



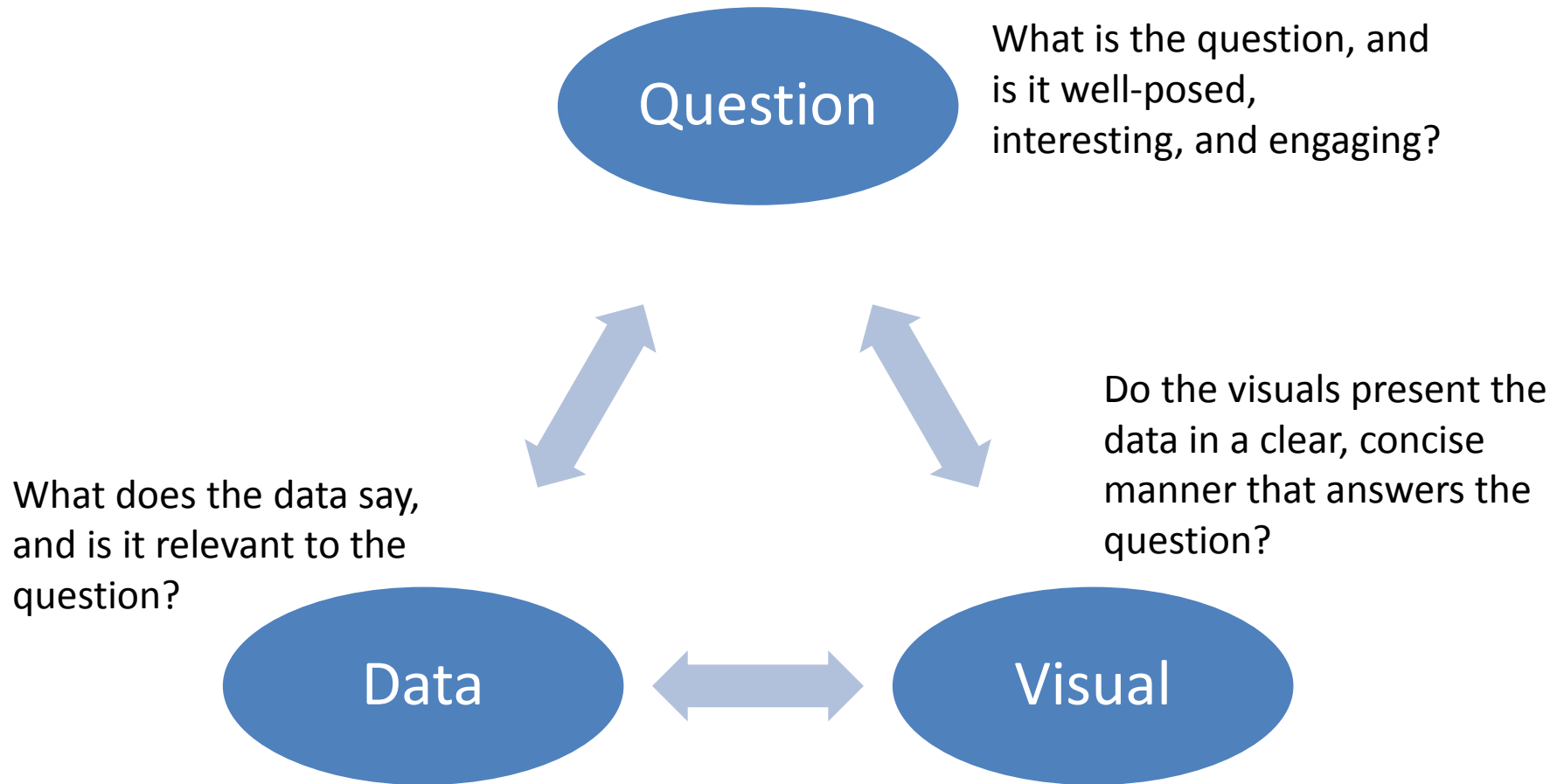
National Institutes of Health  
*Office of Management*

# Creating Infographics with Inkscape

Chris Belter and Lisa Federer  
NIH Library

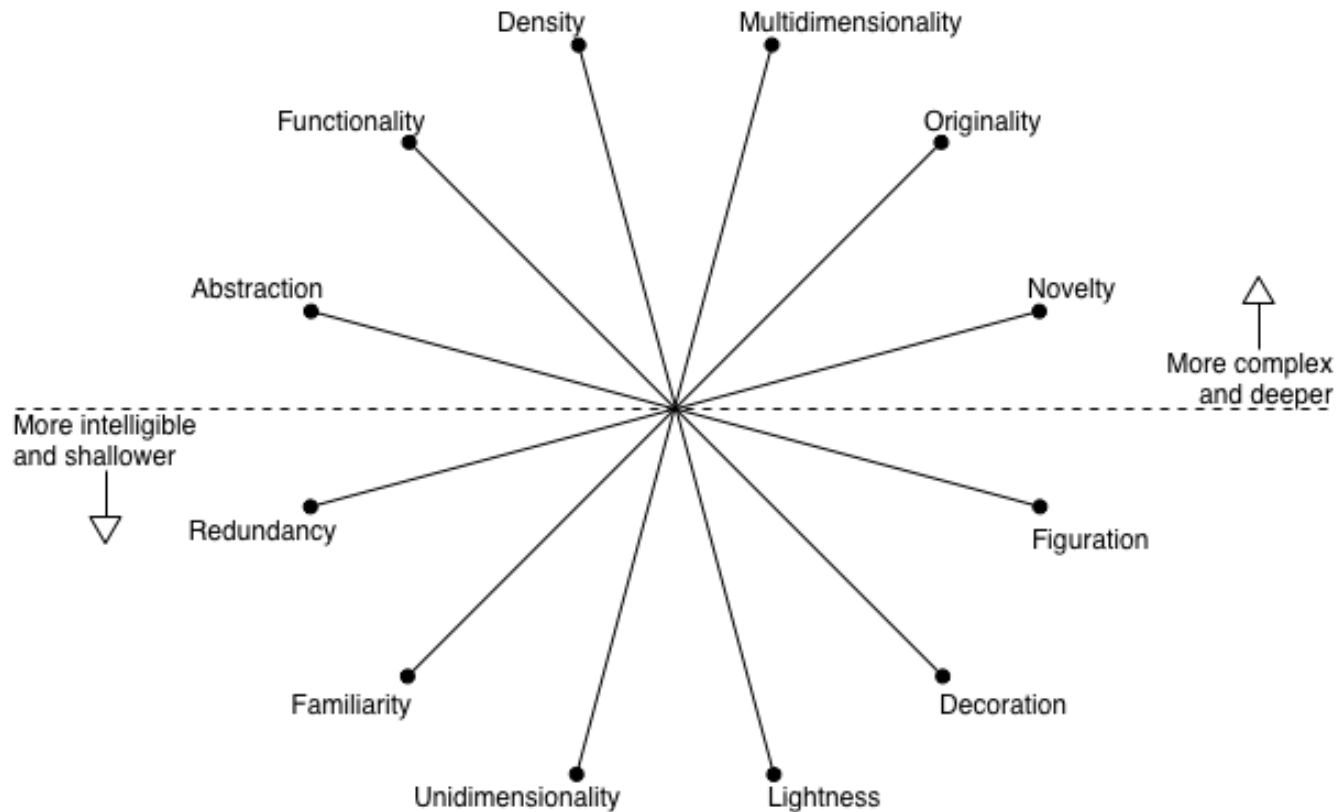
- Visual perception and design
- Elements of design
- Principles of design
- Hands-on practice with Inkscape

# Infographic trifecta



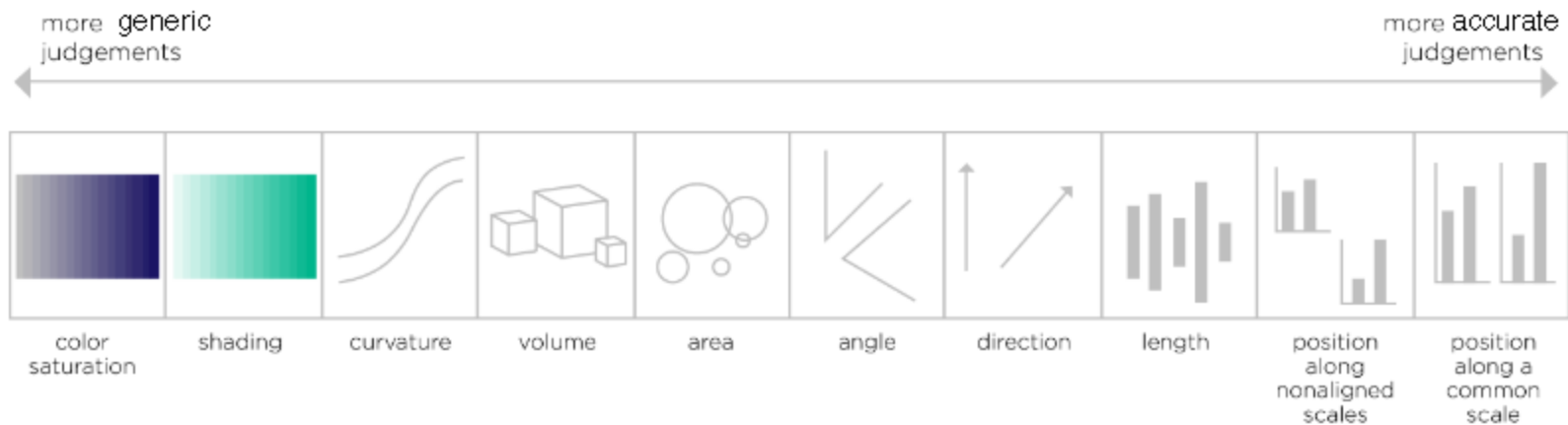
Adapted from Kaiser Fung,  
[http://junkcharts.typepad.com/junk\\_charts/junk-charts-trifecta-checkup-the-definitive-guide.html](http://junkcharts.typepad.com/junk_charts/junk-charts-trifecta-checkup-the-definitive-guide.html)

# The visualization wheel



From Alberto Cairo, *The Functional Art*

# Perceptual tasks



From Alberto Cairo, *The Functional Art*  
Adaptation of Cleveland and McGill's scale from  
"Graphical Perception: Theory, Experimentation and  
Application to the Development of Graphical  
Methods," available at  
[https://web.cs.dal.ca/~sbrooks/csci4166-6406/seminars/readings/Cleveland\\_GraphicalPerception\\_Science85.pdf](https://web.cs.dal.ca/~sbrooks/csci4166-6406/seminars/readings/Cleveland_GraphicalPerception_Science85.pdf)

# Elements of design

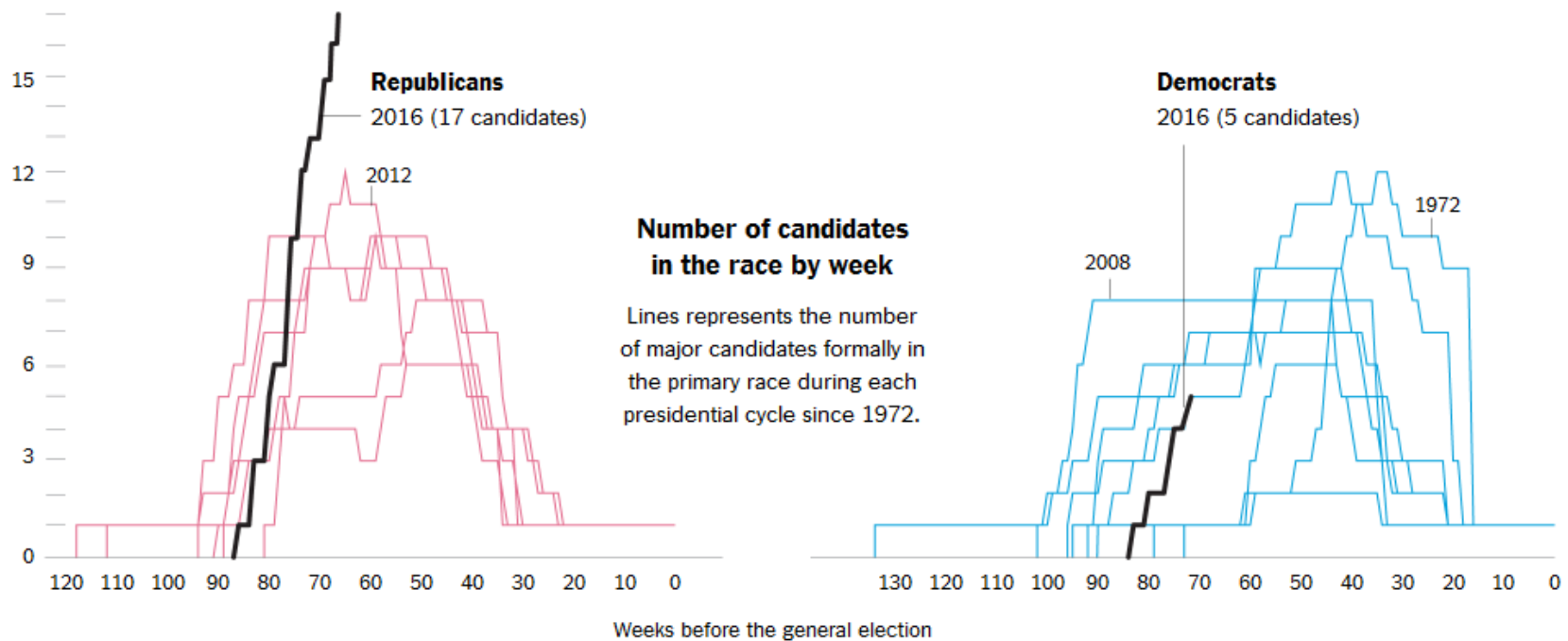
- Line
- Shape
- Value
- Color
- Texture
- Space
- Typography



## Stacking Up the Presidential Fields

By ALICIA PARLAPIANO **UPDATED** AUGUST 3, 2015

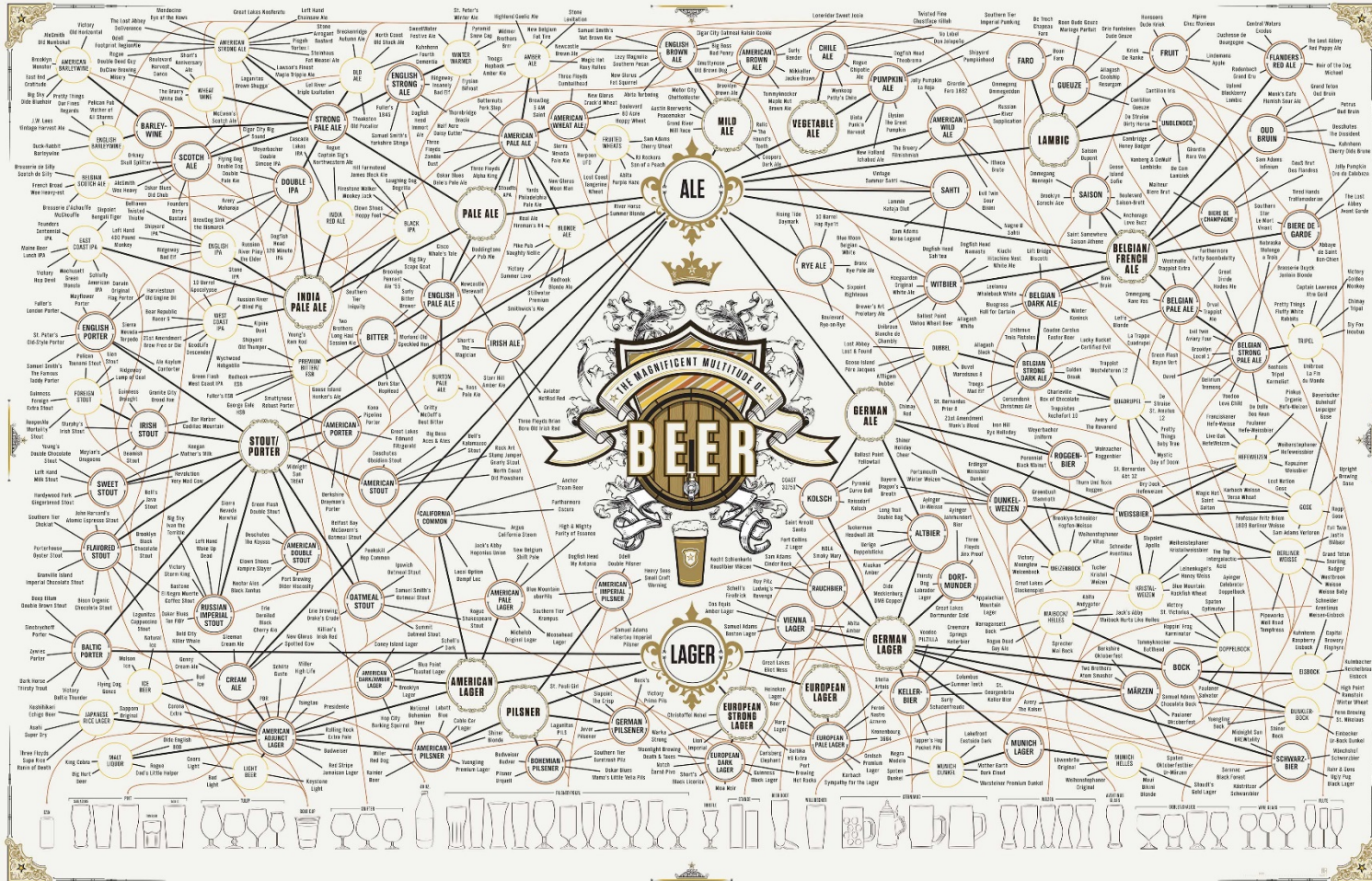
The Republican party has 17 major presidential candidates this cycle — more than three times the number of Democrats and more than any other field in recent history. The charts below show the number of candidates in each field since 1972 (in years when there was no party incumbent) at any given week before the election.



<http://www.nytimes.com/interactive/2015/06/04/us/politics/stacking-up-the-presidential-fields.html>

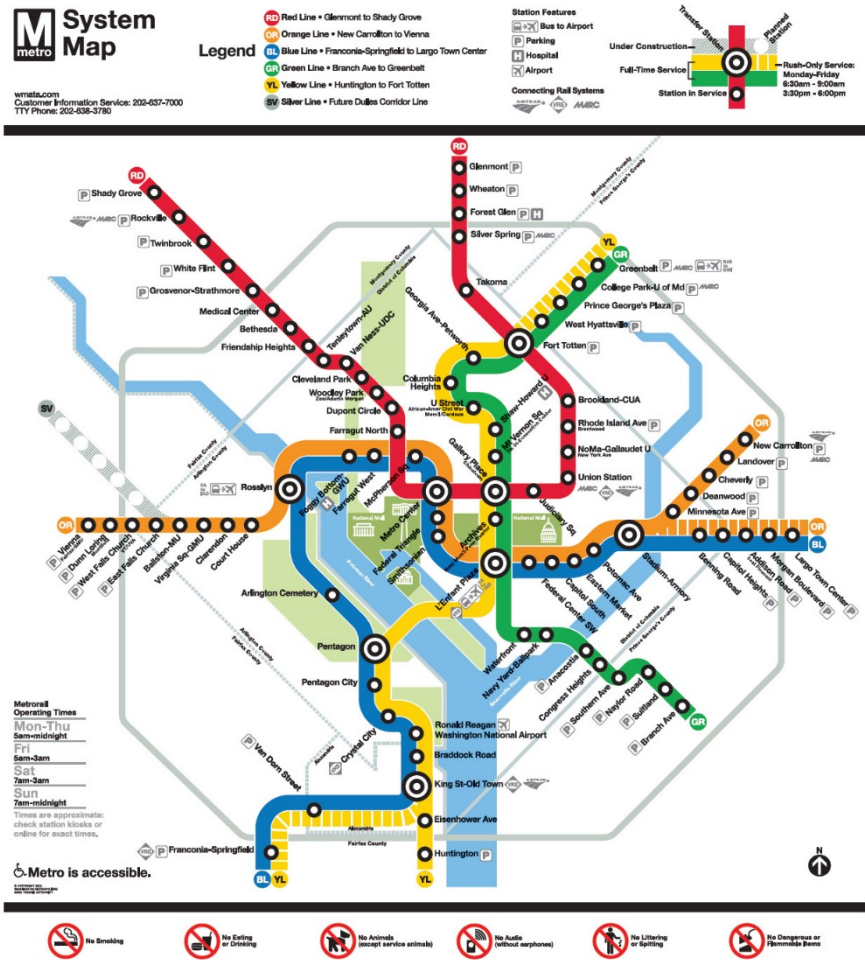


# Line: relationships



<http://popchartlab.com/products/the-magnificent-multitude-of-beer>

# Line: physical space



## WE ALL SCREAM

During the latest heatwave, MGMT's thoughts turned to ice cream. Originally invented by the Chinese around 200 B.C., legend has it that the Emperor kept it a secret until Marco Polo visited and allegedly took the technique back to Italy. This chart shows there is more than one way to enjoy a scoop. Or two.

### PLAIN

Ice cream where the color and flavor ingredients amount to less than 5% of the volume of the unfrozen ice cream (whatever that means).



**Cake Cone**

An ice cream cone with a lighter texture, in a mold that creates a cuff at the top.



**Tub**

Another way to keep your hands clean. The name certainly the name doesn't imply one could eat an entire TUB but...



**Ice Cream Sandwich**

A brilliant novelty dessert that sandwiches a layer of ice cream between two thin, cake-like layers or two cookies.



**Frozen Custard**

Frozen dessert similar to ice cream, but served at a warmer temperature from a machine that extrudes the ice cream into soft, swirled peaks.



**Hokey Pokey**

"Hokey pokey" is the English adaptation of the Italian phrase "o che poco," meaning how "oh, how little" (inexpensive).

### ICE

Made from fruit juices, sugar, and stabilizers, without and without fruit acids, colors, flavoring, and water, and frozen to the consistency of ice cream.



**Snow Cone**

Snow cones are the descendants of the original "ice cream," which was snow flavored with fruit juice, created 4,000 years ago by the Chinese.



**Sorbet**

A frozen dessert generally made from fruit purée or fruit juice. Unlike sherbet, sorbet technically contains no milk. And if you haven't had an Italian sorbet in a lemon shell then you should fix that.



**Popsicle**

Invented in 1905 by 11-year-old Frank Epperson, who left a glass of soda with a mixing stick outside overnight. Seventeen years later, Epperson introduced it to the public.



**Ice Milk**

A low butterfat variation of ice cream, which due to advances in food technology over the last 20 years, has all but disappeared as a term, replaced by "reduced fat ice cream."



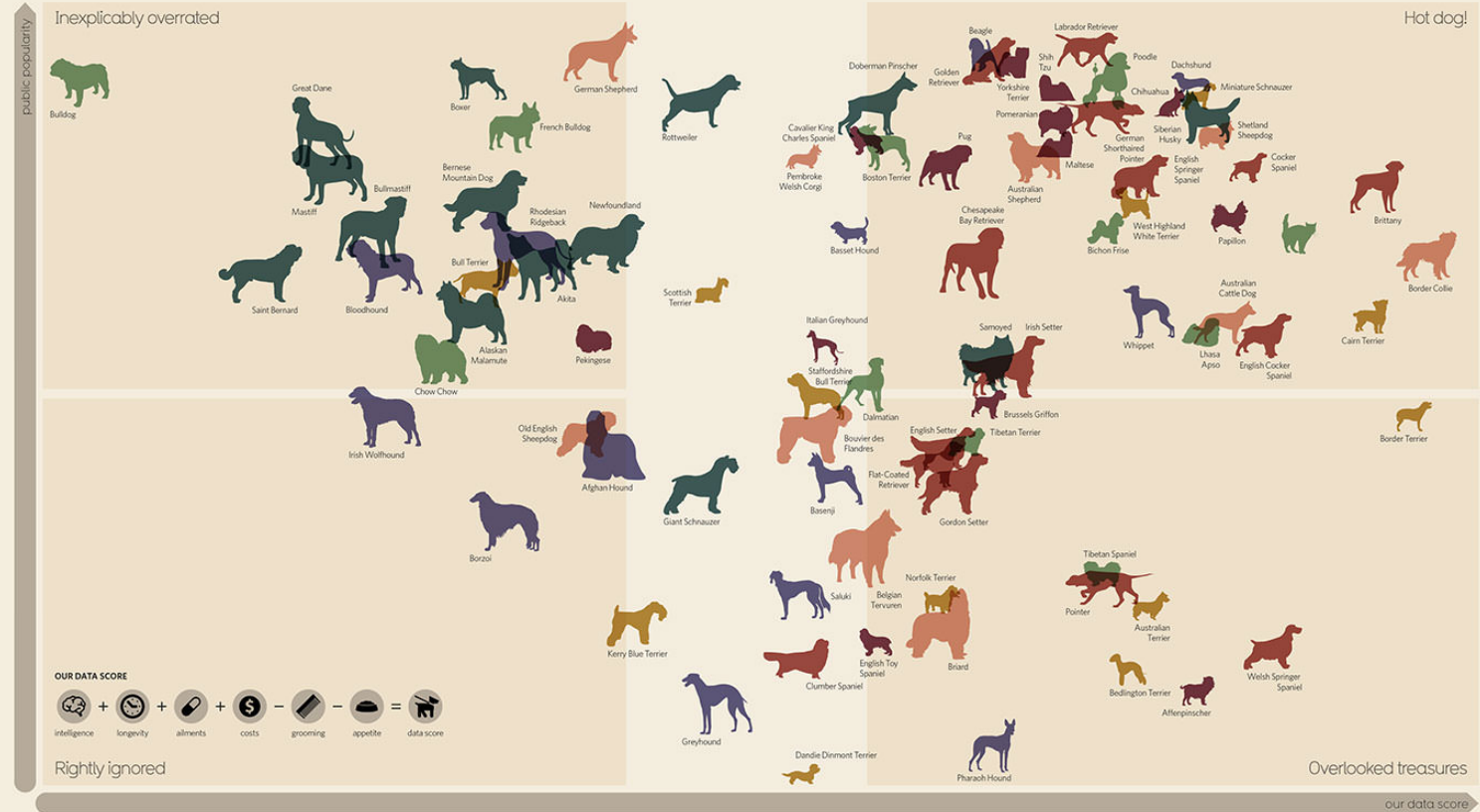
**Sherbet**

The legal definition of sherbet stipulates that it can contain no more than 2% milkfat.

<http://www.mgmtdesign.com/work.html?id=1,11,100>

# Shape: symbols as categories

## Best in Show The ultimate datadog



016 | 017

from the infographic mega-tome **Knowledge is Beautiful**  
by David McCandless - InformationIsBeautiful.net

data: [bit.ly/KIB\\_BestDogs](http://bit.ly/KIB_BestDogs)

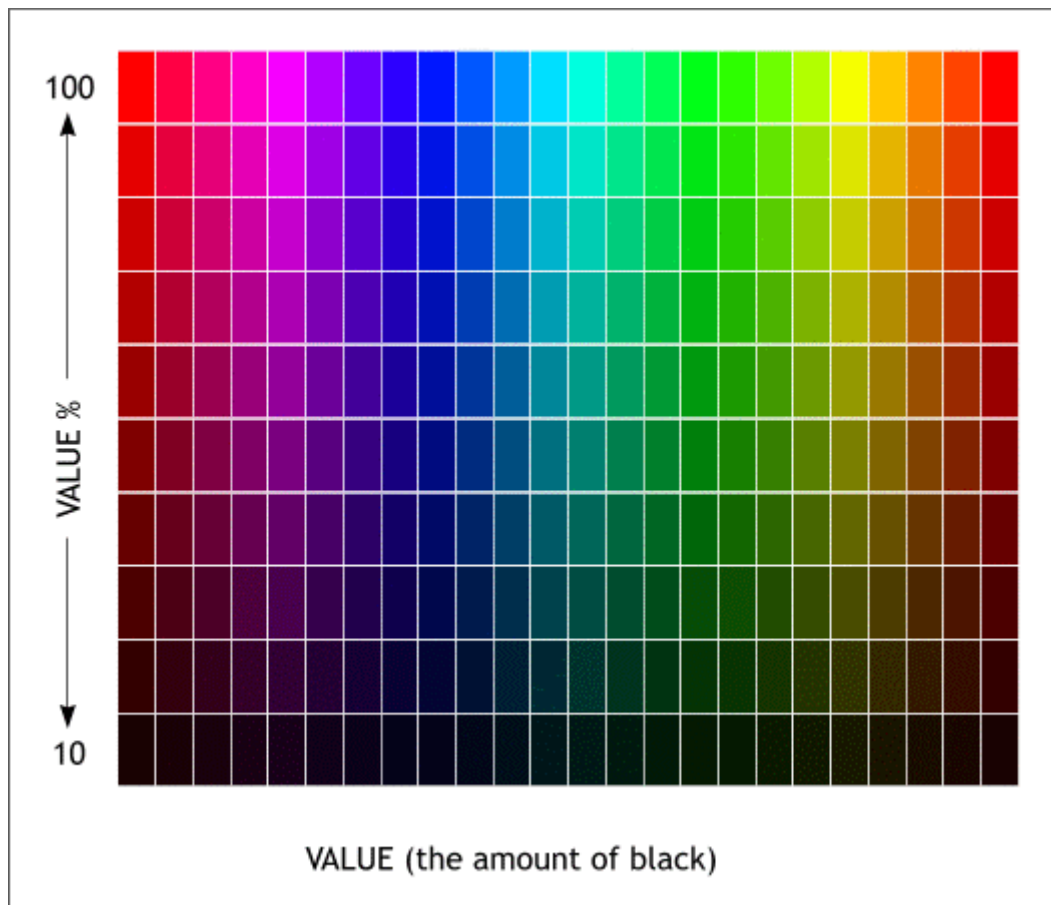
# Caution: detecting shape variation

24813481187116715541388198443771347915641531845305848641  
23475789411484122238814691613548048407890877078678751211  
86584234044377134791564153184530584864123475789411484122  
23881469161354804840789087707867875121186584234018874276

2481**3**481187116715541**3**8819844**3**771**3**479156415**3**1845**3**05848641  
**2**347578941148412223881469161**3**548048407890877078678751211  
865842**3**40443771**3**479156415**3**1845**3**058486412**3**475789411484122  
**2**3881469161**3**548048407890877078678751211865842**3**4018874276

<http://www.formulate.com.au/blog/perception-3-colour>

# Design elements – value



[http://facweb.cs.depaul.edu/sgrais/color\\_value.htm](http://facweb.cs.depaul.edu/sgrais/color_value.htm)

# Value: emphasis and mood

## A Light in Dark Places Winter-time Cycling

More cyclists than ever are hitting the roads in the UK, with total mileage cycled up 20% over the last 12 years from 4 billion kms in 1998 to 5 billion kms in 2011. Although cycling in the winter isn't as popular as it once was, more Brits than ever are getting on their bikes no matter the weather. **But how safe are you on the UK's roads in the winter?**



**19,215**

Cyclists were injured or killed on British roads since 2011

1 figure = 1,000 cyclists



About a **fifth** of the cyclists killed or injured are children and young people

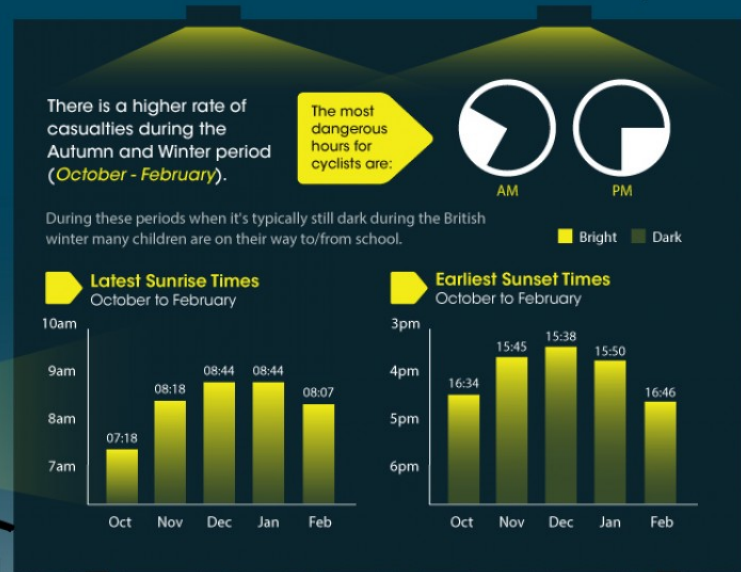
- Children
- Adults
- Age Unknown



**25%** of cyclist casualties occur due to impairment or lack of safety equipment

### Tips for staying safe on the roads

- 1 Wear light-coloured or fluorescent clothing, or a high-visibility vest.
- 2 Wear reflective accessories, such as belt or arm/ankle bands, in the dark.
- 3 Ensure your bike has a reliable white front light, red rear light, red rear reflector, amber/yellow pedal reflectors, spoke reflectors.



#### Citations

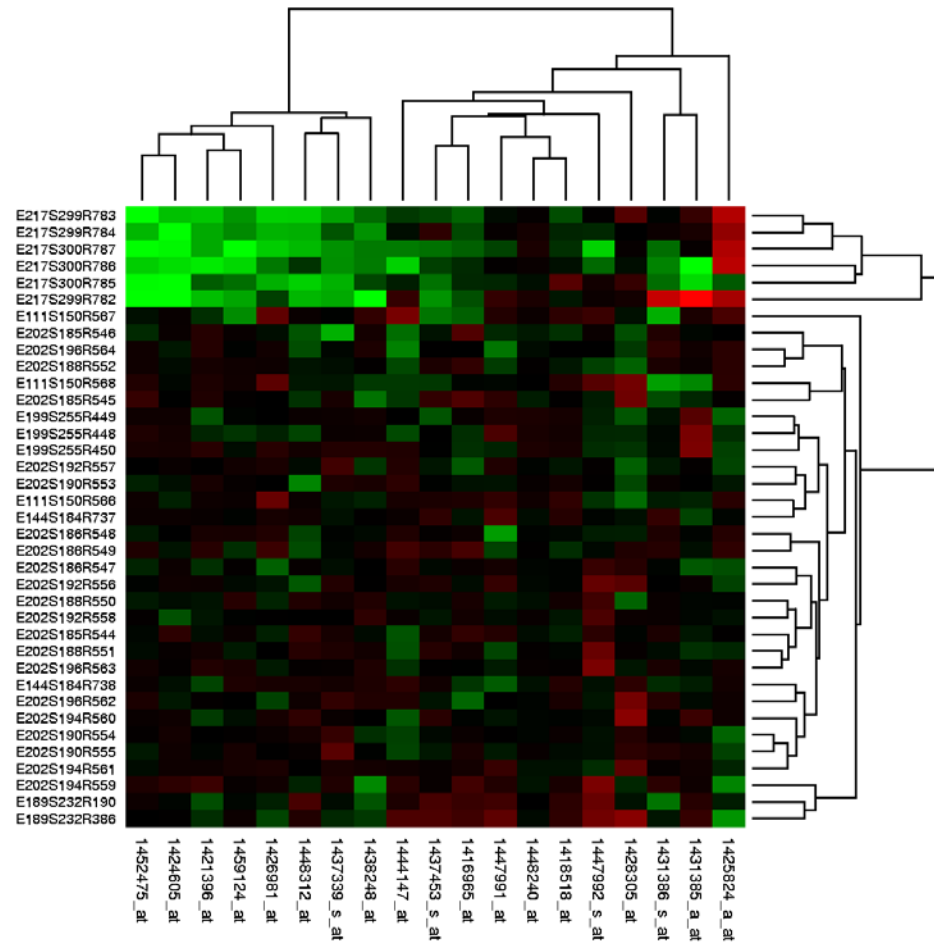
- <http://assets.dft.gov.uk/statistics/releases/road-accidents-and-safety-annual-report-2011/rrcgb2011-complete.pdf>
- <http://www.dft.gov.uk/statistics/releases/reported-road-casualties-gb-main-results-2011/>
- <http://beta.ctc.org.uk/ctc-cycling-statistics>
- <http://www.emsaonline.com/mediacenter/articles/00000054.html>
- <http://www.rospa.com/roadsafety/adviceandinformation/cycling/facts-figures.aspx>
- <http://www.timeanddate.com>

This infographic was commissioned by Arrow Europe.



<http://visual.ly/light-dark-places>

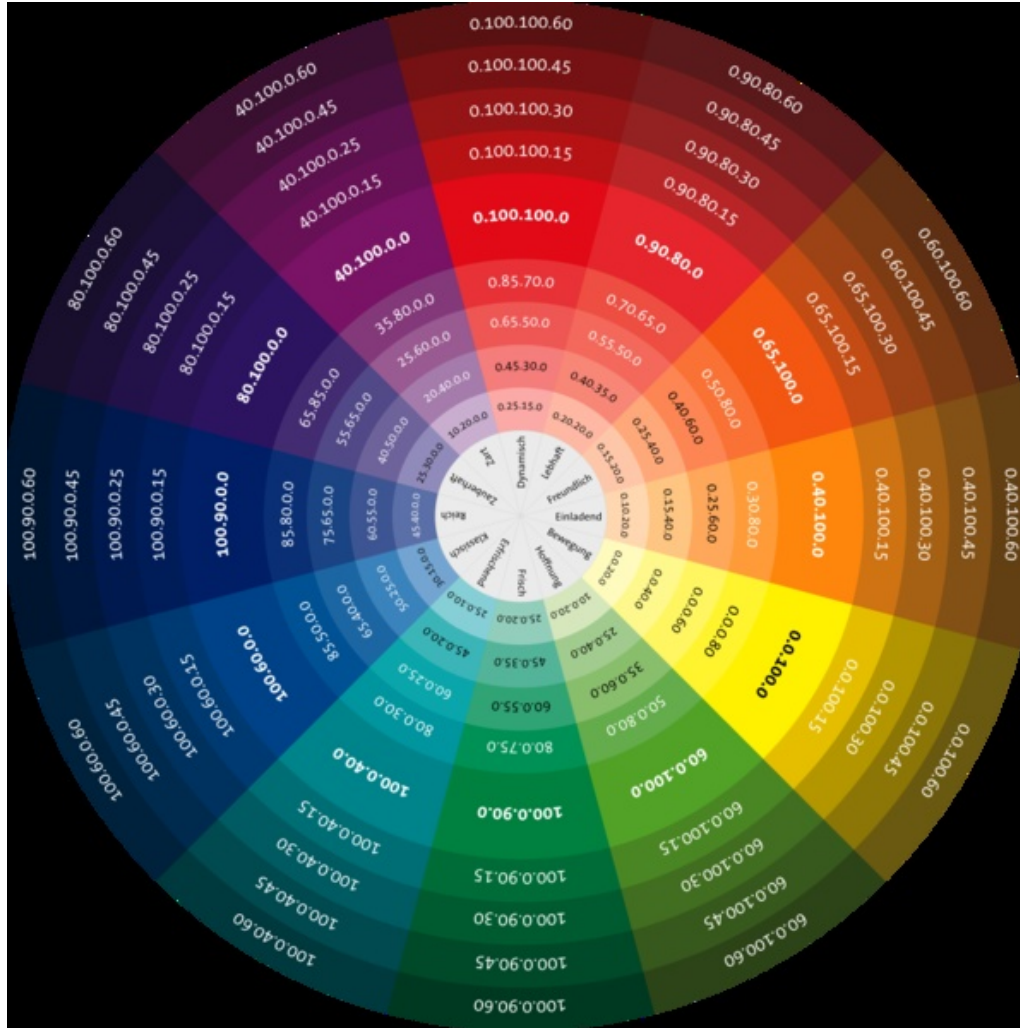
# Value: comparison



<http://www.unibo.it/en/research/business-and-research/patents/2013/molecular-signature>



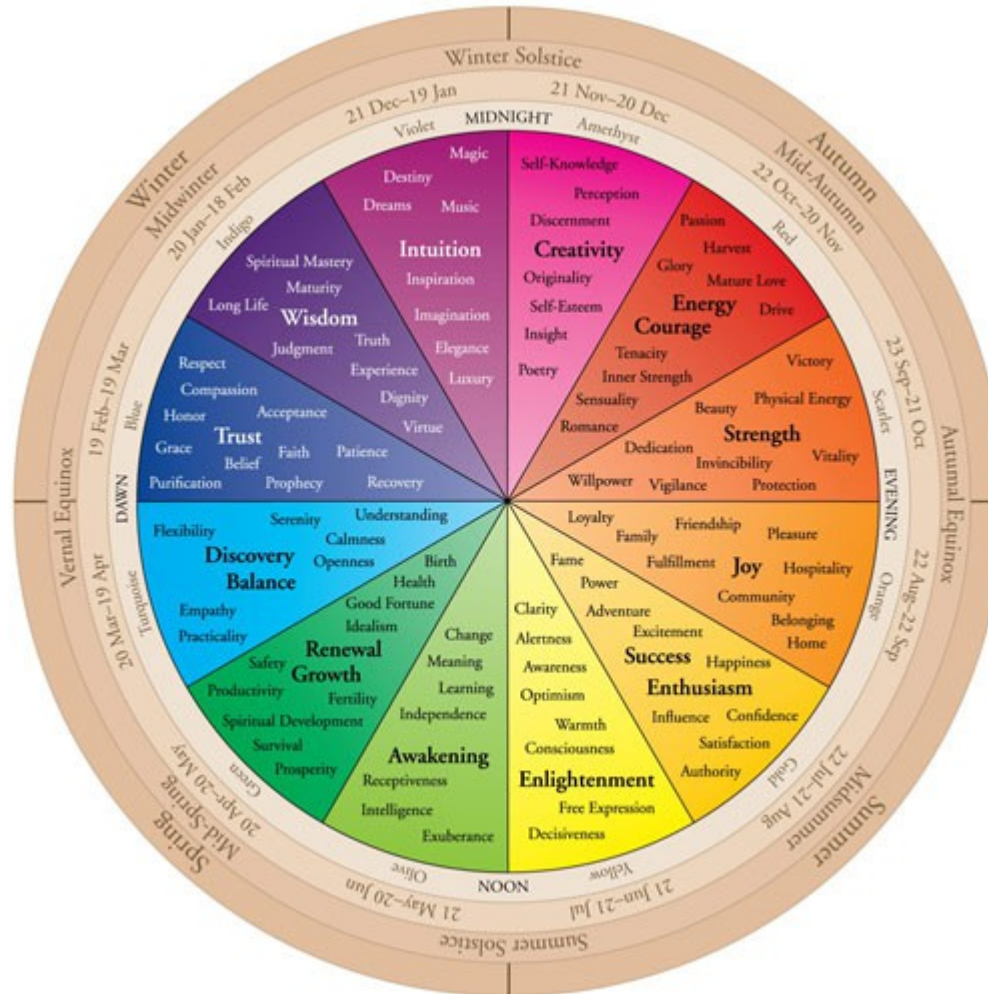
# Design elements: color



<https://www.pinterest.com/pin/62909726019312969/>



# Color: mood



<http://www.carlyjamison.com/2012/08/05/color-theory-wheel/>

# Describing color

The image displays a color picker interface with the following data:

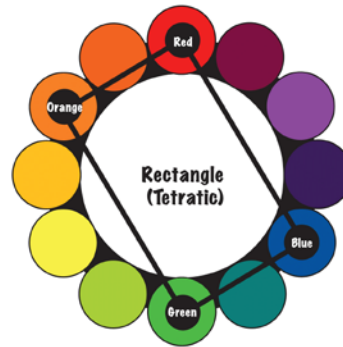
Model	Component	Value
RGB(A)	Red	38
	Green	141
	Blue	210
	Hex	#268dd2
HSL(A)	Hue	204.07
	Saturation	69.35
	Lightness	48.63
HSV / HSB	Hue	204.07
	Saturation	81.9
	Value/Brightness	82.35
CMYK	Cyan	81.9
	Magenta	32.86
	Yellow	0
	Key/Black	17.65

<http://colorizer.org/>

## Color Schemes



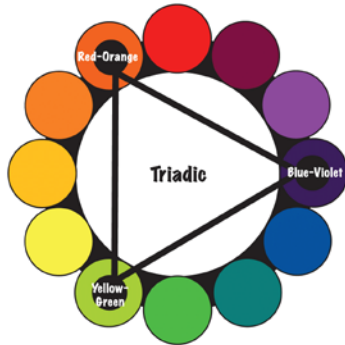
**Complementary color scheme**  
Colors that are opposite each other on the color wheel are considered to be complementary colors  
(example: Orange and Blue).



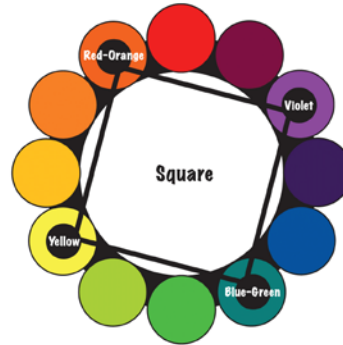
**Rectangle (tetradic) color scheme**  
The rectangle or tetradic color scheme uses four colors arranged into two complementary pairs.  
(example: Orange, Red, Blue and Green)



**Analogous color scheme**  
Analogous color schemes use colors that are next to each other on the color wheel.  
(example: Green, Blue-Green and Blue)



**Triadic color scheme**  
A triadic color scheme uses colors that are evenly spaced around the color wheel.  
(example: Yellow-Green, Red-Orange and Blue-Violet)



**Square color scheme**  
The square color scheme is similar to the rectangle, but with all four colors spaced evenly around the color circle.  
(example: Yellow, Red-Orange, Violet and Blue-Green)

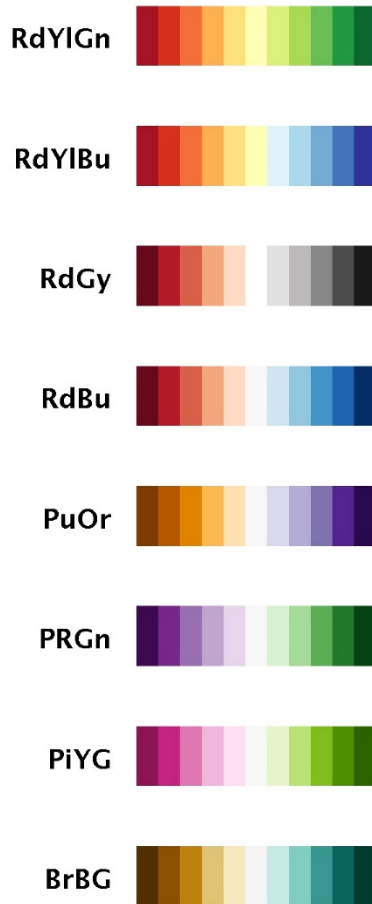


**Split-Complementary color scheme**  
The split-complementary color scheme is a variation of the complementary color scheme. In addition to the base color, it uses the two colors adjacent to its complement.  
(example: Yellow, Red-Violet and Blue-Violet)

<http://sunywcc2ddesign.com/project-5-color-schemes>

# Color palette types

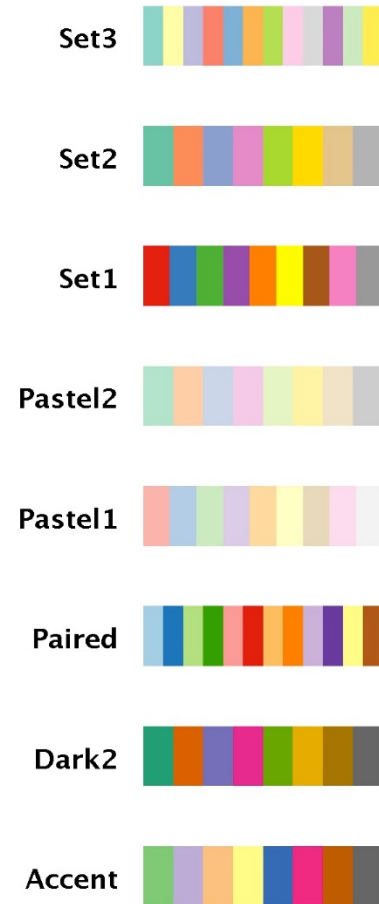
## Diverging



## Sequential



## Qualitative



<http://www.mathworks.com/matlabcentral/fileexchange/34087-cbrewer---colorbrewer-schemes-for-matlab/content/cbrewer/cbrewer.m>

# Cool tool: Paletton



<http://paletton.com/>

# Cool tool: Color Brewer

The screenshot displays the Color Brewer 2.0 web application interface. At the top right, the text "COLOR BREWER 2.0" is prominently displayed in orange and white, with the tagline "color advice for cartography" below it. The main area shows a map of the United States with a 7-class PiYG color scheme applied to its counties. The colors range from dark purple in the northwest to dark red in the southeast, with intermediate shades of blue, green, yellow, and orange.

On the left side, there are several control panels:

- Number of data classes:** A dropdown menu set to "7".
- Nature of your data:** Radio buttons for "sequential" (selected), "diverging", and "qualitative".
- Pick a color scheme:** A grid of 12 color scheme thumbnails.
- Only show:** Checkboxes for "colorblind safe", "print friendly", and "photocopy safe".
- Context:** Checkboxes for "roads", "cities", and "borders" (checked).
- Background:** Radio buttons for "solid color" (selected) and "terrain".
- Color transparency:** A horizontal slider.

At the bottom left, a legend for the "7-class PiYG" scheme is shown, listing the following hex codes from top to bottom: #c51b7d, #e9a3c9, #fde0ef, #f7f7f7, #e6f5d0, #a1d76a, and #4d9221. To the right of the legend is an "EXPORT" button.

At the top left of the map area, there are links for "how to use", "updates", "downloads", and "credits".

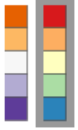
<http://colorbrewer2.org/>

# Greyscale

Number of data classes: 4 how to use | updates | downloads | credits

Nature of your data:  
 sequential  diverging  qualitative

Pick a color scheme:



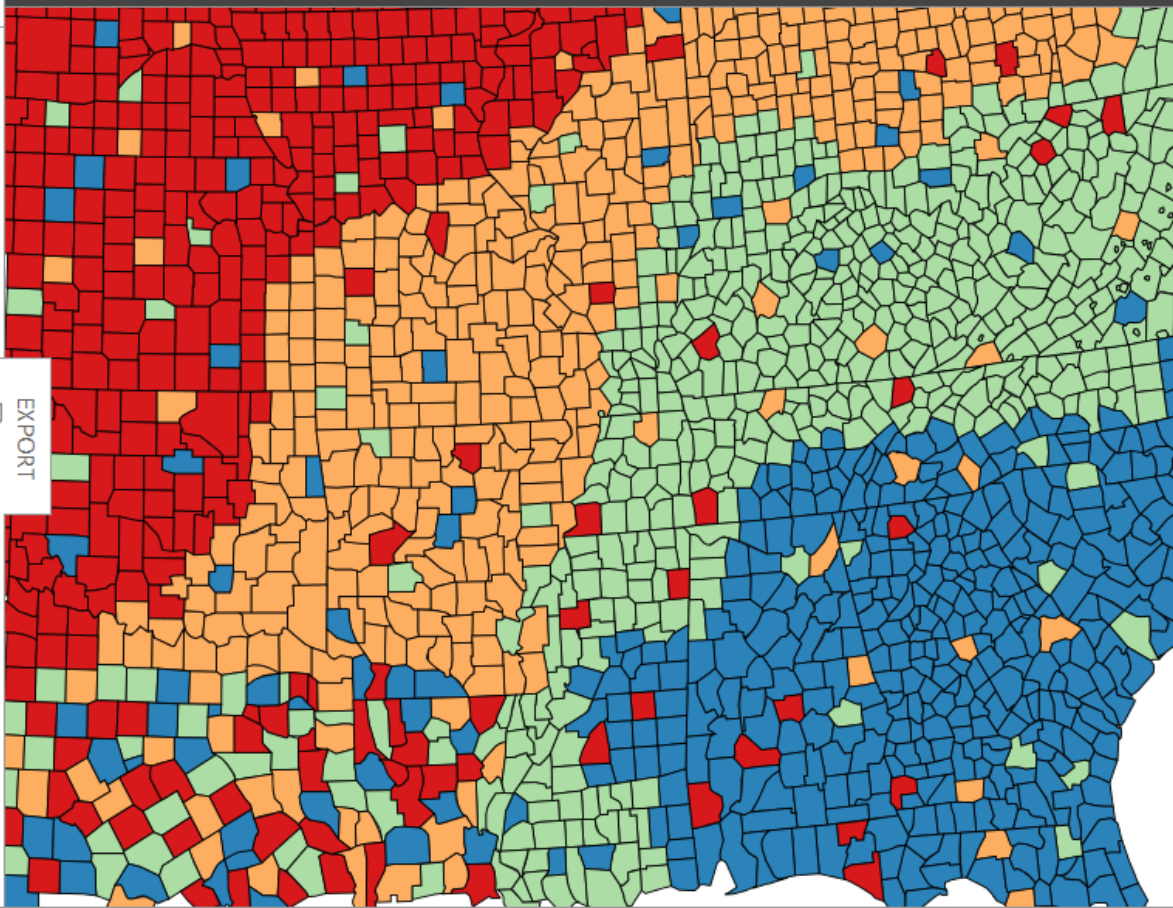
Only show:  
 colorblind safe  
 print friendly  
 photocopy safe

Context:  
 roads  
 cities  
 borders

Background:  
 solid color  terrain  
color transparency

4-class Spectral  
EXPORT  
HEX  
#d7191c  
#fdae61  
#abdda4  
#2b83ba

COLORBREW 2.0  
color advice for cartography





# Greyscale – works

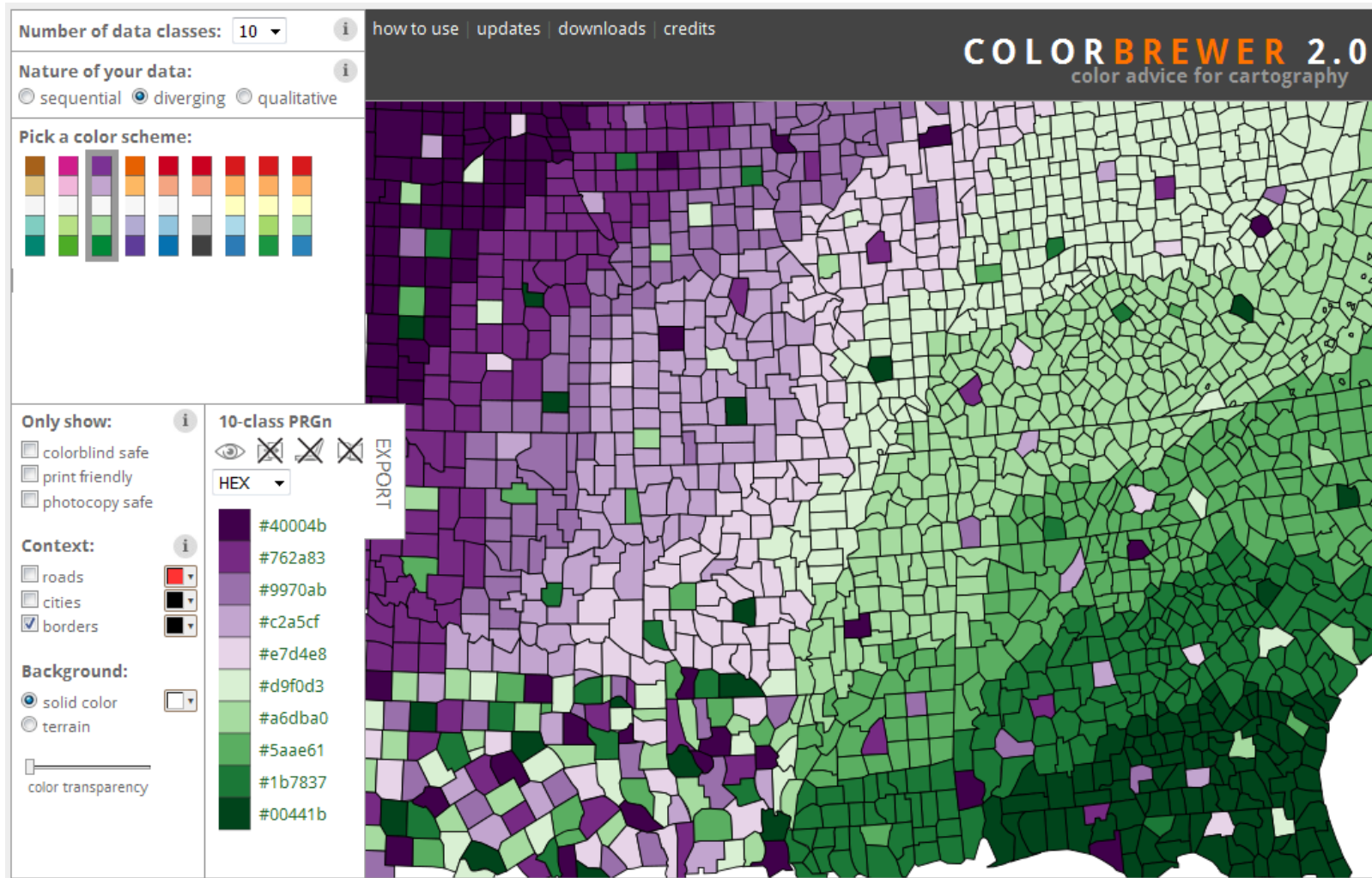
The screenshot displays the ColorBrewer 2.0 web application interface. At the top right, the text "COLORBREWER 2.0" is displayed in a large, bold font, with "color advice for cartography" underneath it. Below this, there are navigation links: "how to use", "updates", "downloads", and "credits".

The main interface is divided into several sections:

- Number of data classes:** A dropdown menu is set to "4".
- Nature of your data:** Three radio buttons are present: "sequential" (unselected), "diverging" (selected), and "qualitative" (unselected).
- Pick a color scheme:** A small preview of the selected color scheme is shown.
- Only show:** Three checkboxes are present: "colorblind safe" (unchecked), "print friendly" (unchecked), and "photocopy safe" (checked).
- Context:** Three checkboxes are present: "roads" (unchecked), "cities" (unchecked), and "borders" (checked).
- Background:** Two radio buttons are present: "solid color" (selected) and "terrain" (unselected). Below this is a "color transparency" slider.
- 4-class Spectral:** A legend for the selected color scheme is shown, listing four colors with their corresponding hex codes: #d7191c (darkest), #fdae61, #abdda4, and #2b83ba (lightest).
- EXPORT:** A vertical button labeled "EXPORT" is located to the right of the legend.

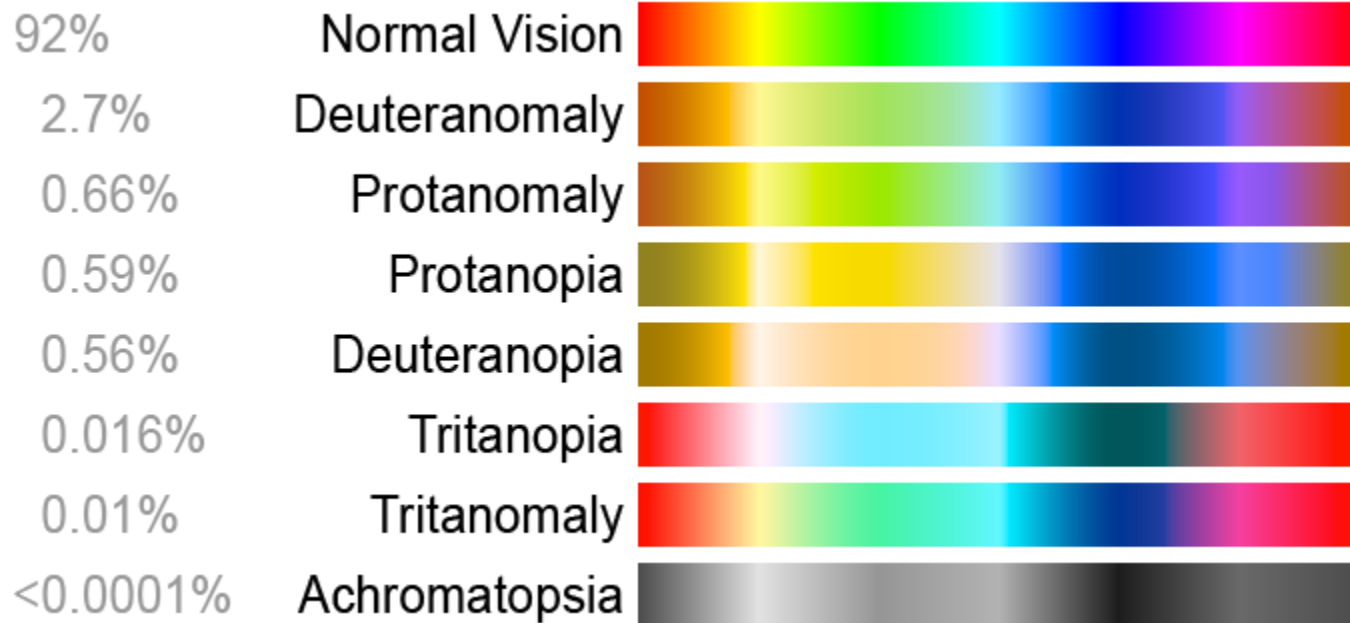
The central part of the interface is a large map of the United States, where each state is filled with a different shade of grey, representing the 4-class Spectral color scheme. The map is overlaid with a grid of small squares, likely representing the underlying data points or a sampling grid.

# Greyscale: doesn't work!



<http://colorbrewer2.org/>

# Color blindness

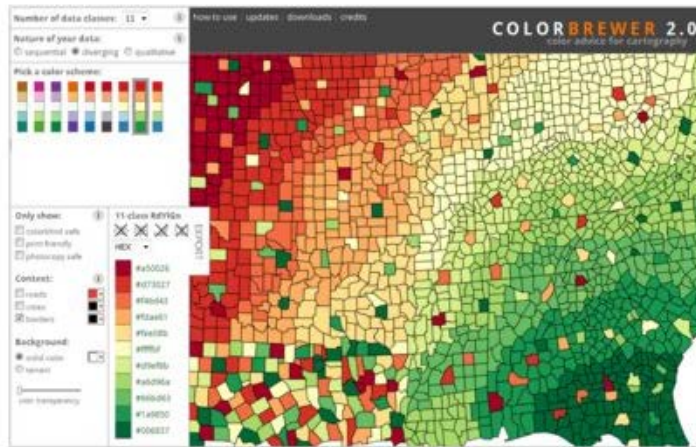


<https://plus.google.com/+HermanWillems/posts>

## Try Vischeck on Your Image Files

Your Results:

Original Image



Deuteranope Simulation



### Select the type of color vision to simulate:



- Deuteranope (a form of red/green color deficit)
- Protanope (another form of red/green color deficit)
- Tritanope (a blue/yellow deficit- very rare)

Image file:  No file selected.

<http://www.vischeck.com/vischeck/>

# Design elements: texture

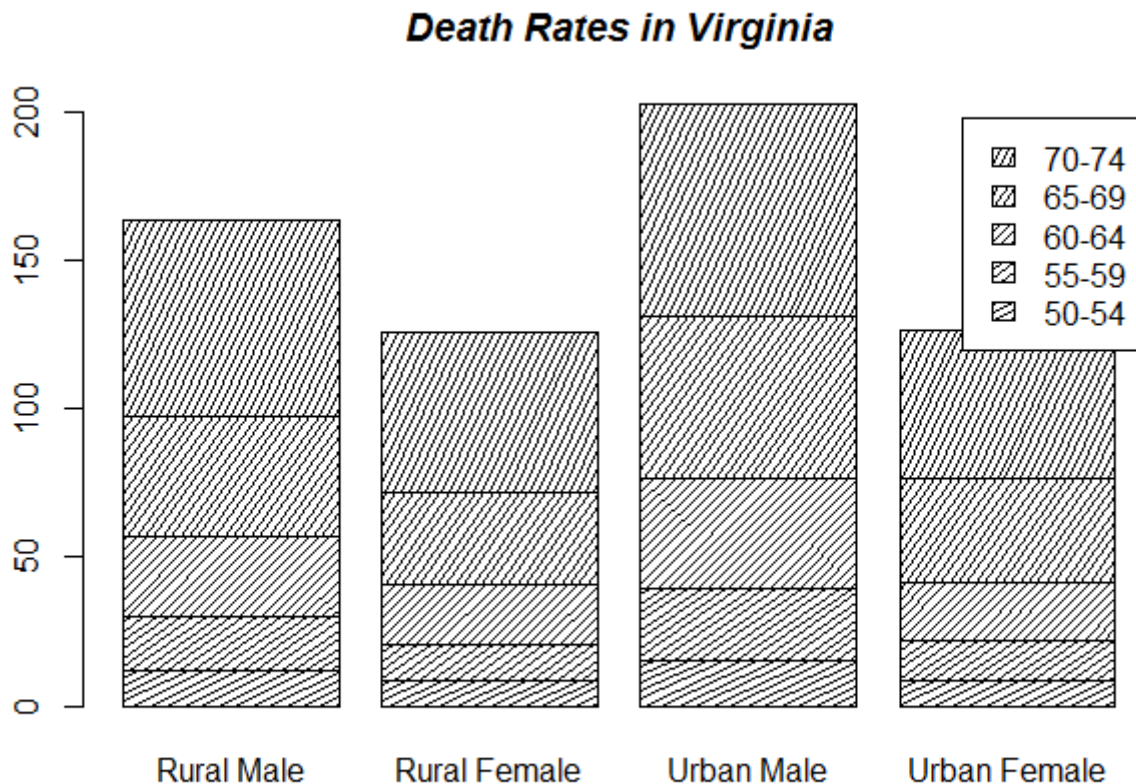
## THE GRIZZLY SCALE

The Washington Post weighted the style of facial hair, or lack thereof, of all active ballplayers on a scale of 0 to 8 — zero being clean shaven, eight being the grizzliest — then calculated the average hairiness of each team. The New York Yankees are the only team in the bigs that have a mandatory clean-cut policy.



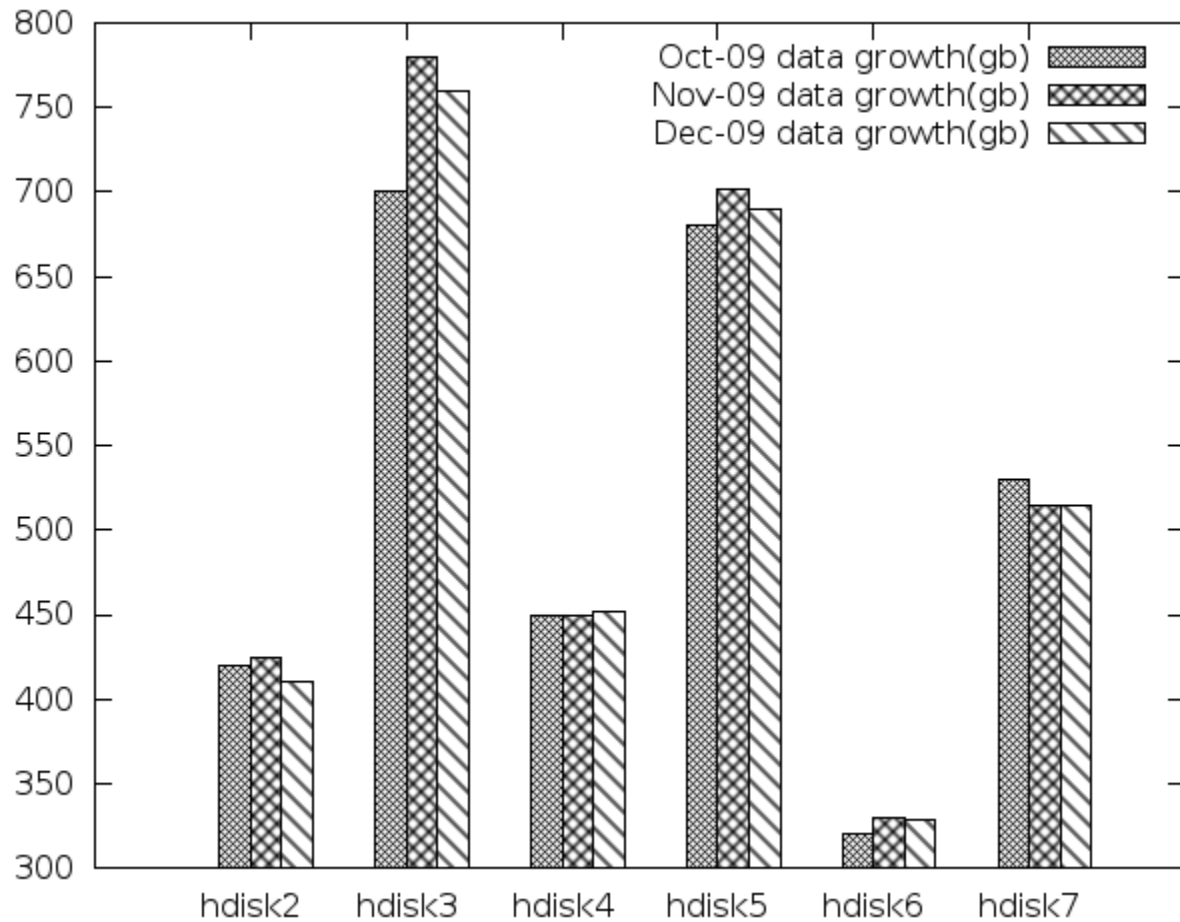
<http://apps.washingtonpost.com/f/beards/>

# Texture: difference (not so well done)



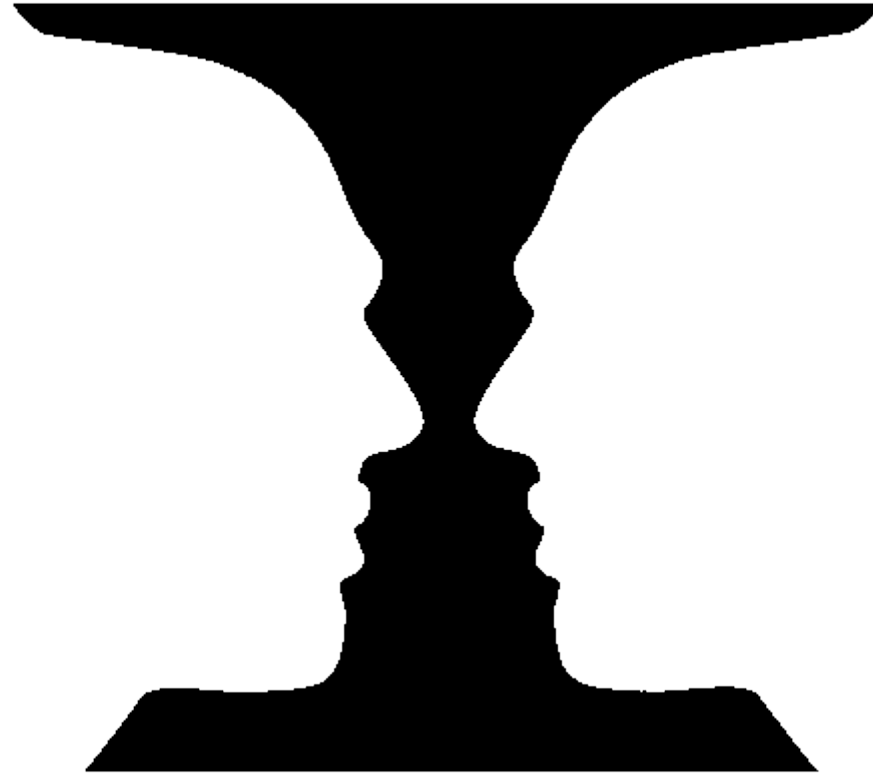
<http://stackoverflow.com/questions/30193799/how-to-fill-stacked-barplot-with-patterns-or-textures-in-r>

# Texture: difference (better)



<http://stackoverflow.com/questions/28782380/distinct-bars-of-different-group-in-gnuplot-for-printing>

# Design elements: space



<http://infohost.nmt.edu/~armiller/illusion/cupface.htm>



# Space: defining flow

## TAMING THE BREATH OF A WOK

Stir-frying is one of the most dynamic of cooking techniques because you control the heat applied to the food primarily by tossing the ingredients. Using a constant circular motion that exploits the round shape of the wok, gather the food together and flip it up off the metal. Don't allow the food to spend much time in direct contact with the hottest part of the wok—the conduction zone—which can quickly scorch its surface. Lift the food pieces so that they spend most of their time cooking in the high-temperature steam in the condensation zone above the wok, with occasional forays into the drier, cooler air of the convection zone.

The patina on the wok consists of black oxide, which prevents rust from forming on the metal, and a layer of decomposed fat, which bonds to the metal and yields a smooth, nonstick coating. Teflon and other modern nonstick coatings cannot replace the traditional patina and should never be used on a true wok. At temperatures greater than 260 °C / 500 °F, Teflon breaks down, and at temperatures greater than 340 °C / 645 °F, Teflon molecules decompose into toxic vapors.

Woks are usually made from either carbon steel or cast iron. The metal is relatively thin (3 mm / 1/8 in) so that the pan is light enough to handle with ease. Although aluminum is commonly used to make Western cookware, it is unsuitable for woks because a professional wok burner gets hot enough to melt aluminum.

Hot air from the burner rushes past the wok and up into the kitchen hood. As a result, wok cooking is not very efficient. Much of the heat never makes it to the food. The inefficiency does yield one beneficial side effect, however: the rush of hot air helps carry smoke and steam away from the cook and into the hood.

The book has 36 annotated cutaway photos like this one.

Stir-fried food experiences a wide range of temperatures as it cycles repeatedly among three different cooking zones. Its average cooking temperature is a function of the time and total heat the food experiences in all of the zones.

### CONVECTION ZONE

The air well above the wok is somewhat cooler and contains less water vapor, so it transfers heat less efficiently. This region is still very hot, however, so food up here continues to cook, albeit much more slowly than when it is in the lower zones.

### CONDENSATION ZONE

Food rising or falling through this middle region bathes in steam that is near 100 °C / 212 °F. The food itself is cooler than the boiling point of water, so some of the steam condenses onto its surface. The condensation deposits formidable amounts of latent energy that rapidly heat the food. It also forms a visible fog.

### CONDUCTION ZONE

Food here cooks in heat conducted by direct contact with the pan, which diffuses the intense heat of the flame. At its hottest, the pan glows reddish-orange—an example of the phenomenon known as blackbody radiation (discussed in chapter 5 on Heat and energy, page 1260). Metallic atoms in the pan are transforming energy from heat to light. The color of the glow indicates the temperature of the metal, which can reach 760–815 °C / 1,400–1,500 °F.

The combustion of propane generates flames as hot as 1,980 °C / 3,600 °F.

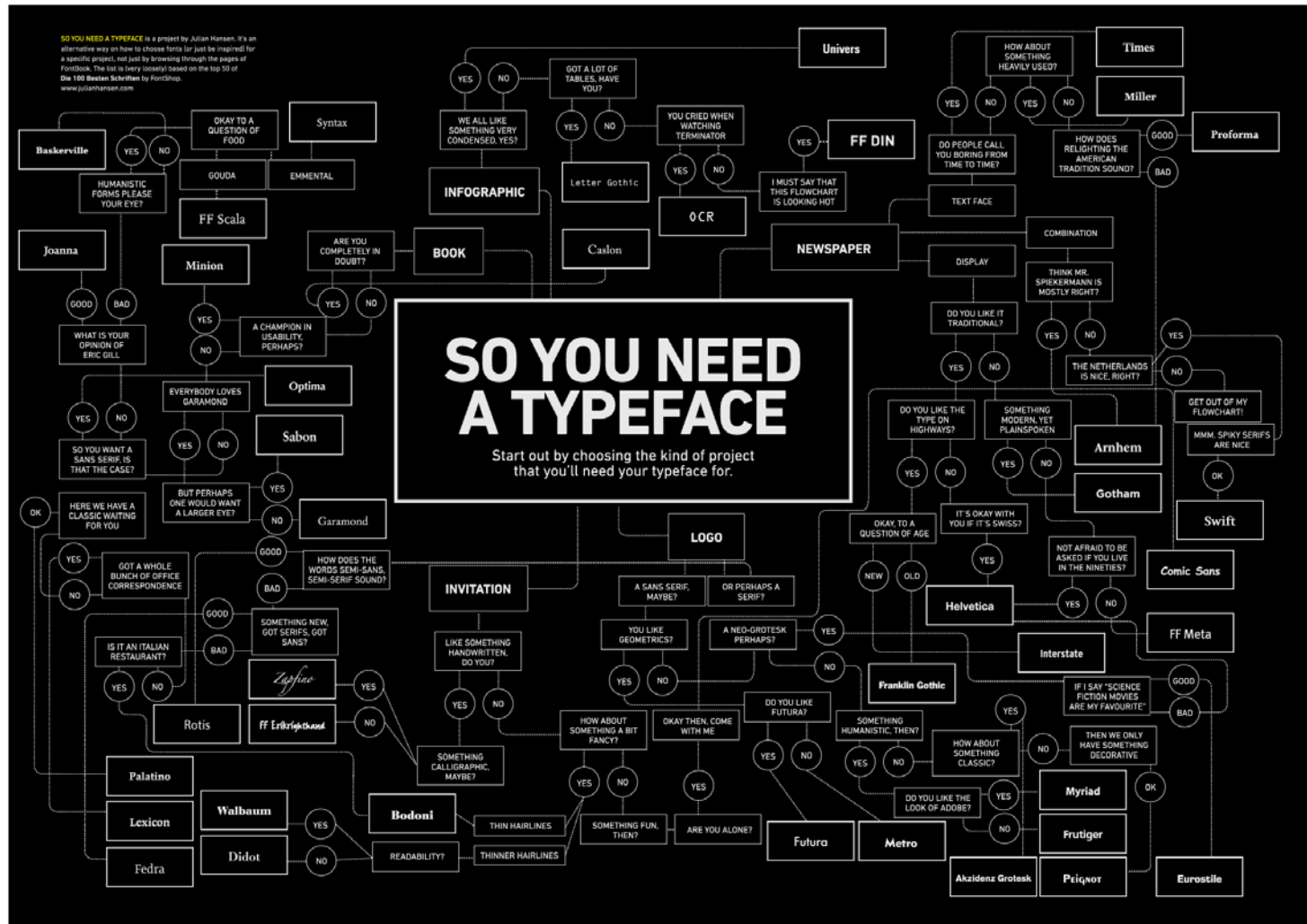
Wok burners are unusually powerful, combusting far more propane or natural gas than other burners. The high power generates up to 25 times as much heat as a regular domestic gas burner can produce. The terrifically high temperatures that result create the unique taste of foods prepared in a wok—the *wok hei* or “breath of a wok.”

# Space: how much?



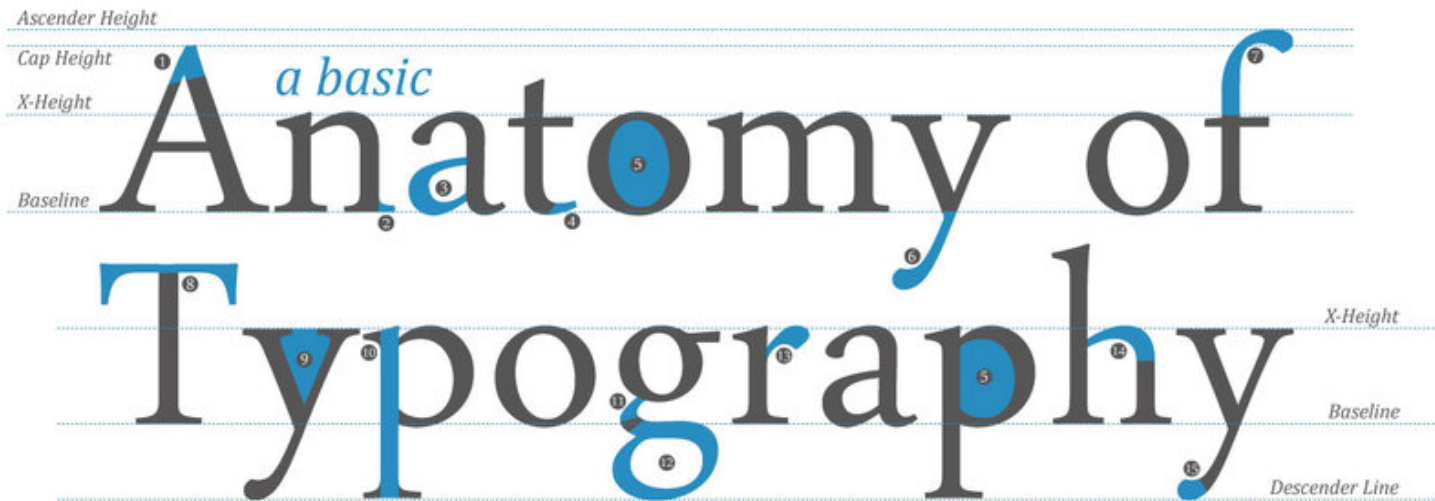
[http://infografistas.blogspot.com/2010\\_06\\_01\\_archive.html](http://infografistas.blogspot.com/2010_06_01_archive.html)

# Design elements: typography



<http://julianhansen.com/>

# Typography basics



*Typefaces*, like most things, are made up of constituent parts. The characteristics of these parts give typefaces their character.

- |            |                 |              |
|------------|-----------------|--------------|
| 1. Apex    | 6. Descender    | 11. Link     |
| 2. Serif   | 7. Ascender     | 12. Loop     |
| 3. Bowl    | 8. Bar          | 13. Ear      |
| 4. Finial  | 9. Open-counter | 14. Shoulder |
| 5. Counter | 10. Stem        | 15. Tail     |

Yaeri Hokken

<http://typostrate.com/post/84910109490/the-anatomy-of-type>

# Serif or sans serif?

Serifs are the small lines tailing from the edges of letters and symbols, separated into distinct units for a typewriter or typesetter

Check out my sweet serifs!



## Serif fonts are easier to read in printed works

This is because the serif make the individual letters more distinctive and easier for our brains to recognise quickly. Without the serif, the brain has to spend longer identifying the letter because the shape is less distinctive.

Sans-serif is a typeface that does not have the small projecting features called "serifs" at the end of strokes.

Modern, Minimal, Magnificent, I am Sans



## Sans serif fonts are better on the web

An important exception must be made for the web. Printed works generally have a resolution of at least 1,000 dots per inch; whereas, computer monitors are typically around 100 dots per inch.

<http://www.webdesignerdepot.com/2013/03/serif-vs-sans-the-final-battle/>

## THE 10 COMMANDMENTS OF TYPOGRAPHY

1	2	3	4	5	6	7	8	9	10
<b>KNOW YOUR FONT FAMILIES! EVER HEARD OF GHOTMS?</b>	<b>COMBINE A SANS-SERIF FONT WITH A SERIF FONT.</b>	<b>COMBINE A SERIF FONT WITH A SANS-SERIF FONT.</b>	<b>COMBINING TWO SIMILAR FONTS IS NOT COOL.</b>	<b>CONTRAST IS THE KEY.</b>	<b>STICK TO TWO FONTS. ONLY GO FOR THREE IF YOU MUST.</b>	<b>DON'T MIX DIFFERENT MOODS.</b>	<b>COMBINE FONTS OF COMPLEMENTARY MOODS AND OF SIMILAR TIME ERAS.</b>	<b>USE DIFFERENT WEIGHTS OF FONTS IN THE SAME FAMILY.</b>	<b>AND LASTLY, PLEASE AVOID THE FOLLOWING FONTS...</b>
Geometric Sans <i>a</i>	Myriad Minion	Minion Myriad	Minion Novelty	Futura CASTELLAR	Monogly Arial Rounded AvantGarde	BOBETWOD MANDINGO GENEVA	Black Chancey <i>Arigold</i>	Minion Garamond	Comic Sans
Humanist Sans <i>a</i>	AndrewGothic CASTELLAR	CASTELLAR AndrewGothic	Colonna MT CASTELLAR	Liberal AndrewGothic	MANDINGO souvenir It Arial	ADREACK <i>ALL-CAPS</i> GOTHIC ROMAN	Amaze <i>festus</i>	Myriad Futura	Papyrus
Old Style <i>a</i>	Ocean Sans Std Garamond	Garamond Ocean Sans Std	Garamond <i>Times New Roman</i>	Myriad Ocean Sans Std	GENEVA Advantage Ocean Sans Std	Black Chancey MASQUE <i>Commanche light</i>	ANDES <i>bougan</i>	GENEVA DALLAS	Curlyz
Transitional <i>a</i>	Segoe UI Lucida Fax	Lucida Fax Segoe UI	Agency FB <i>Lucida Gothic</i>	Novelty Advantage	Novelty CASTELLAR Time Roman	AFRICAN MATOSE GillklickCage	Borealis <i>calibri</i>	November Niagara	Viner
Modern <i>a</i>	Futura Minion	Minion Futura	Futura Franklin Gothic	OVERHAUL <i>Angelina</i>	AKKA colonna MT dallas	ALLENB MECHANICAL DELCOBOLD	GENEVA BLACK, CHANCEY	Valken VAGrounded	Kristen
Slab Serifs <i>a</i>	Liberal Garamond	Garamond Liberal	Mandingo Liberal	GENEVA Futura	Akka BIENVILLE Castellar	AnglicanVert MINION MULLSTROCKER	Coronet <i>Trebuchet</i>	TRAJAN Sylfaen	Συμβολ

dm | Designmantic

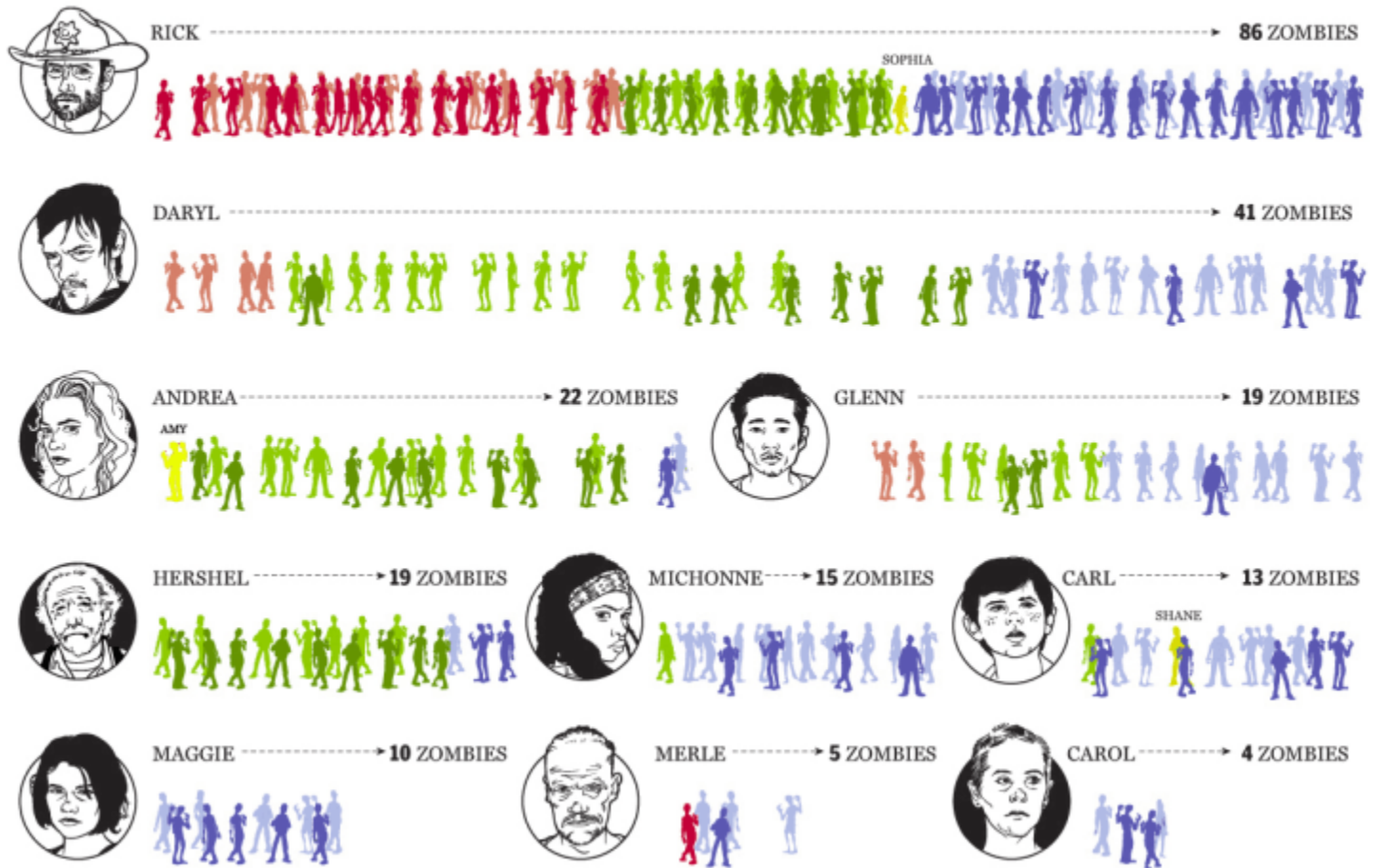
<http://superdevresources.com/making-font-combinations-that-work-infographics/>

# The principles of design

- Unity
- Balance
- Hierarchy
- Repetition
- Contrast
- Proximity

# Unity

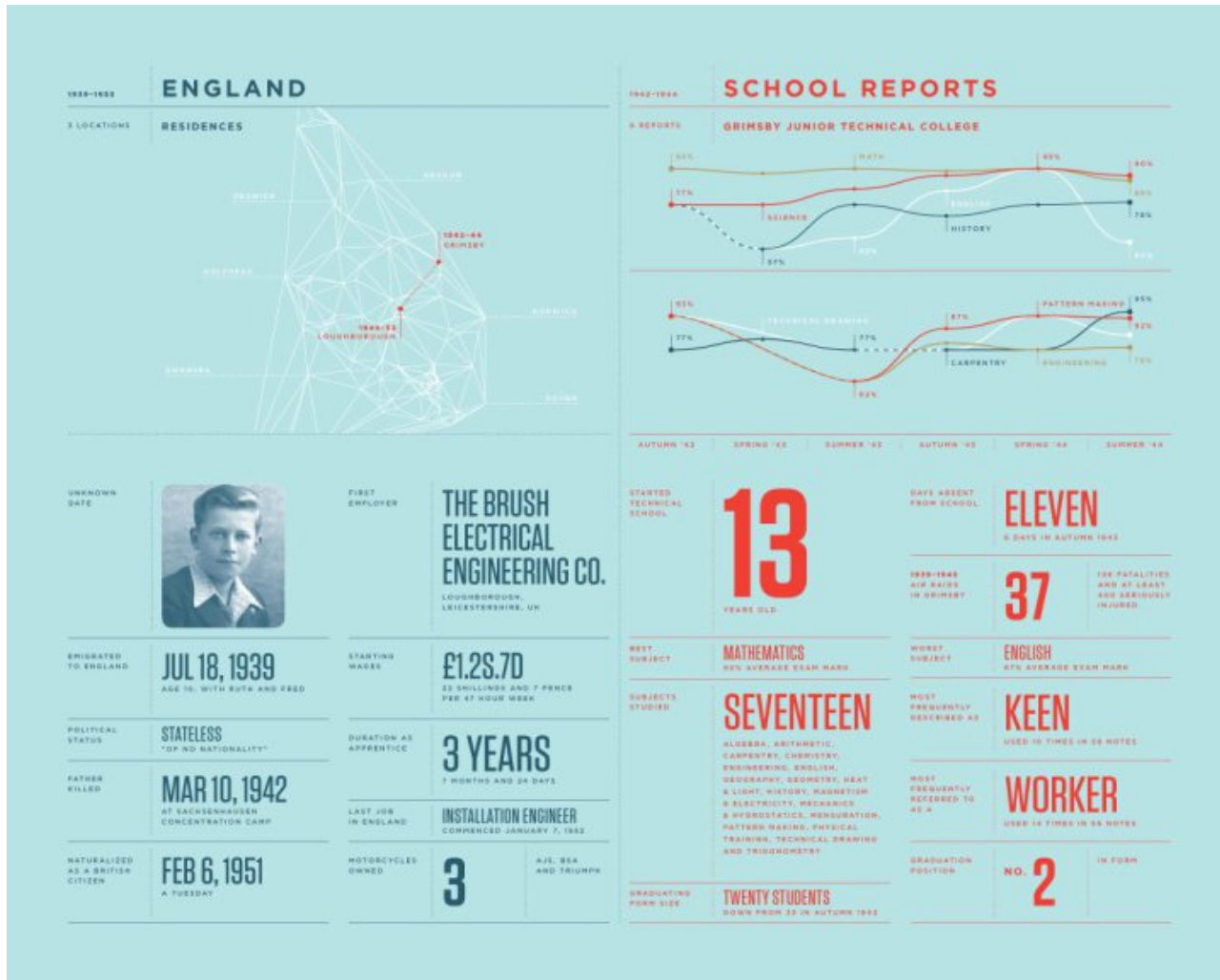
ON SCREEN KILLS FOR SEASON ONE ■ SEASON TWO ■ SEASON THREE ■



<http://news.nationalpost.com/news/graphics/graphic-stopping-the-dead-a-statistical-look-back-at-the-walking-dead-series-so-far>

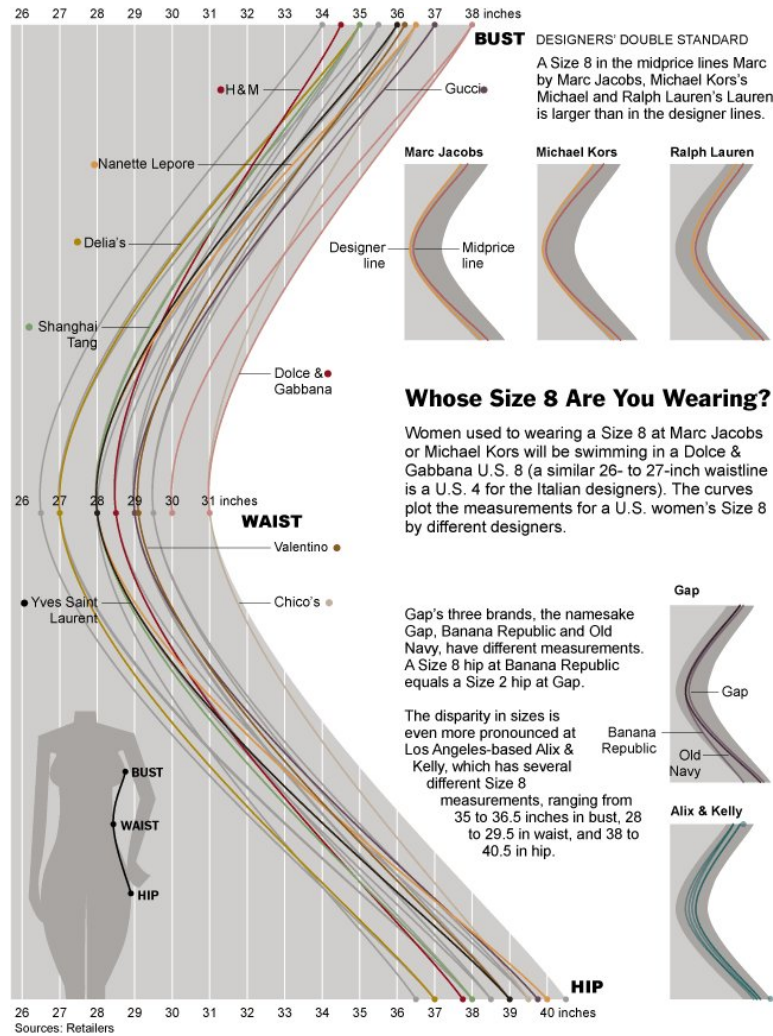


# Balance: symmetrical



<http://flowingdata.com/2011/02/07/annual-feltron-report-is-up-this-time-with-dad/>

# Balance: asymmetrical



<http://www.nytimes.com/2011/04/25/business/25sizing.html>

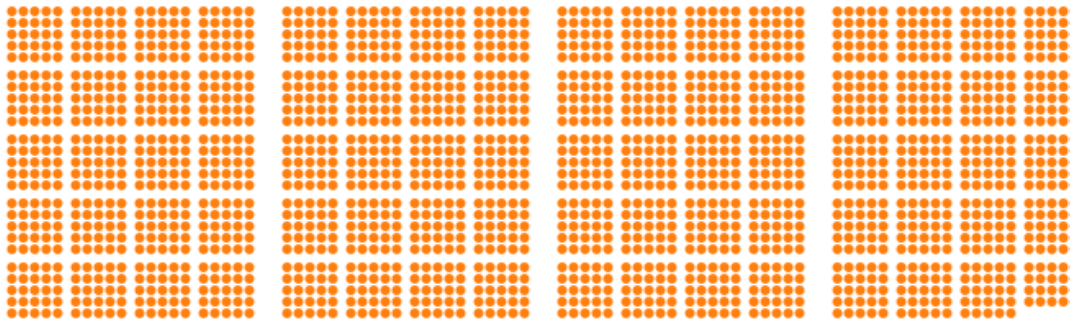
# Hierarchy



<http://flowingdata.com/2009/10/20/how-much-do-ceos-make-in-the-united-states/>

## Can This Treatment Help Me? There's a Statistic for That

JAN. 26, 2015



4 heart attacks are  
not prevented  
●●●● ●

When **2,000** People Take a Daily Aspirin for Two Years:

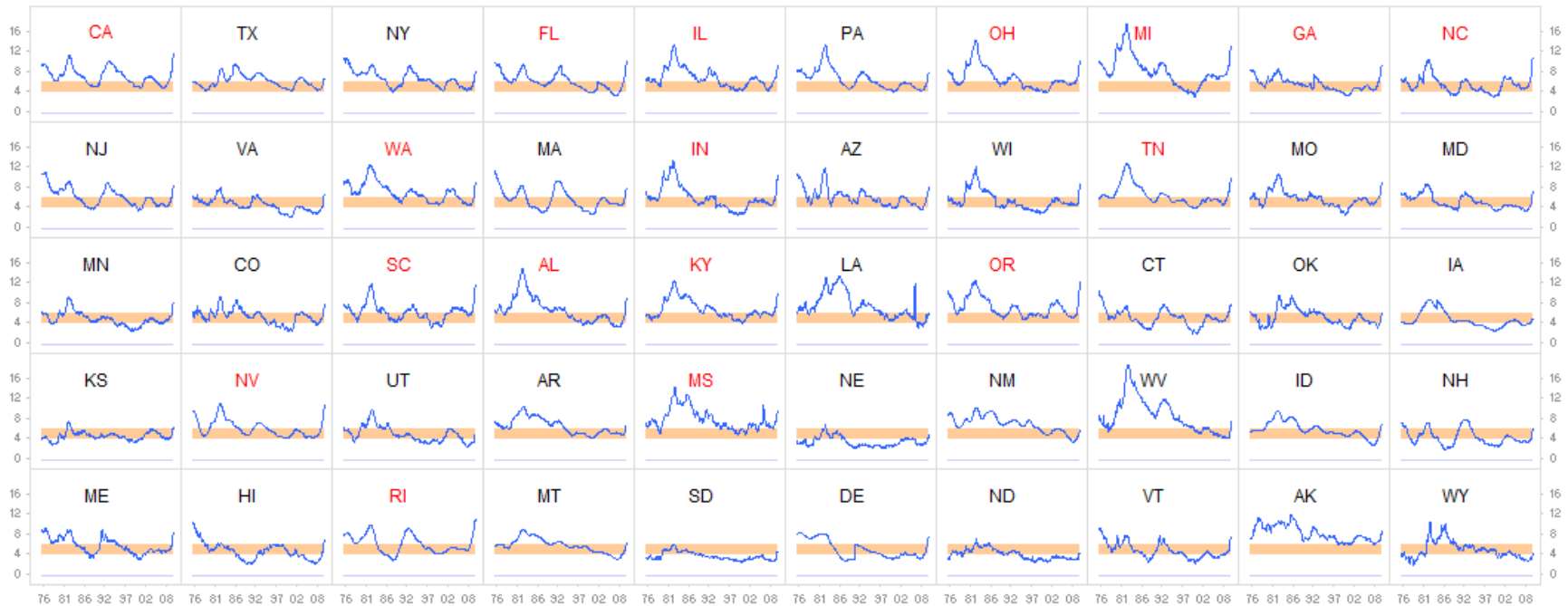
People at risk for a first heart attack are often recommended to take aspirin daily to prevent it. Only a very few will actually see this benefit and there's no way to know in advance who.

**1** Heart Attack is Prevented

<http://www.nytimes.com/2015/01/27/upshot/can-this-treatment-help-me-theres-a-statistic-for-that.html>

# Repetition: small multiples

Monthly Unemployment Rates by State, Jan 1976 - Apr 2009



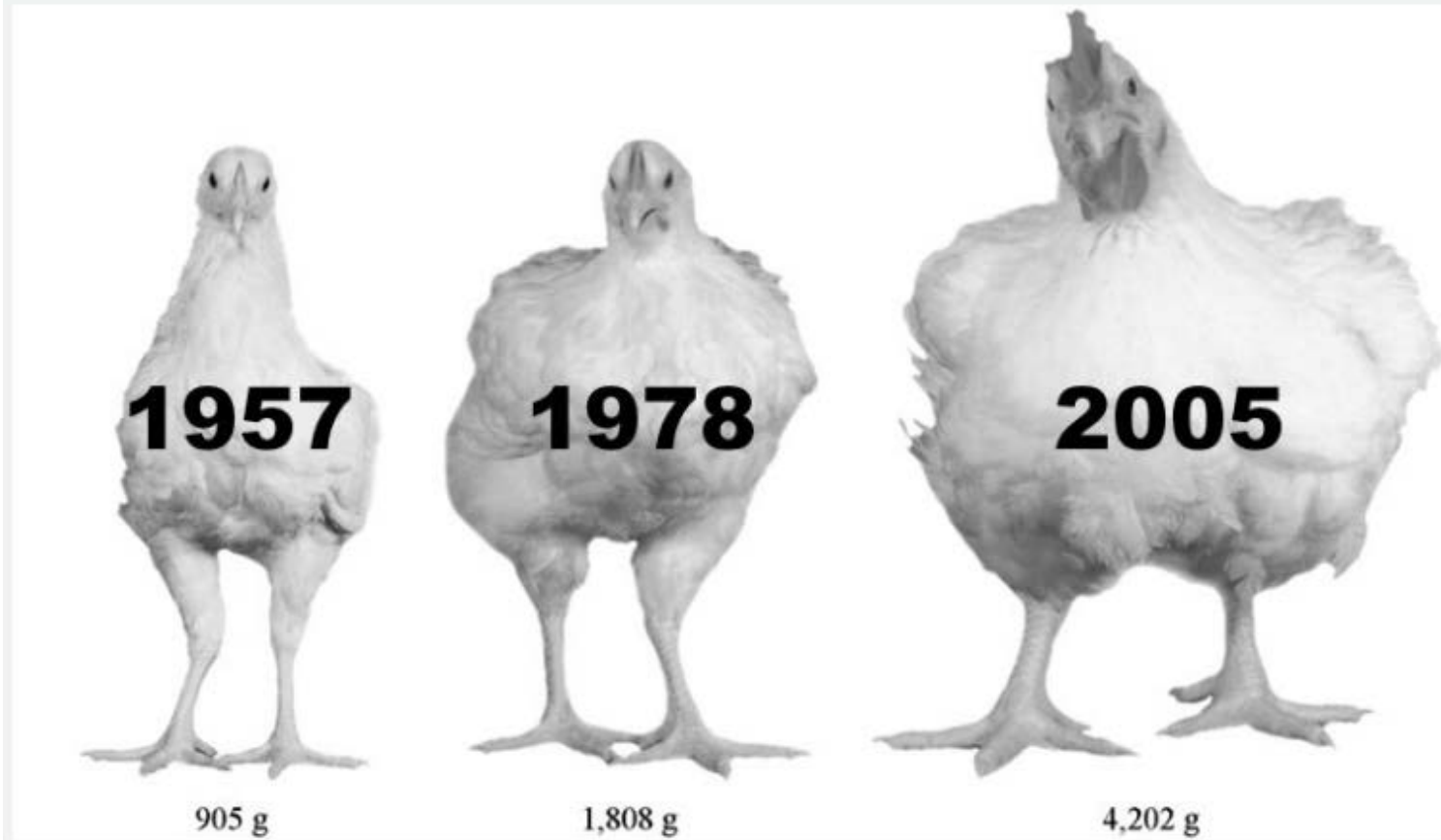
Source: Bureau of Labor Statistics

Notes: The orange band denotes a "normal" unemployment rate (4%-6%);  
State code in red: unemployment rate in April 2009 is higher than the US average

<http://www.juceanalytics.com/writing/better-know-visualization-small-multiples>

# Contrast

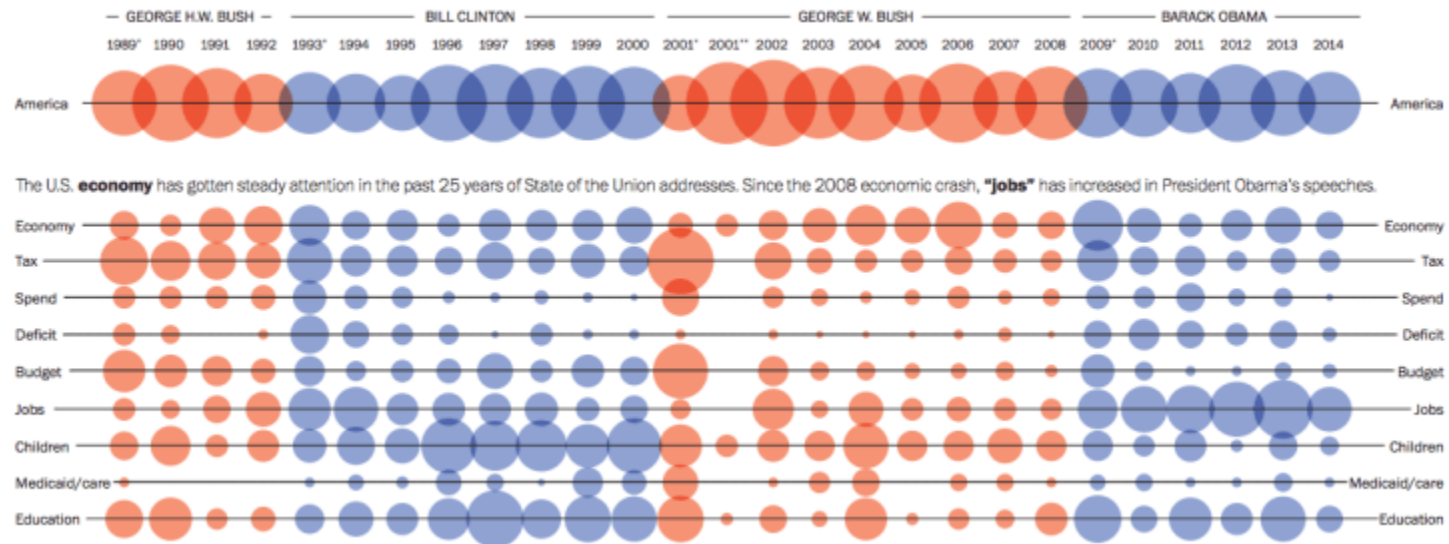
Here are three different breeds of chicken, raised on the exact same diet:



Zuidhof, M.J. et al. 2014 *Poultry Science* 93 :1-13/Numbers added by Vox.

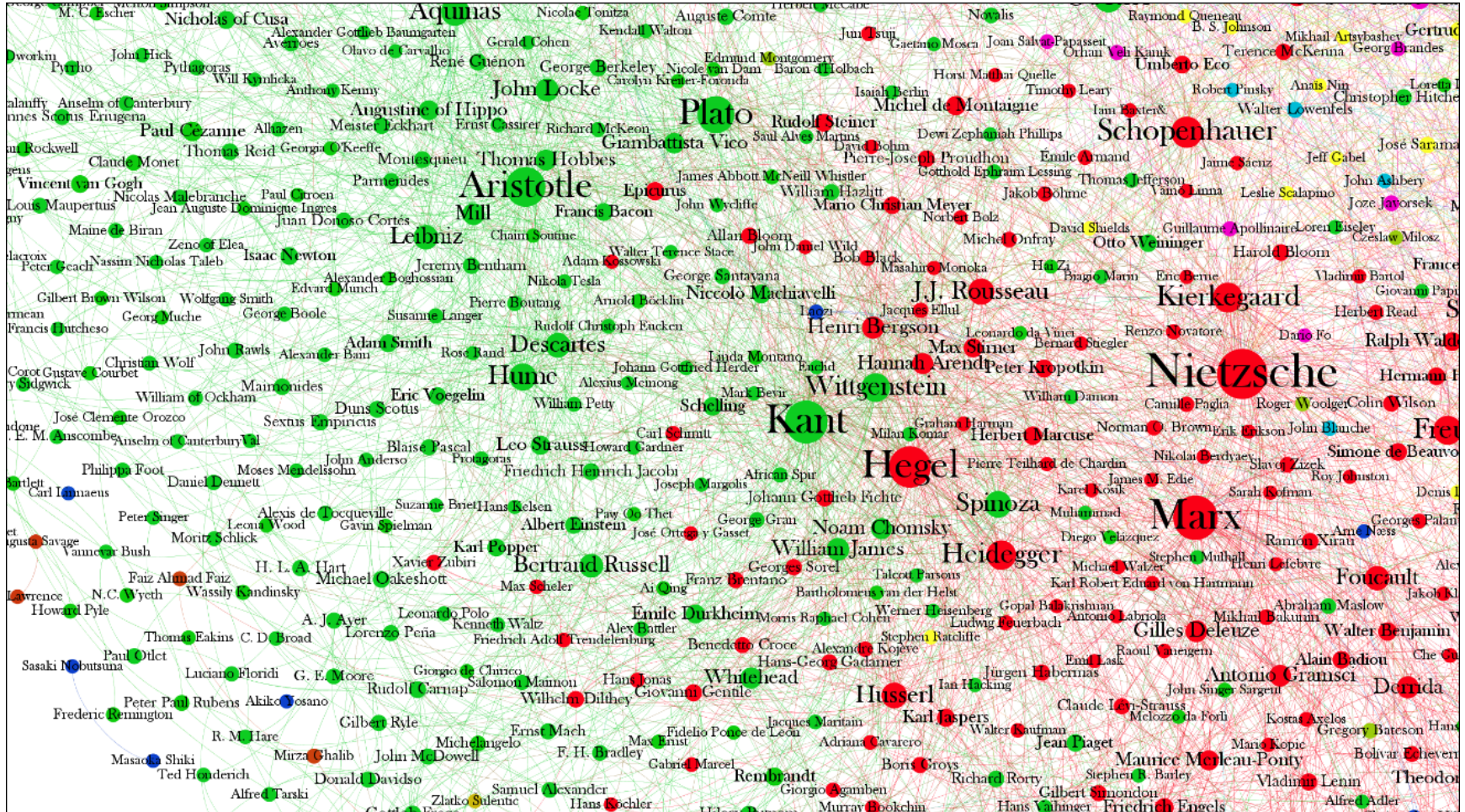
<http://www.vox.com/xpress/2014/10/2/6875031/chickens-breeding-farming-boilers-giant>

## History through the president's words



<http://www.washingtonpost.com/wp-srv/special/politics/2014-state-of-the-union/language-of-sotu/>

# Proximity



<http://zoom.it/l3dq>



# Recommended resources

- Cairo, Alberto (2013). *The Functional Art: An Introduction to Information Graphics and Visualization*.
- Wong, Dona (2014). *The Wall Street Journal Guide to Information Graphics: The Dos and Don'ts of Presenting Data, Facts, and Figures*.

# Websites to follow

- Flowing Data, <http://flowingdata.com/>
- Junk Charts,  
[http://junkcharts.typepad.com/junk\\_charts/](http://junkcharts.typepad.com/junk_charts/)
- 13 pt, <http://13pt.com/>