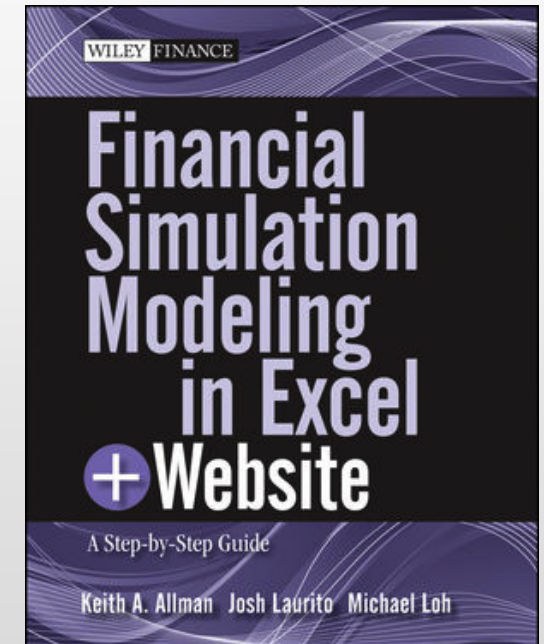


# Knowledge & Visual Analytics

Lecture 1

Josh Laurito

# Who Am I?



# Who Is Aaron?



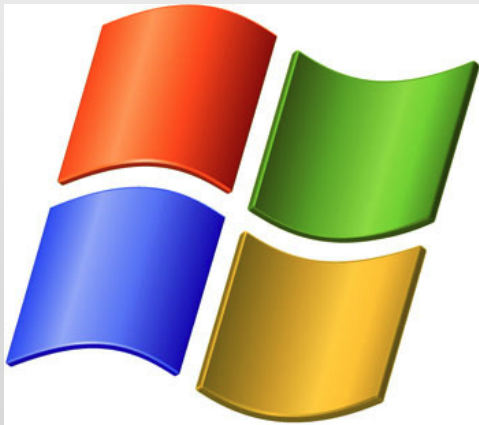
**NOKIA**



# What Do You Do?

Tech? Industries? Goals for this class?

Please fill out initial survey



images via wikipedia



# What is this Class About?

How to present information

How to present quantitative information

How to present quantitative information graphically

How to use technology to present quantitative information graphically

# General Class Info

All class dates are in the syllabus

Every class, a short quiz and a homework will be due

At the end of the semester, you will complete a larger, public project

If you have questions, email me at [josh.laurito@gmail.com](mailto:josh.laurito@gmail.com)







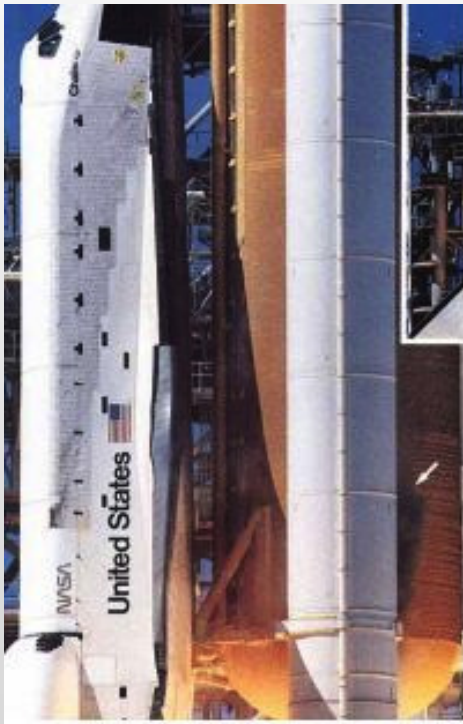
# Visualization Technique & Theory

# Importance of Data Visualization



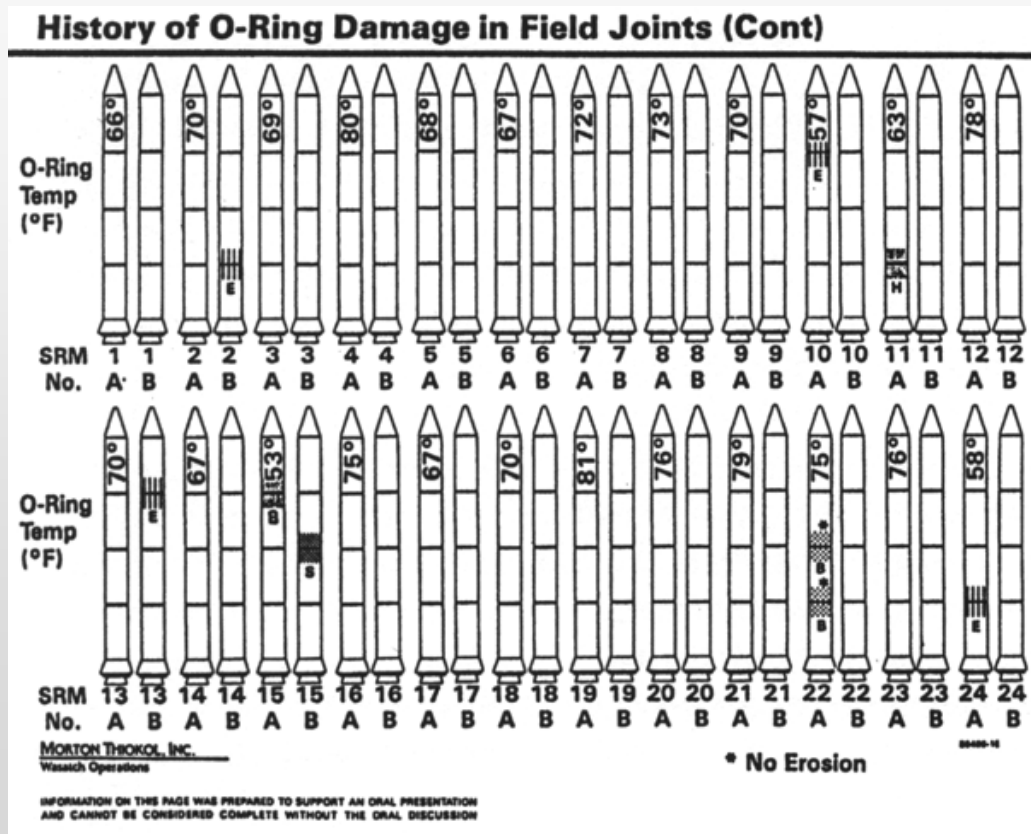
[http://news.bbc.co.uk/2/shared/spl/hi/pop\\_ups/06/sci\\_nat\\_1986\\_challenger\\_disaster/html/1.stm](http://news.bbc.co.uk/2/shared/spl/hi/pop_ups/06/sci_nat_1986_challenger_disaster/html/1.stm)

# Importance of Data Visualization



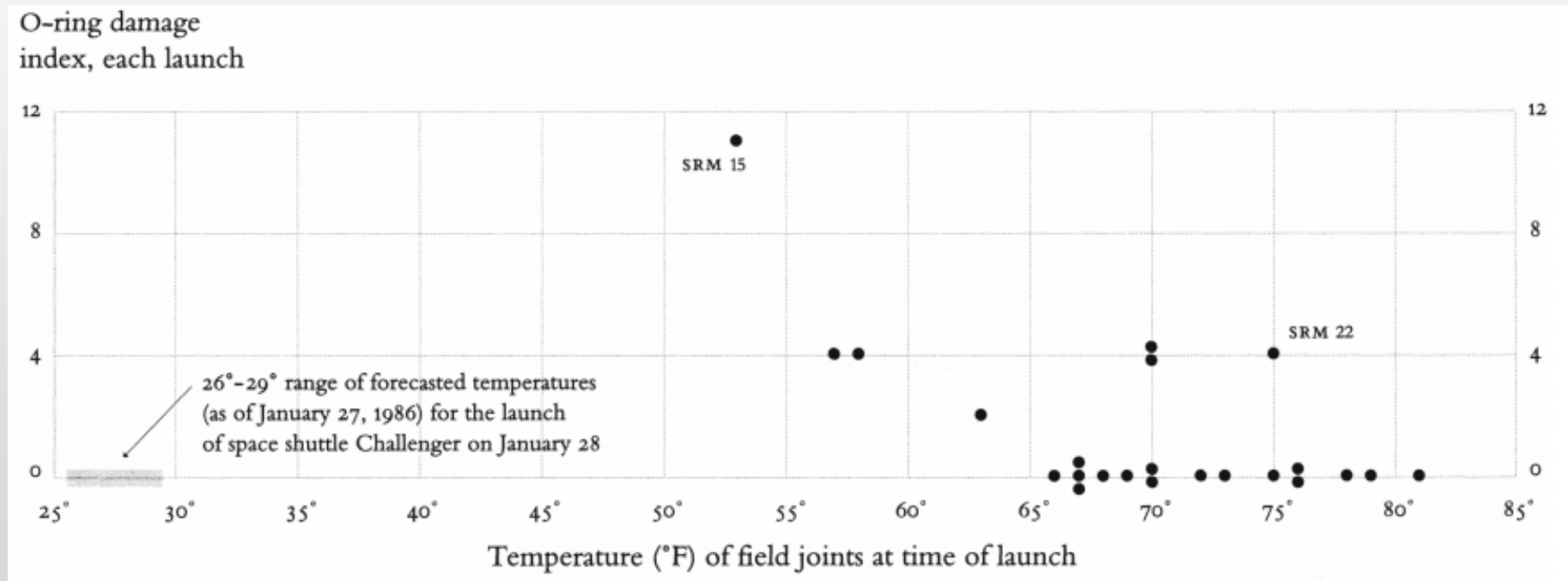
<http://www.aerospaceweb.org/question/investigations/q0122.shtml>

# Importance of Data Visualization



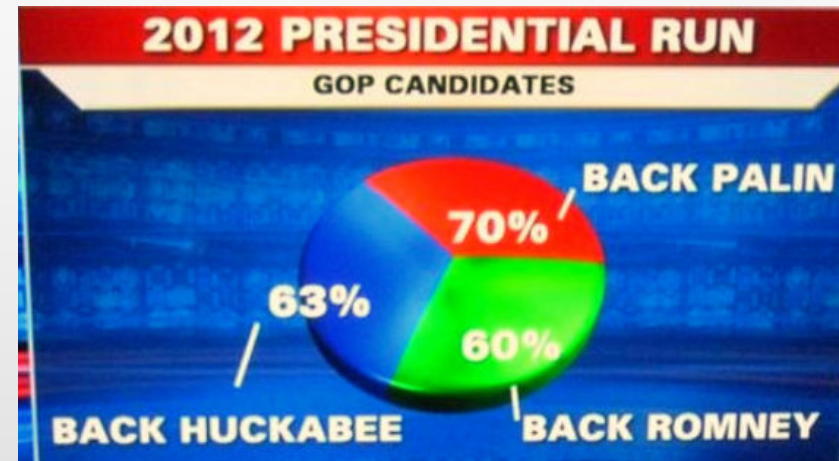
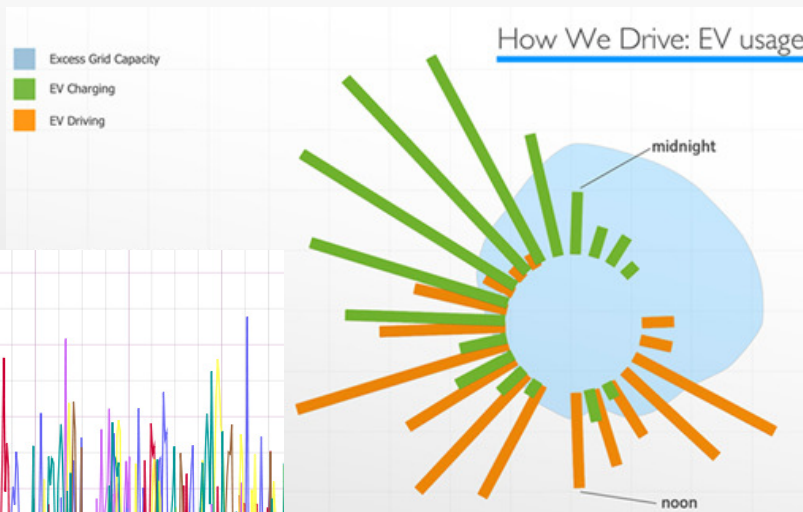
From Tufte's *Visual Explanations*

# Importance of Data Visualization



From Tufte's *Visual Explanations*

# Other Bad Visualizations



<http://blog.visual.ly/poor-visualization-can-do-more-harm-than-good/>  
<http://www.nbcchicago.com/news/local/FOX-News-Chart-Fails-Math-73711092.html>  
<http://themonkeycage.org/2013/01/08/how-2012-stacks-up-the-worst-graph-on-record/>



# Goals of Data Visualization

Data Visualization has a few primary goals:

Minimize mental effort (images are more clear than numbers)

Make information easy to retain (memory is often visual)

Insight over beauty ('Aha!' is more important than 'wow')

# Visualization Strategies

Ways to make visualization **clear**, **memorable** and **insightful**:

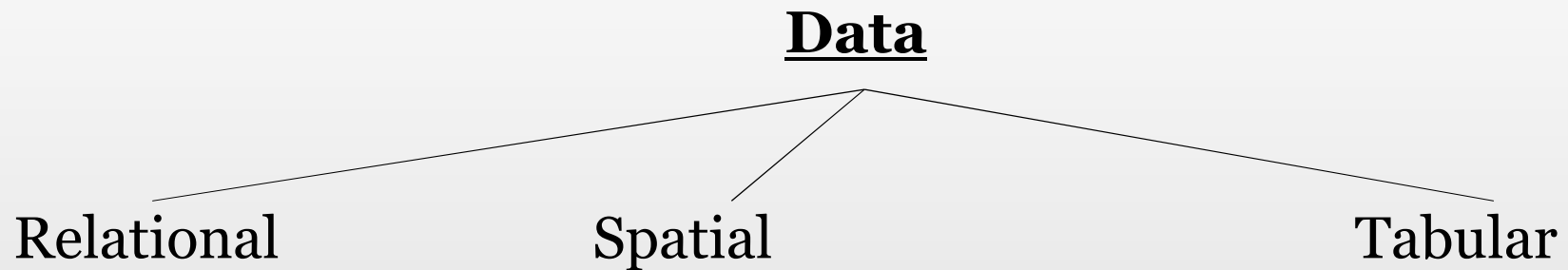
Match display to data and purpose

Maximize information-to-ink ratio

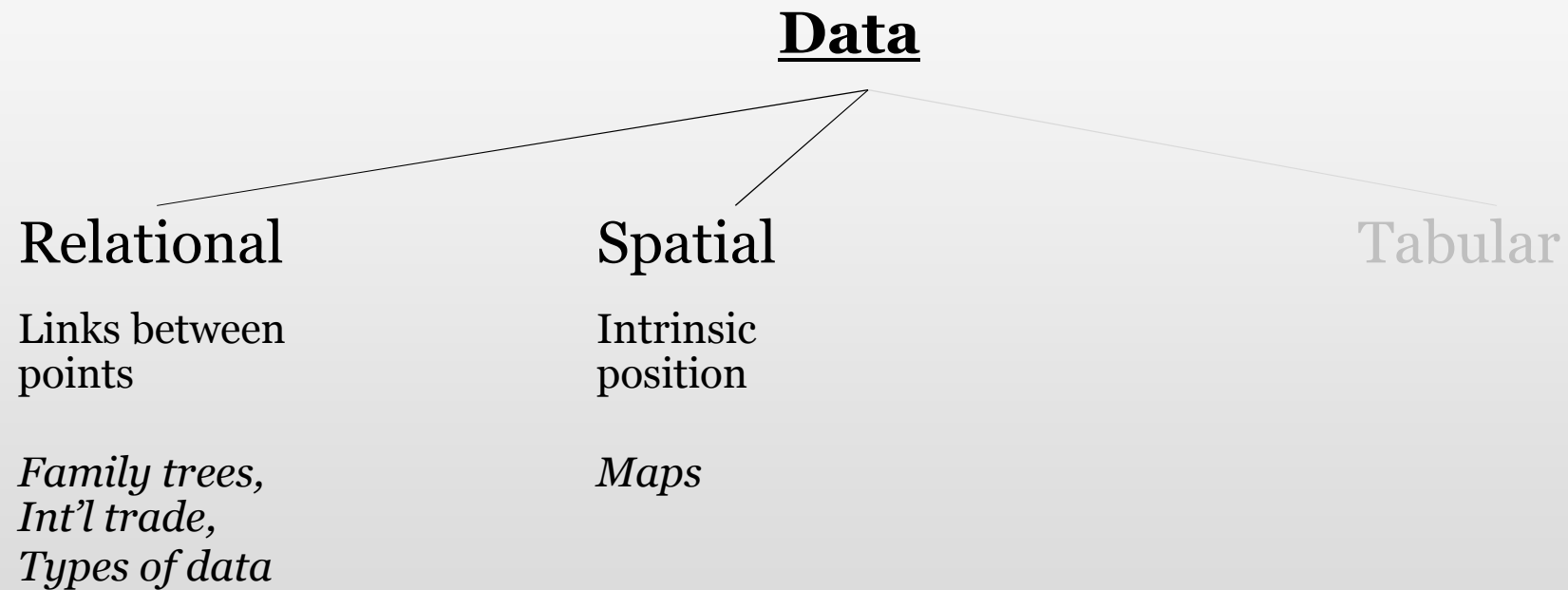
Principal of small multiples



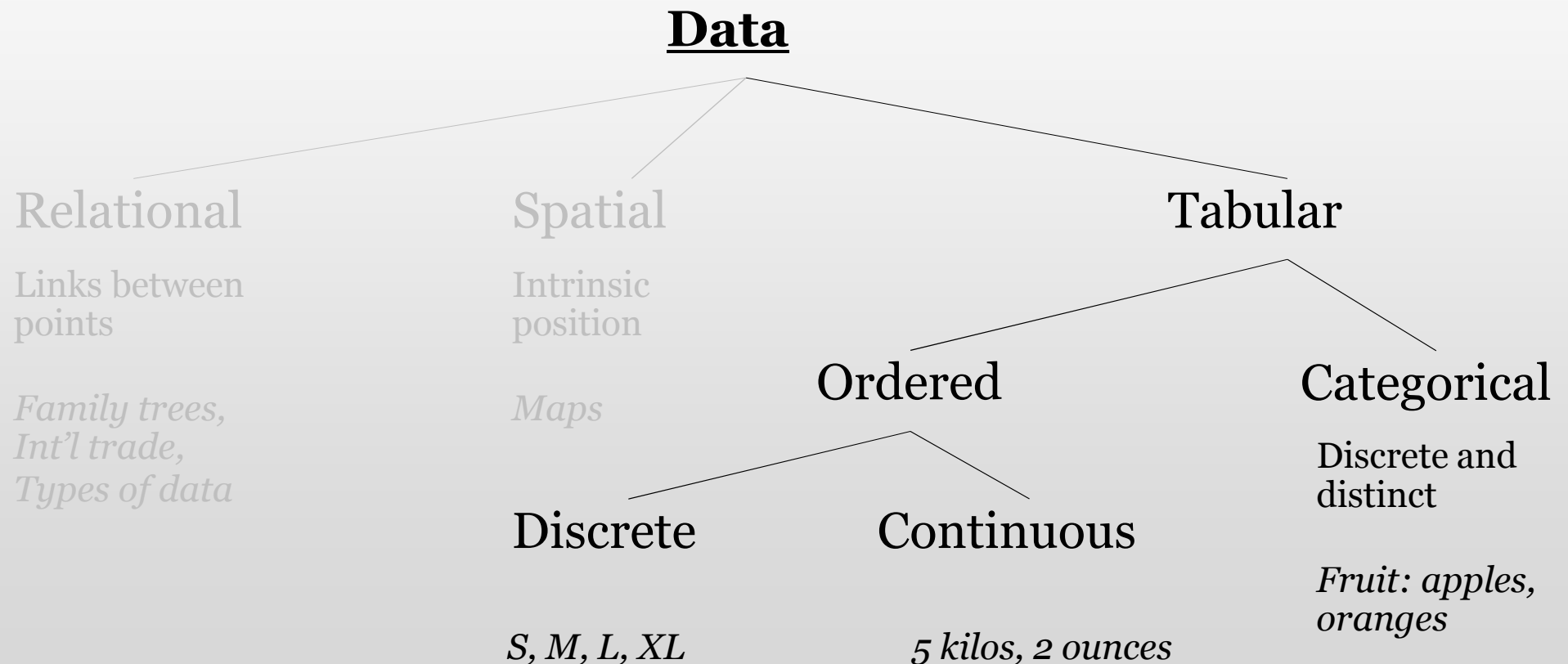
# Match Display to Data and Purpose



# Match Display to Data and Purpose



# Match Display to Data and Purpose



# Match Display to Data and Purpose

Relational

Spatial

Ordered  
discrete/cont.

Categorical

# Match Display to Data and Purpose

Relational

Spatial

Ordered  
discrete/cont.

Categorical

Maps



# Match Display to Data and Purpose

Relational

Spatial

Ordered  
discrete/cont.

Categorical

Contain

Connect

Similarity

Proximity

Maps

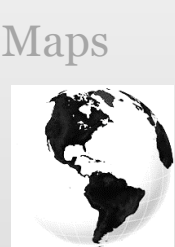


# Match Display to Data and Purpose

## Relational

- Contain
  - • •
  - • •
- Connect
  - • •
  - • •
- Similarity
  - ○ ○
  - ○ ○
- Proximity
  - • •
  - • •

## Spatial



## Ordered discrete/cont.

- Position
  - | • •
- Length
  - | — —
- Area
  - ■
- Shade
  - ■
- Saturation
  - ■
- etc...

## Categorical

# Match Display to Data and Purpose

## Relational

Contain	•	•	•
	•	•	•
Connect	•	•	•
	•	•	•
Similarity	•	o	o
	•	o	o
Proximity	•	•	•
	•	•	•

## Spatial

Maps



## Ordered discrete/cont.

Position		•	•
Length			
Area			
Shade			
Saturation			
etc...			

## Categorical

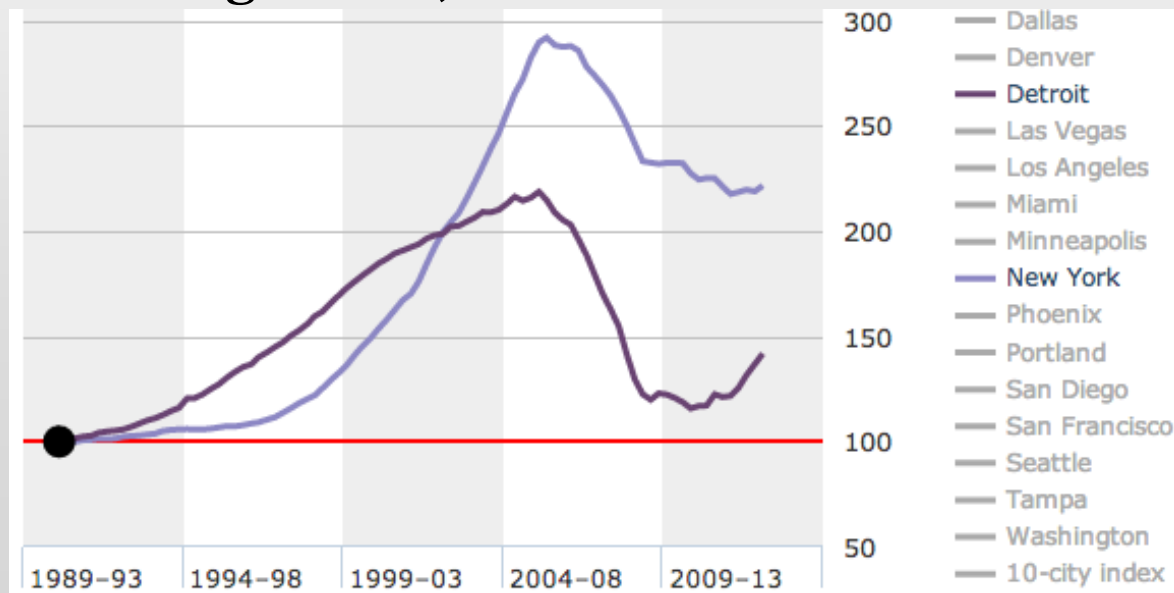
Position	•	•	•
	•	•	•
Color	•	•	•
	•	•	•
Shape	•	o	o
	•	o	o
Patterns			



# Match Dimensions to Data

Use highly ranked channels for key info to keep memorable

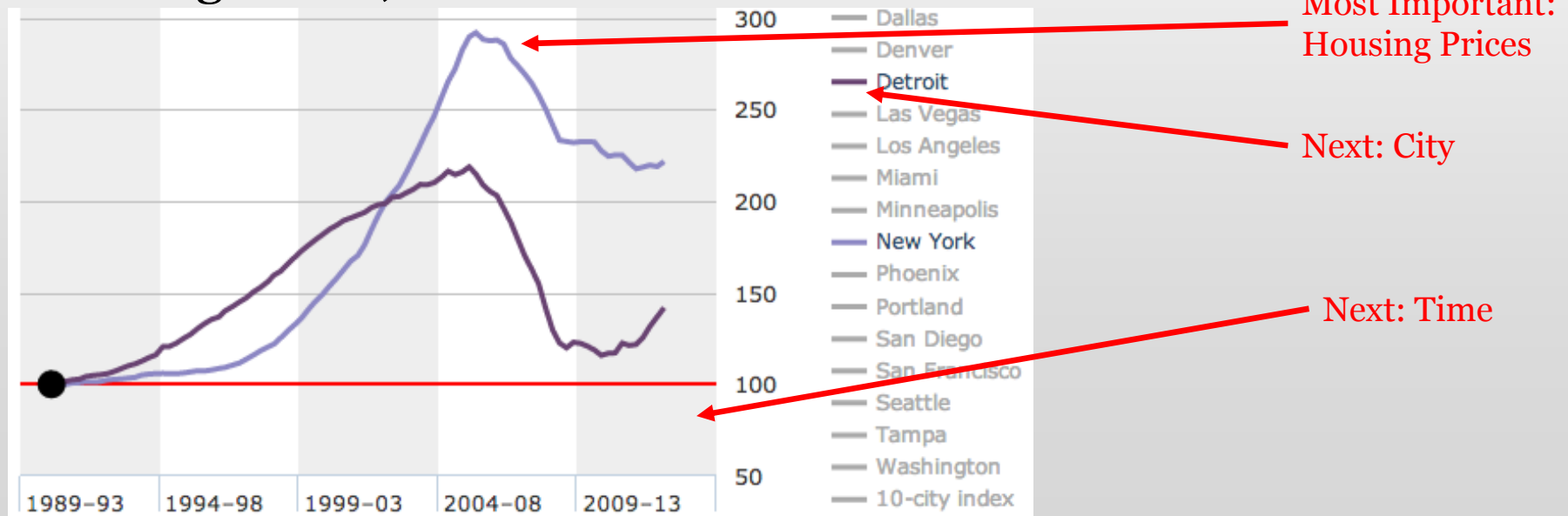
## Housing Prices, *The Economist*



# Match Dimensions to Data

Use highly ranked channels for key info to keep memorable

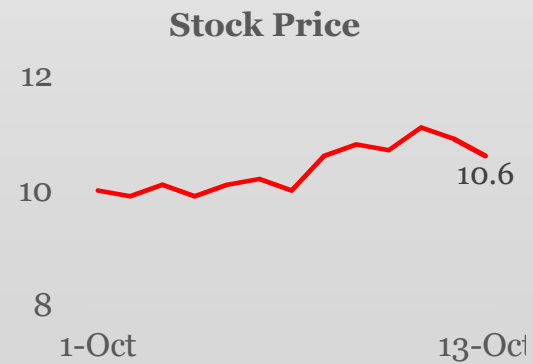
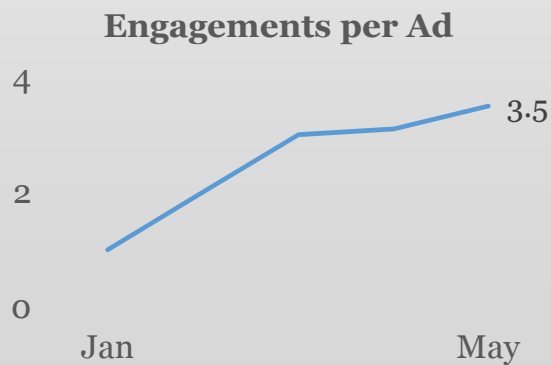
## Housing Prices, *The Economist*



# Maximize Information-to-Ink Ratio

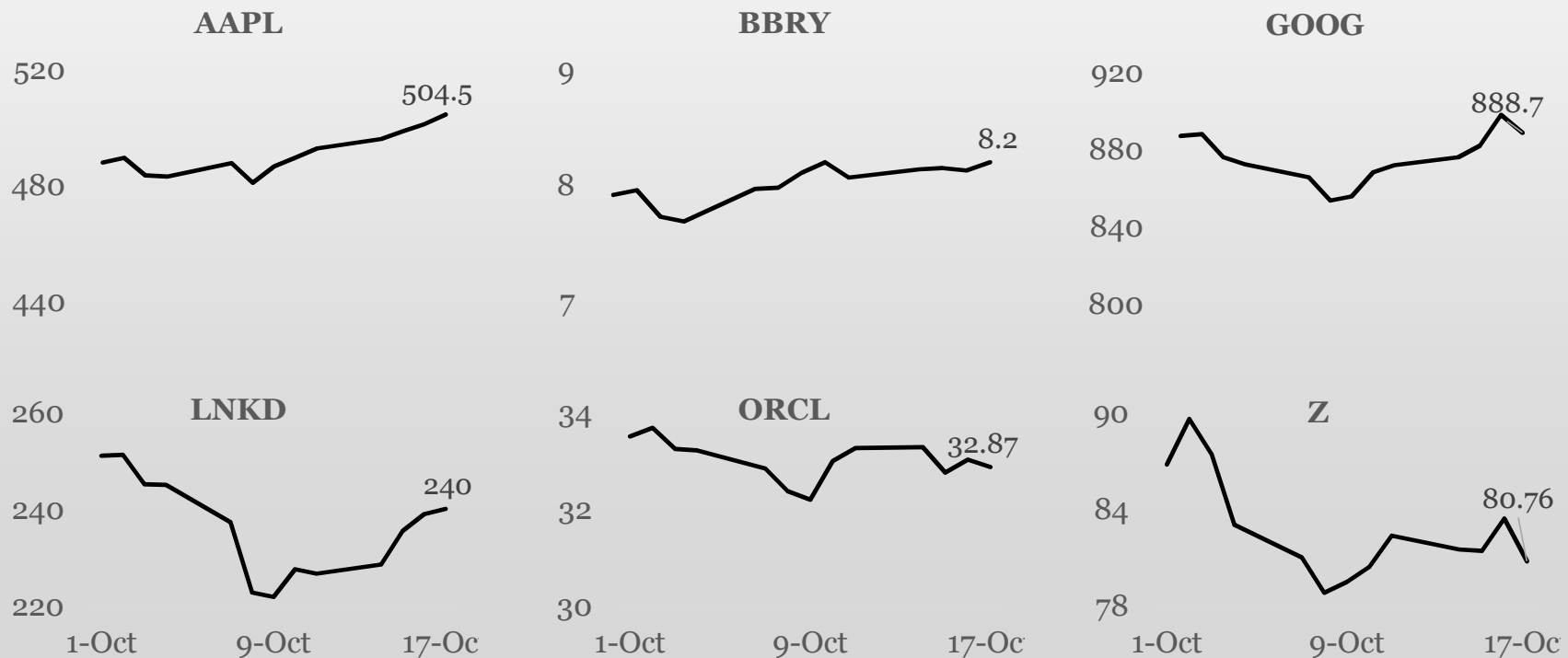
Achieve clarity by removing distractions & distracting elements

Taken to its logical endpoint: **Sparklines**



# Principal of Small Multiples

It is easier to compare items next to each other than over-plotted



# Principal of Small Multiples In Practice



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

Unique Visitors

227

Pages / Visit

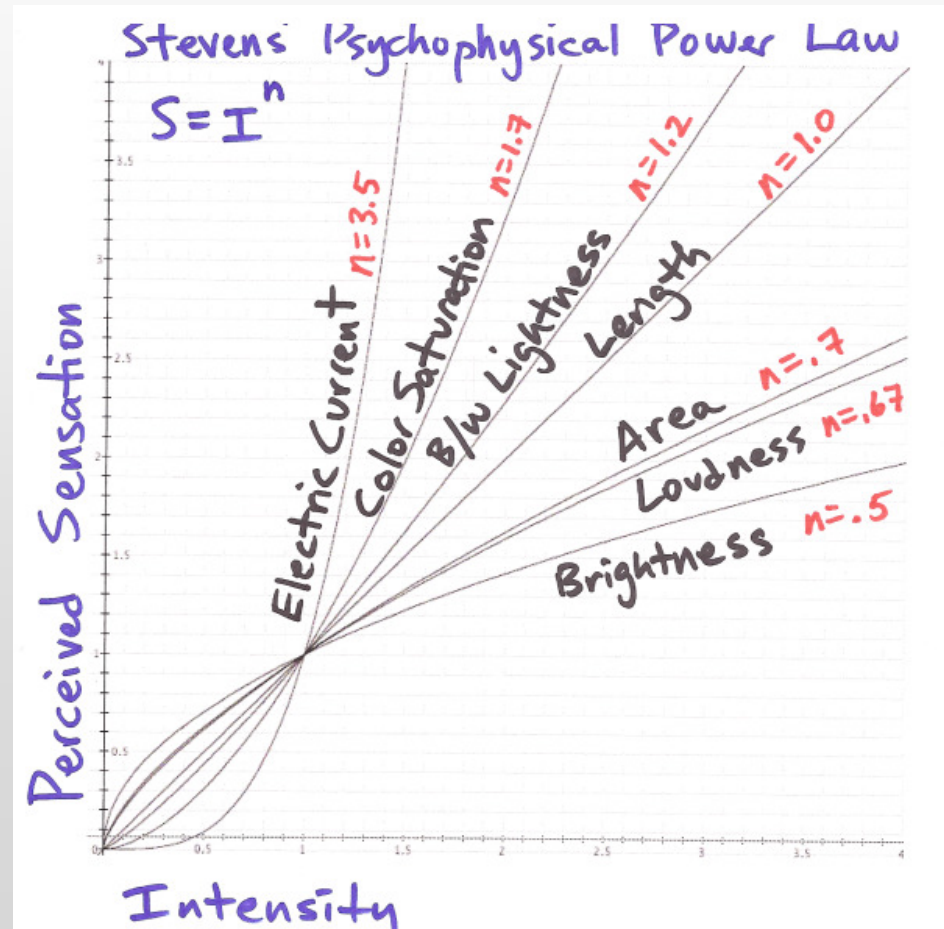
1.39

Bounce Rate

77.49%

<https://www.google.com/analytics/>

# Things To Keep in Mind - Dimensions



# Things To Keep in Mind - Discrimination

~3 for Pie Charts



~7 for colors (not as a scale!)



~4 overlapping lines

# Just the Basics

Data Visualization: seems small & cute, actually a huge topic!



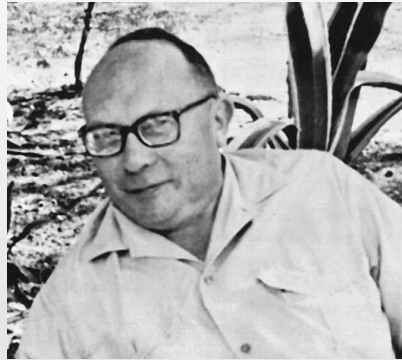
image via <http://www.cnn.com>



# Further Reading on Visualization

Pioneers:

Jacques Bertin



Edward Tufte



Current Leaders:

Tamara Munzner

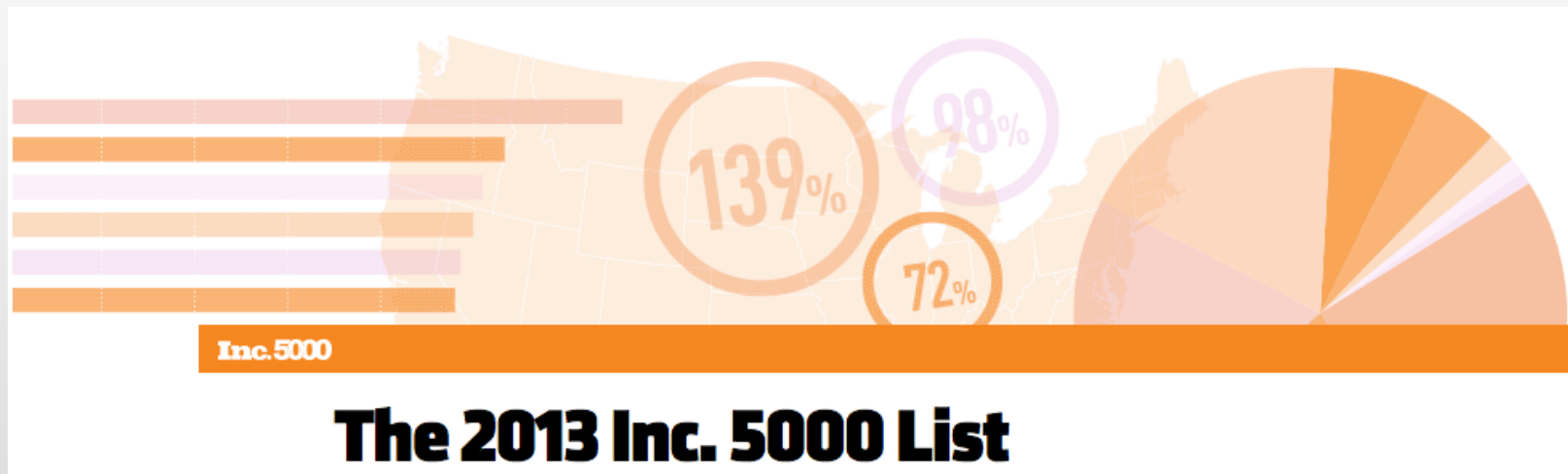


Mike Bostock



Favorites:  
[Bertin](#)  
[Tufte](#)  
[Munzner](#)  
[Bostock](#)

# Assignment 1 – Business Data, ggplot2



# Assignment 1 – Business Data, ggplot2

Read ggplot2 presentation

Submit code to me

Post images with some analysis

# Contact me with Questions

[josh.laurito@gmail.com](mailto:josh.laurito@gmail.com) is best