

# Choosing the Right Visual

# The Art of Visualizing Data

- Storytelling is an art
- Visualization is a form of storytelling

Why should we be interested in visualization? Because the human visual system is a pattern seeker of enormous power and subtlety. The eye and the visual cortex of the brain form a massively parallel processor that provides the highest-bandwidth channel into human cognitive centers.... If we can understand how perception works, our knowledge can be translated into rules for displaying information.... [W]e can present our data in such a way that the important and informative patterns stand out. If we disobey the rules, our data will be incomprehensible or misleading.

-- Colin Ware (*Information Visualization: Perception for Design*)

# Data is the art of storytelling

## Let's really make it ART

When we present data, we are trying to tell a story.

- Kids prefer stories with illustrations, because they are only just learning about how the world looks and works
- Visualization aids unfamiliar audiences

Find a clear story to tell, and let your visuals help you tell it.

# The challenges of visualization

## 1. Dimensionality

- We often have a lot of different features in our data
- We can't easily process more than 2 or 3 at once

## 2. Context

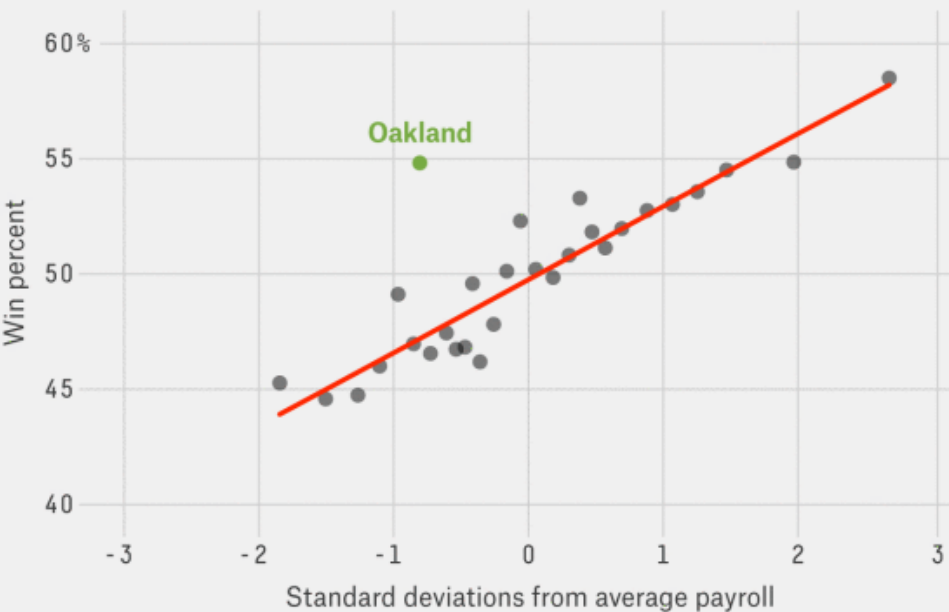
- It can be hard to understand a figure's context

# Classic Visuals



## Season Win Percent vs. Relative Payroll

Standard deviations above/below league average (15 team bins)



# Classic Visuals

Our visuals should be

1. Aesthetically Pleasing
2. Novel
3. Informative
4. Efficient

# Aesthetically Pleasing

- Don't let beauty overwhelm data
- Aesthetics should accentuate the information
- Familiar looks and feels can help!



# Novel

A visual can be novel in many ways:

- Novel Data
- Novel Insights
- Novel Presentation

Most often, designs that delight us do so not because they were designed to be novel, but because they were designed to be effective -- Beautiful Visualization

# Informative

A visual that [is not informative] has failed. -- Beautiful Visualization

**Ask:** What is the intended usage of our visual?

My goal is to display \_\_\_\_\_ so that \_\_\_\_\_ can \_\_\_\_\_.

- What is our context of use?
- Is it for presentation or exploration?

Catering a visual to our audience ensures that they can quickly obtain the most valuable information.



# Efficient

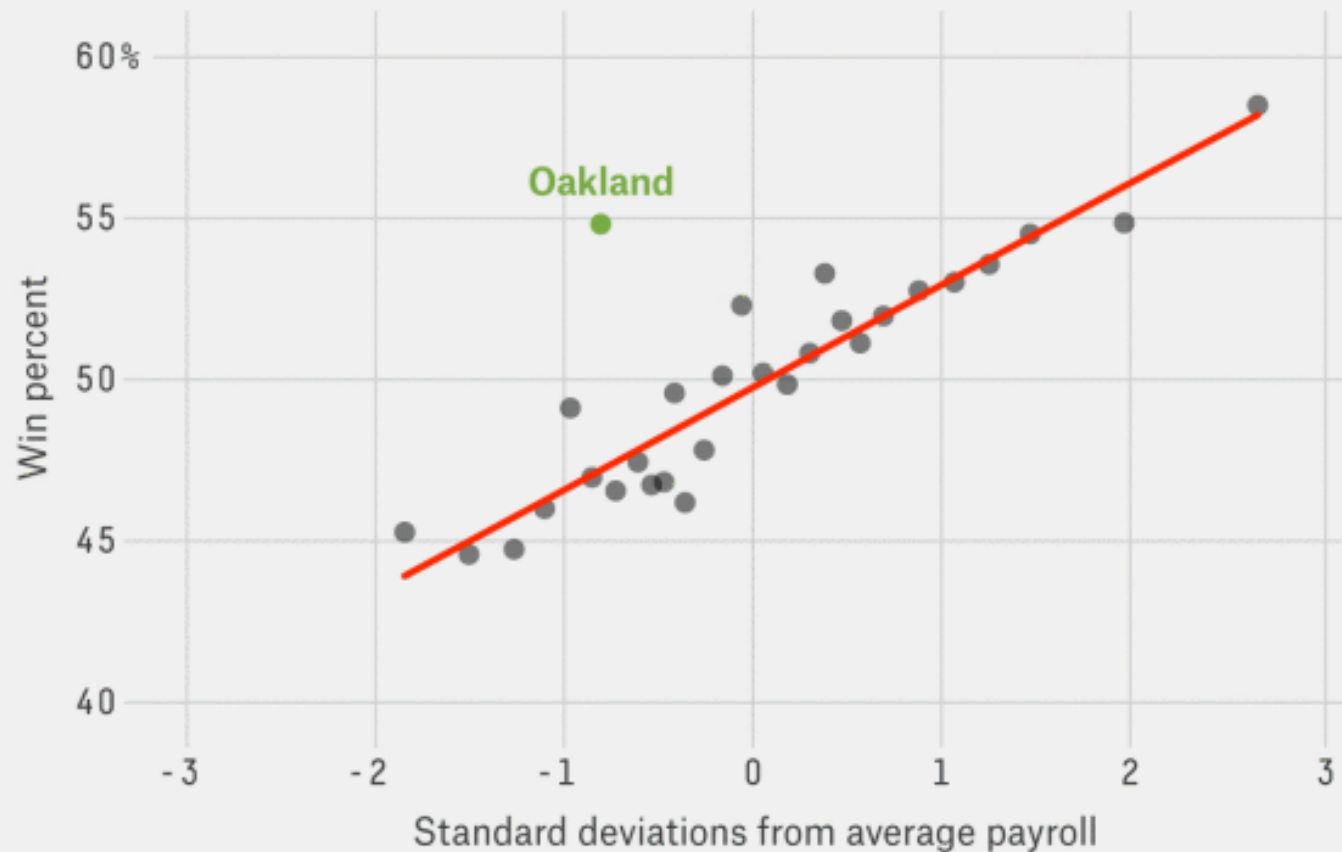
Irrelevant data is the same thing as noise. If it's not helping, it's probably getting in the way. -- Beautiful Visualization

- The minimum viable product concept is critical in visualization of data
  - Each new element slows your audience's perception of the important points
  - BUT! Don't omit critical components

# Efficient

## Season Win Percent vs. Relative Payroll

Standard deviations above/below league average (15 team bins)



# An amazing visual

## Periodic Table of the Elements

1 IA																	18 VIIIA
1 H	2 He																
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg	3 IIIV	4 IVB	5 VB	6 VIB	7 VIIB	8	9 VII	10	11 IB	12 IIB	13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	57-71	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	89-103	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Uut	114 Fl	115 Uup	116 Lv	117 Uus	118 Uuo
6	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu	6	
7	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr	7	

Alkali Metals

Alkali Earth Metals

Transition Metals

Other Metals

Metalloids

Other Non Metals

Halogens

Noble Gases

Lanthanides & Actinides

## A PERIODIC TABLE OF VISUALIZATION METHODS

<b>€</b> euro Data Visualization Visual representation of quantitative data in schematic form (either with or without axes)	<b>€</b> euro Strategy Visualization The systematic use of complementary visual representations in the analysis, development, formulation, extension, update and implementation of strategies in organizations	<b>€</b> euro Graphic visualization
<b>Tb</b> titanium Information Visualization The use of computer-based representations of data to simplify cognition. This means that the data is transformed into an image, it is subject to screen space. The image can be changed to suit the person working with it.	<b>€</b> euro Metaphor Visualization Visual metaphors present information graphically to organize and structure information. They also carry on insight about the represented information through the key characteristics of the metaphor that is employed.	<b>€</b> euro Compound Visualization The complementary use of different graphic representations forms in one single scheme or frame
<b>Pi</b> pencil Concept Visualization Methods in education (mostly) emphasize concepts, ideas, plans, and analysis.	<b>€</b> euro Metaphor Visualization Visual metaphors present information graphically to organize and structure information. They also carry on insight about the represented information through the key characteristics of the metaphor that is employed.	<b>€</b> euro Compound Visualization The complementary use of different graphic representations forms in one single scheme or frame
<b>B</b> beryllium Data Visualization Visual representation of quantitative data in schematic form (either with or without axes)	<b>Ae</b> argon Information Visualization The use of computer-based representations of data to simplify cognition. This means that the data is transformed into an image, it is subject to screen space. The image can be changed to suit the person working with it.	<b>R</b> rhenium Metaphor Visualization Visual metaphors present information graphically to organize and structure information. They also carry on insight about the represented information through the key characteristics of the metaphor that is employed.
<b>Hi</b> hydrogen Data Visualization Visual representation of quantitative data in schematic form (either with or without axes)	<b>Sc</b> scandium Information Visualization The use of computer-based representations of data to simplify cognition. This means that the data is transformed into an image, it is subject to screen space. The image can be changed to suit the person working with it.	<b>Sa</b> samarium Metaphor Visualization Visual metaphors present information graphically to organize and structure information. They also carry on insight about the represented information through the key characteristics of the metaphor that is employed.
<b>Tk</b> tantalum Data Visualization Visual representation of quantitative data in schematic form (either with or without axes)	<b>Sp</b> selenium Information Visualization The use of computer-based representations of data to simplify cognition. This means that the data is transformed into an image, it is subject to screen space. The image can be changed to suit the person working with it.	<b>Da</b> dysprosium Metaphor Visualization Visual metaphors present information graphically to organize and structure information. They also carry on insight about the represented information through the key characteristics of the metaphor that is employed.

**€** Process Visualization  
**Hy** Structure Visualization  
Note: Depending on your location and connection speed it can take some time to load a pop-up picture.  
© Ralph Lengler & Martin J. Eppler, www.visual-literacy.org version 1.5

<b>Su</b> sulfur Data Visualization Visual representation of quantitative data in schematic form (either with or without axes)	<b>Pe</b> pencil Information Visualization The use of computer-based representations of data to simplify cognition. This means that the data is transformed into an image, it is subject to screen space. The image can be changed to suit the person working with it.	<b>St</b> steel Metaphor Visualization Visual metaphors present information graphically to organize and structure information. They also carry on insight about the represented information through the key characteristics of the metaphor that is employed.	<b>Oc</b> oxygen Compound Visualization The complementary use of different graphic representations forms in one single scheme or frame	<b>Ho</b> holmium Data Visualization Visual representation of quantitative data in schematic form (either with or without axes)	<b>Fd</b> fermium Information Visualization The use of computer-based representations of data to simplify cognition. This means that the data is transformed into an image, it is subject to screen space. The image can be changed to suit the person working with it.	<b>Ft</b> fermium Metaphor Visualization Visual metaphors present information graphically to organize and structure information. They also carry on insight about the represented information through the key characteristics of the metaphor that is employed.	<b>Mq</b> manganese Compound Visualization The complementary use of different graphic representations forms in one single scheme or frame	<b>Ld</b> lead Data Visualization Visual representation of quantitative data in schematic form (either with or without axes)	<b>Po</b> polonium Information Visualization The use of computer-based representations of data to simplify cognition. This means that the data is transformed into an image, it is subject to screen space. The image can be changed to suit the person working with it.	<b>S</b> sulfur Metaphor Visualization Visual metaphors present information graphically to organize and structure information. They also carry on insight about the represented information through the key characteristics of the metaphor that is employed.	<b>Sm</b> samarium Compound Visualization The complementary use of different graphic representations forms in one single scheme or frame	<b>Is</b> iodine Data Visualization Visual representation of quantitative data in schematic form (either with or without axes)	<b>Tc</b> technetium Information Visualization The use of computer-based representations of data to simplify cognition. This means that the data is transformed into an image, it is subject to screen space. The image can be changed to suit the person working with it.
<b>Ed</b> europium Data Visualization Visual representation of quantitative data in schematic form (either with or without axes)	<b>Pf</b> pencil Information Visualization The use of computer-based representations of data to simplify cognition. This means that the data is transformed into an image, it is subject to screen space. The image can be changed to suit the person working with it.	<b>Sg</b> selenium Metaphor Visualization Visual metaphors present information graphically to organize and structure information. They also carry on insight about the represented information through the key characteristics of the metaphor that is employed.	<b>Mz</b> manganese Compound Visualization The complementary use of different graphic representations forms in one single scheme or frame	<b>Z</b> zinc Data Visualization Visual representation of quantitative data in schematic form (either with or without axes)	<b>Ad</b> adamantium Information Visualization The use of computer-based representations of data to simplify cognition. This means that the data is transformed into an image, it is subject to screen space. The image can be changed to suit the person working with it.	<b>De</b> deuterium Metaphor Visualization Visual metaphors present information graphically to organize and structure information. They also carry on insight about the represented information through the key characteristics of the metaphor that is employed.	<b>Bm</b> beryllium Compound Visualization The complementary use of different graphic representations forms in one single scheme or frame	<b>Stc</b> steel Data Visualization Visual representation of quantitative data in schematic form (either with or without axes)	<b>Vc</b> vanadium Information Visualization The use of computer-based representations of data to simplify cognition. This means that the data is transformed into an image, it is subject to screen space. The image can be changed to suit the person working with it.	<b>Hy</b> hydrogen Metaphor Visualization Visual metaphors present information graphically to organize and structure information. They also carry on insight about the represented information through the key characteristics of the metaphor that is employed.	<b>Sr</b> strontium Compound Visualization The complementary use of different graphic representations forms in one single scheme or frame	<b>Ta</b> tantalum Data Visualization Visual representation of quantitative data in schematic form (either with or without axes)	<b>Sd</b> selenium Information Visualization The use of computer-based representations of data to simplify cognition. This means that the data is transformed into an image, it is subject to screen space. The image can be changed to suit the person working with it.

So terrible...

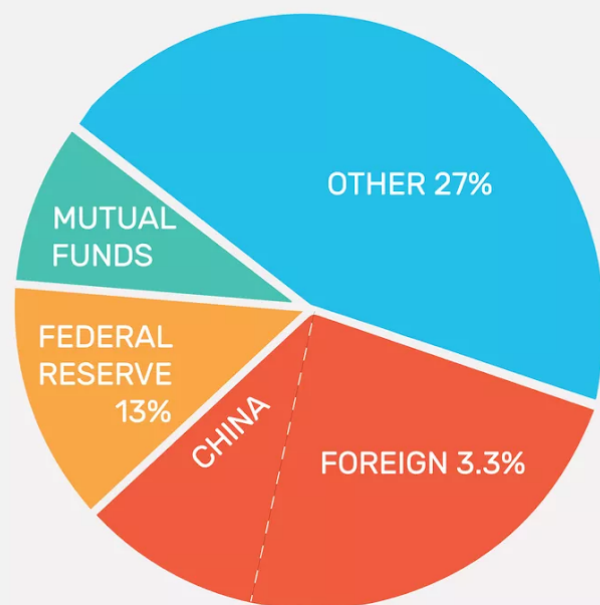
Maybe we do **this** instead...

Or **this**?

Or anything else!

# Another atrocity

## US National Debt Holdings in Trillions



### OTHER 27%

STATE AND LOCAL GOVERNMENT  
PENSION FUNDS  
5%

OFFICE OF PERSONNEL  
MANAGEMENT RETIREMENT  
5%

BANKS  
4%

MILITARY RETIREMENT  
4%

STATE AND LOCAL GOVERNMENT  
PENSION FUNDS  
5%

CASH ON HAND TO FUND  
FEDERAL GOVERNMENT  
OPERATIONS 3%

SOCIAL SECURITY  
15%

INSURANCE COMPANIES  
2%

ALL OTHER  
RETIREMENT FUNDS  
2%

MEDICARE  
2%

PRIVATE PENSION  
FUNDS  
3%

PRIVATE PENSION  
FUNDS  
3%

US SAVINGS  
BONDS  
1%



# A template process

1. Write down your goal and intent for the visual
2. Gather the data that will help you achieve that goal
3. Decide how to tell your intended story with the data
4. Apply a visual representation of your data

# Visual Options in Tableau

Let's walk through this process to address the following question:

How have global civil liberties changed over time?

# Visual Options in Tableau

We will explore the following charts:

1. Bar Chart
2. Histogram
3. Packed Bubbles
4. Line Charts (revisited)

And the following techniques:

- Grouping
- Aggregating
- Trend Lines