- **Grinnell**
  - Lost 113 acres (45%)

- **Kintla**
  - Lost 107 acres (33%)

- **Harrison**
  - Lost 96 acres (19%)

- **Rainbow**
  - Lost 93 acres (25%)

- **Two Ocean**
  - Lost 97 acres (82%)

- **Blackfoot**
  - Lost 63 acres (18%)

- **Logan**
  - Lost 70 acres (56%)

- **Stanton**
  - Lost 65 acres (49%)

- **Chaney**
  - Lost 57 acres (41%)

- **Boulder**
  - Lost 48 acres (85%)

- **Shepard**
  - Lost 44 acres (72%)

- **Dixon**
  - Lost 41 acres (57%)

- **Whitecrow**
  - Lost 34 acres (57%)

- **Herbst**
  - Lost 34 acres (81%)

- **Ipasha**
  - Lost 33 acres (41%)

- **Carter**
  - Lost 32 acres (37%)

- **Harris**
  - Lost 29 acres (77%)
Drug Deaths in America Are Rising Faster Than Ever

By JOSH KATZ  JUNE 5, 2017

New data compiled from hundreds of health agencies reveals the extent of the drug overdose epidemic last year.

AKRON, Ohio — Drug overdose deaths in 2016 most likely exceeded 59,000, the largest annual jump ever recorded in the United States, according to preliminary data compiled by The New York Times.

The death count is the latest consequence of an escalating public health crisis: opioid addiction, now made more deadly by an influx of illicitly manufactured fentanyl and similar drugs. Drug overdoses are now the leading cause of death among Americans under 50.

Although the data is preliminary, the Times’s best estimate is that deaths rose 19 percent over the 52,404 recorded in 2015. And all evidence suggests the problem has continued to worsen in 2017.

Drug overdose deaths, 1980 to 2016
Percentages of Violence

The higher the risk score (the farthest left column) the more likely a person was “Party to Violence” (PTV) in Chicago, meaning they were involved in a shooting or murder. The top 1,400 people have scores of 429 and up, and they were involved in less than 20 percent of the city’s total gun violence in 2016.

<table>
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<th>Score Range</th>
<th>Percent of People on Strategic Subject List</th>
<th>Percent on List Who Were PTV in 2016</th>
<th>% Total Gun Violence</th>
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<td>500</td>
<td>0.04%</td>
<td>35%</td>
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<td>480 to 499</td>
<td>0.03%</td>
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<td>460 to 479</td>
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<td>0 to 239</td>
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