

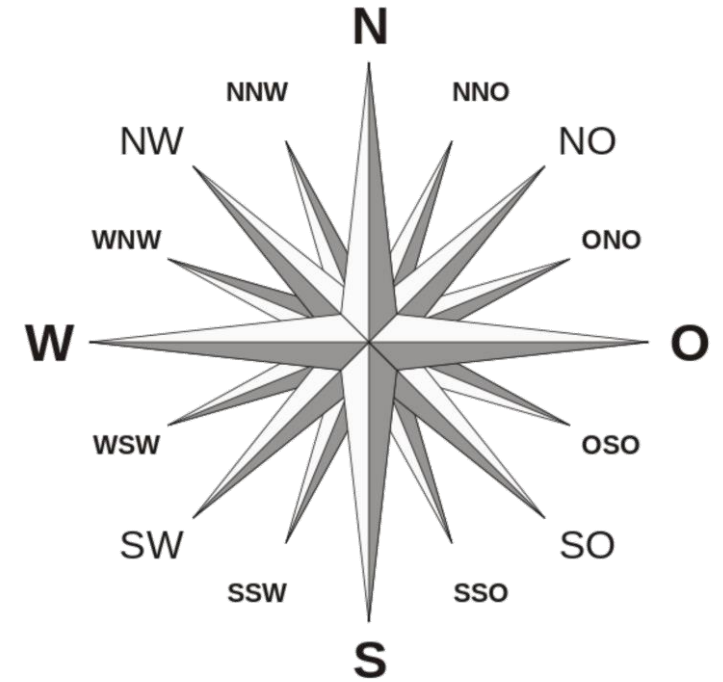
# Human Factors and Human-Machine Interaction Information Visualisation

**FACULTY**  
OF COMPUTER SCIENCE



# OVERVIEW

- (Historical) Examples
- Edward Tufte : Chart Junk, Lie Factor, Small Multiples
- No Good Ideas: The third dimension, pie charts
- Visual characteristics from head to toe: Bertin, Cleveland
- Examples: before & after



(NOT ONLY HISTORICAL)  
EXAMPLES





Exports and Imports to and from DENMARK & NORWAY from 1700 to 1780.

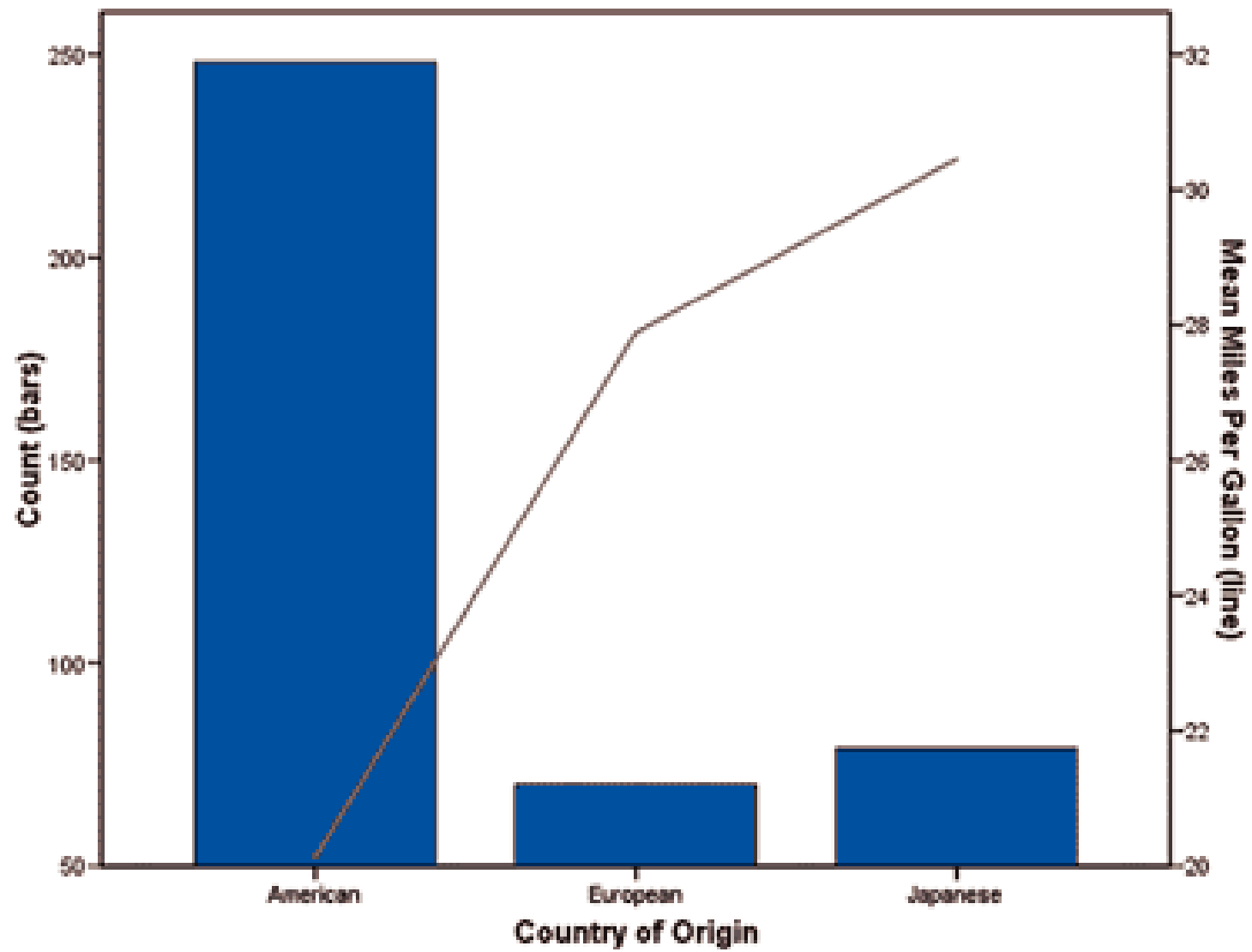


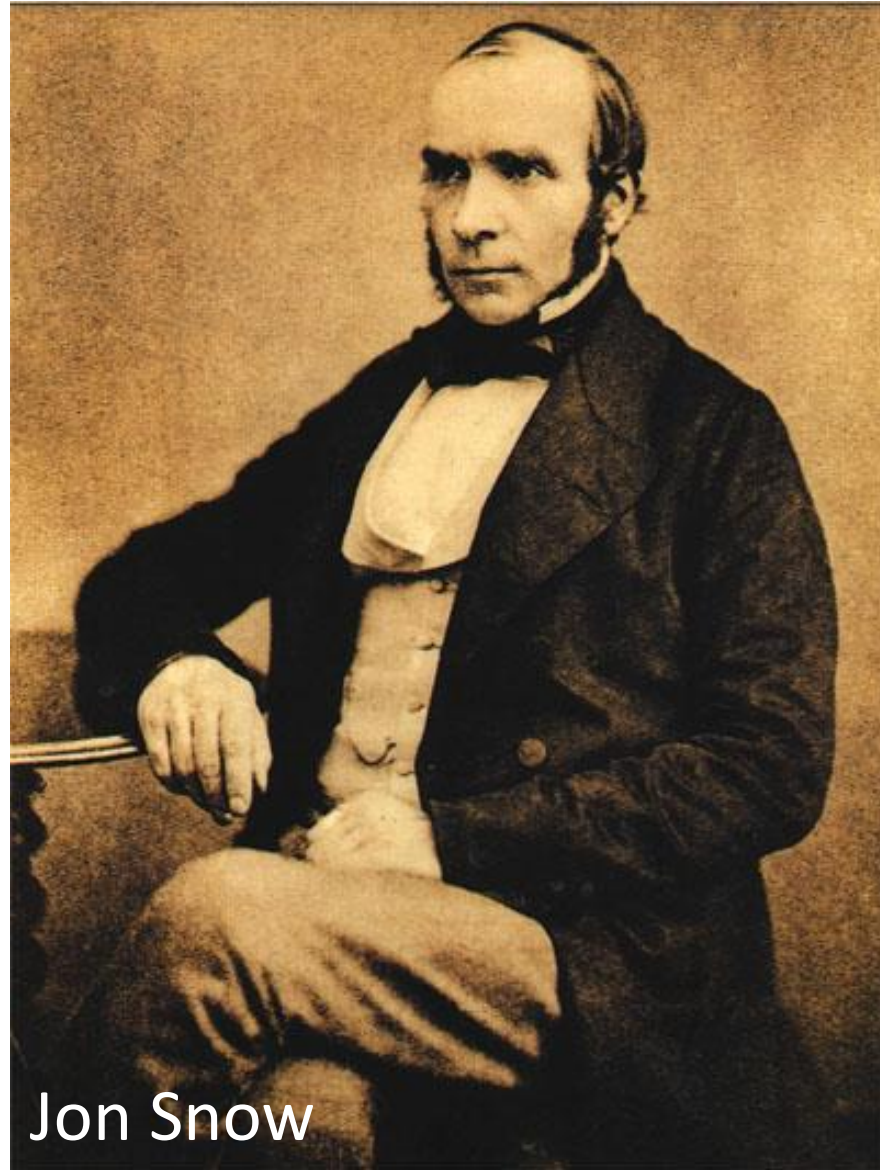
The Bottom line is divided into Years, the Right hand line into £10,000 each.

Published as the Act directs, 16<sup>th</sup> May 1786, by W<sup>m</sup> Playfair

Neale sculpt 332, Strand, London.

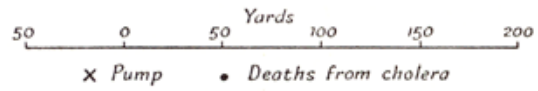






Jon Snow





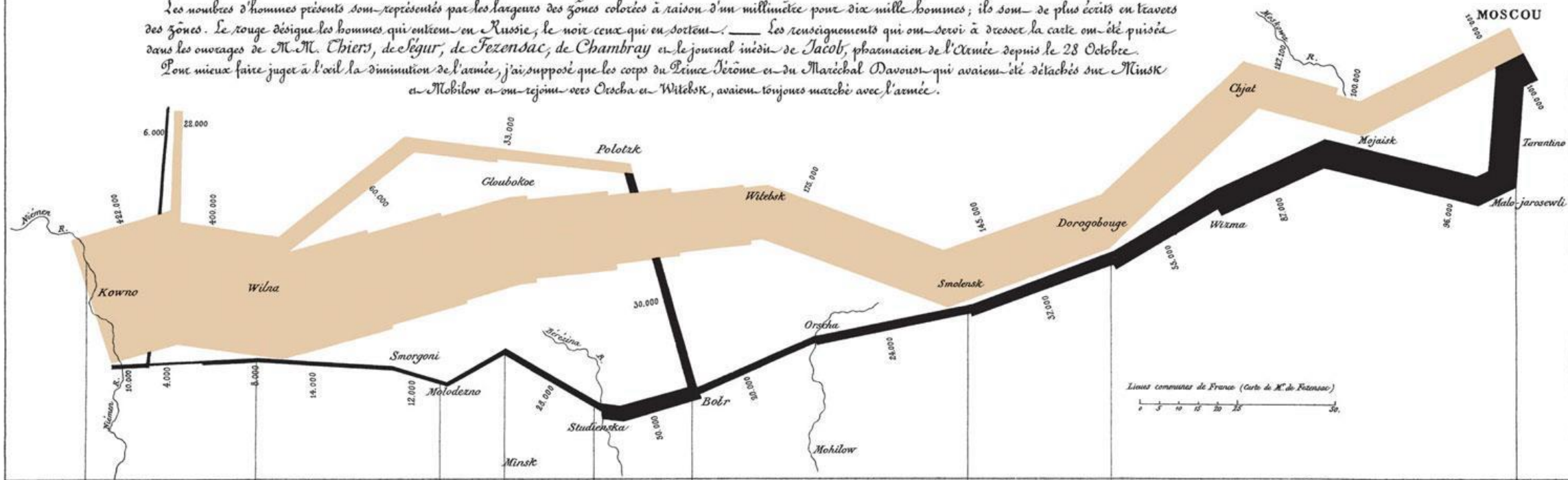


# Carte Figurative des pertes successives en hommes de l'Armée Française dans la Campagne de Russie 1812-1813.

Dressée par M. Minard, Inspecteur Général des Ponts et Chaussées en retraite Paris, le 20 Novembre 1869.

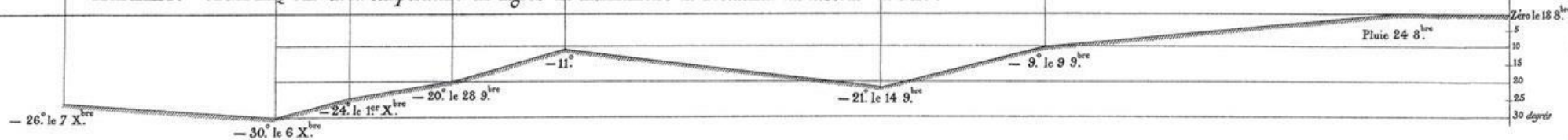
Les nombres d'hommes présents sont représentés par les largeurs des zones colorées à raison d'un millimètre pour dix mille hommes; ils sont de plus écrits en travers des zones. Le rouge désigne les hommes qui entrent en Russie, le noir ceux qui en sortent. — Les renseignements qui ont servi à dresser la carte ont été puisés dans les ouvrages de M. M. Thiers, de Ségur, de Fezensac, de Chambray et le journal inédit de Jacob, pharmacien de l'Armée depuis le 28 Octobre.

Pour mieux faire juger à l'œil la diminution de l'armée, j'ai supposé que les corps du Prince Jérôme et du Maréchal Davoust qui avaient été détachés sur Minsk et Mohilow et ont rejoint vers Orscha et Witebsk, avaient toujours marché avec l'armée.

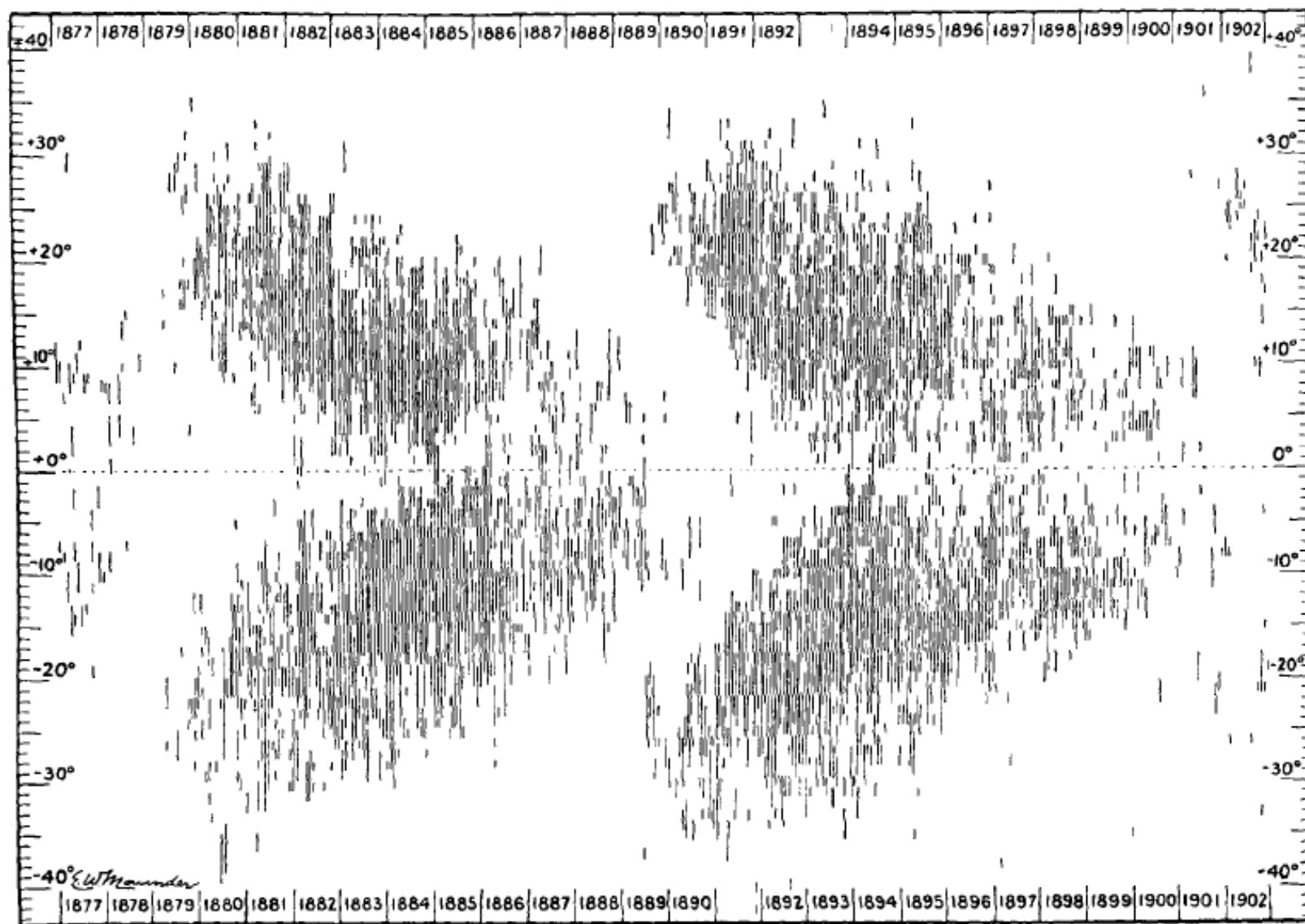


## TABLEAU GRAPHIQUE de la température en degrés du thermomètre de Réaumur au dessous de zéro.

Les Cosaques passent au galop le Niemen gelé.







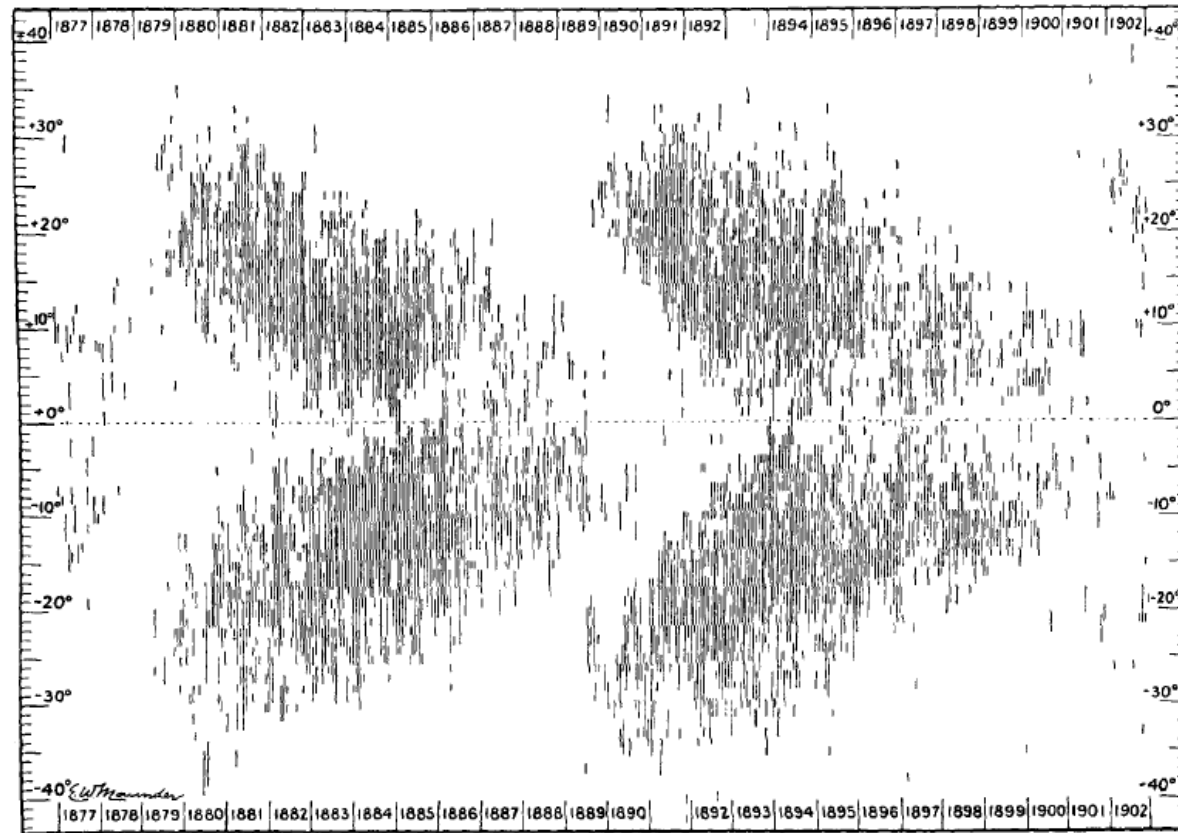
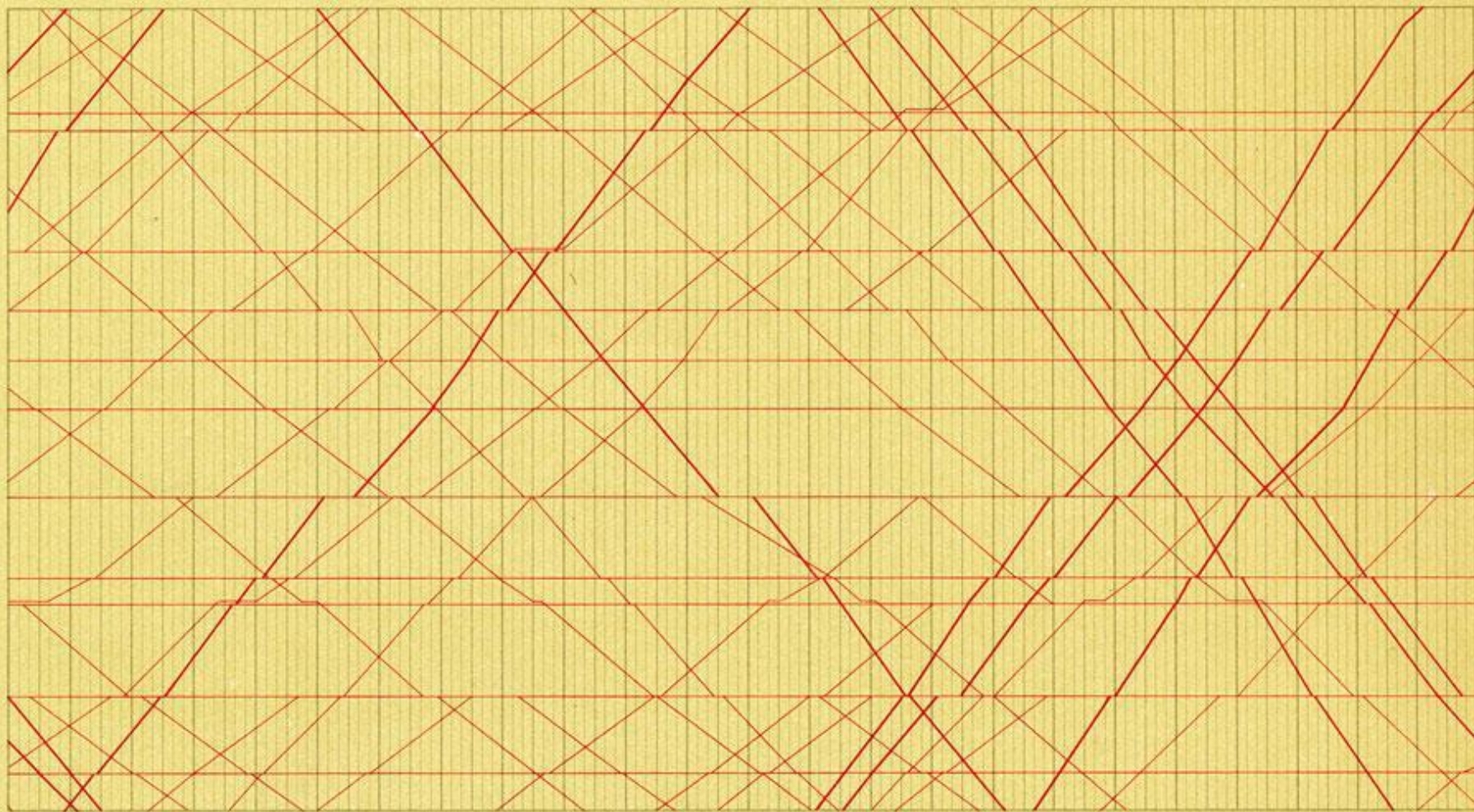


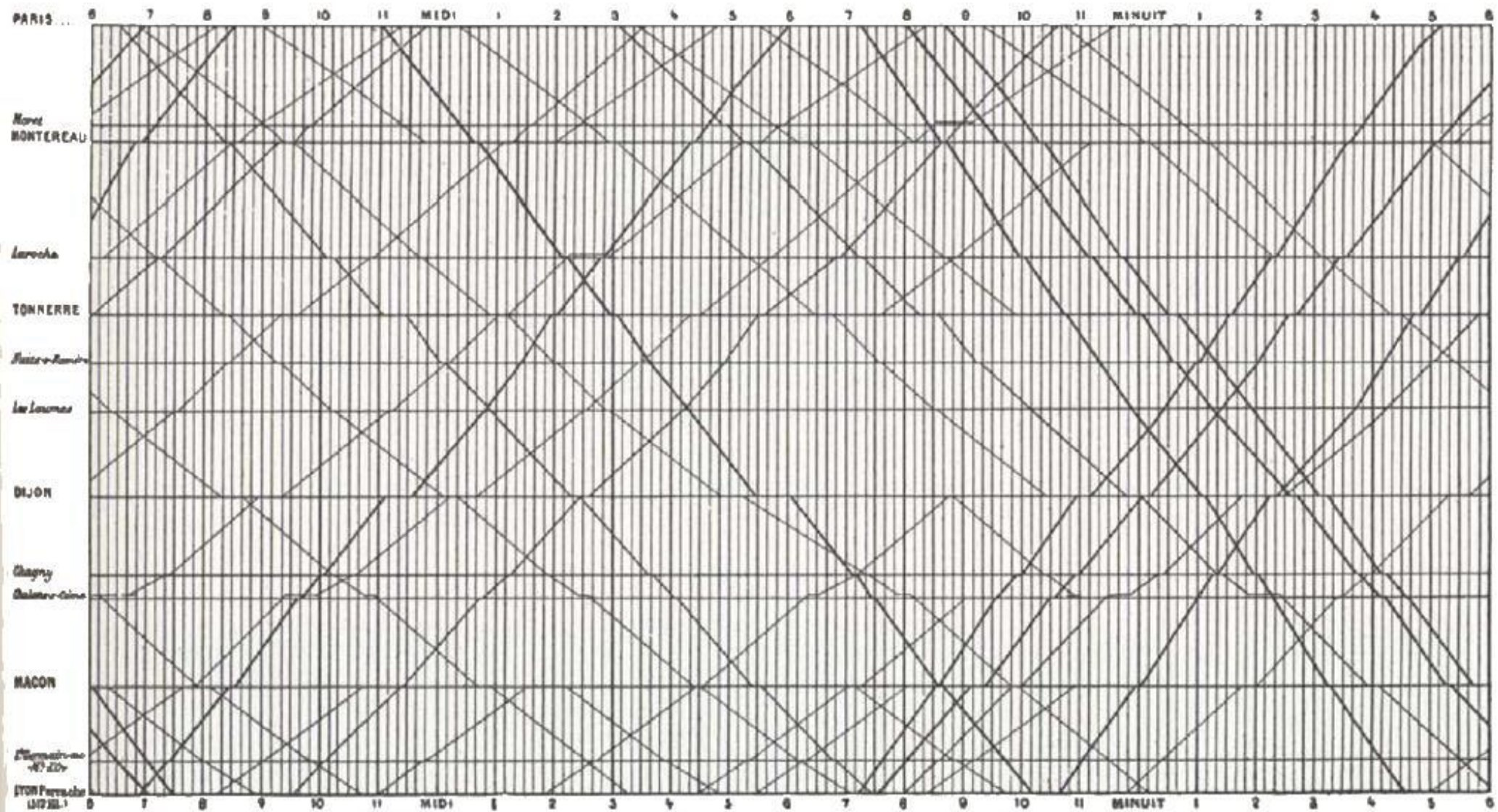
Figure 2.32: The vertical line segments denote the latitudinal extent of sunspots as observed versus time, which is the horizontal axis. Two space dimensions are collapsed into one by ignoring the longitudinal position and width of the sunspots. Note that Maunder has increased the “data-ink” ratio by restricting the latitudinal range to  $\pm 40^\circ$ ; there is only negligible sunspot at higher latitudes, so expanding the vertical axis would have added nothing. From E. W. Maunder, “Notes on the Distribution of Sun-Spots in Heliographic Latitude, 1874-1902,” *Royal Astronomical Society Monthly Notices*, 64, 747-761 (1904).







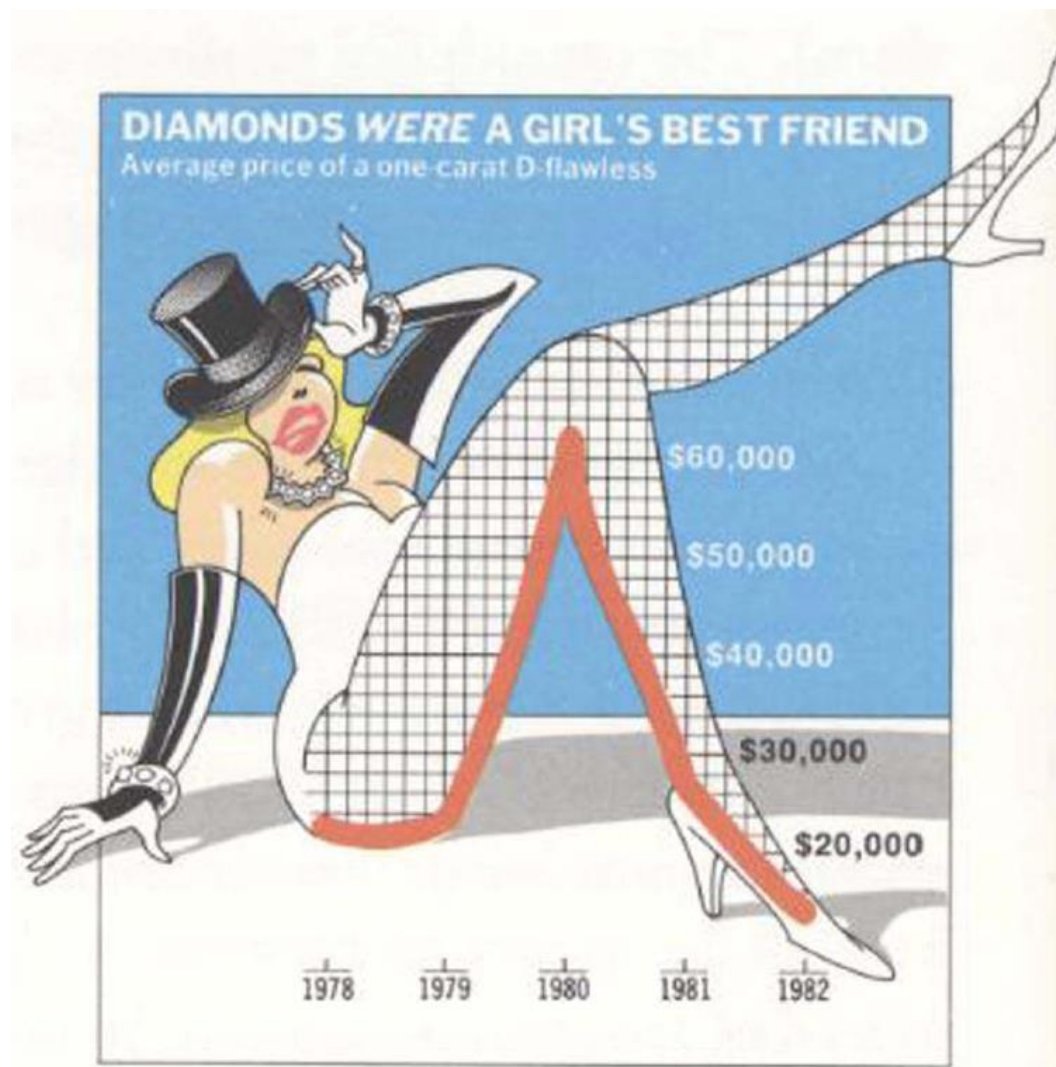
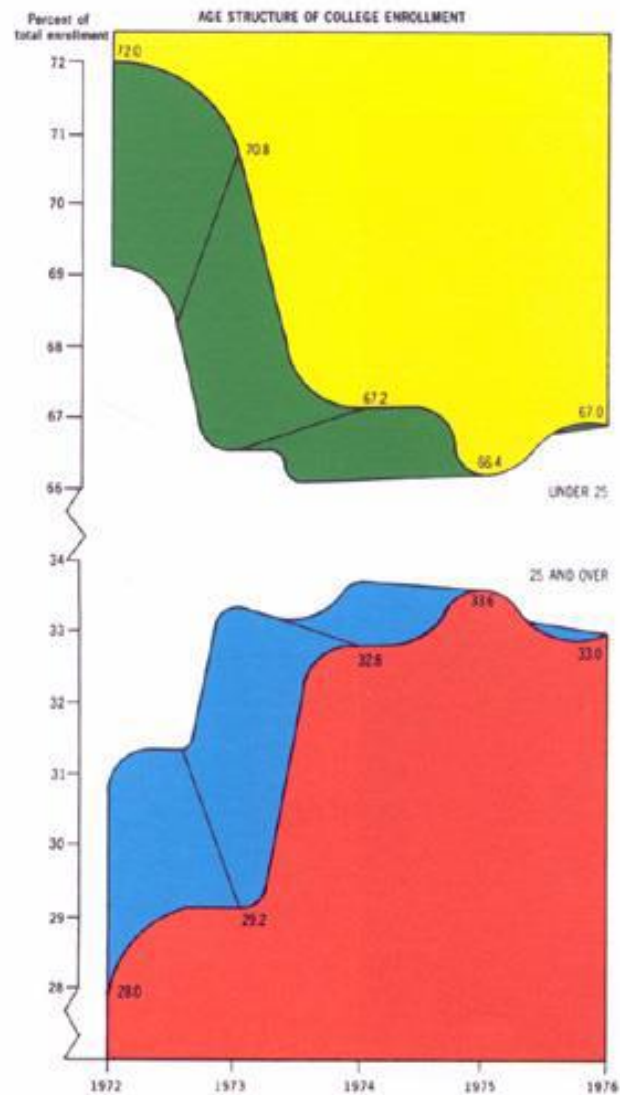






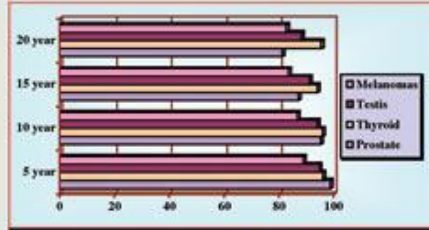
# EDWARD TUFTE: CHART JUNK, LIE FACTOR, SMALL MULTIPLES



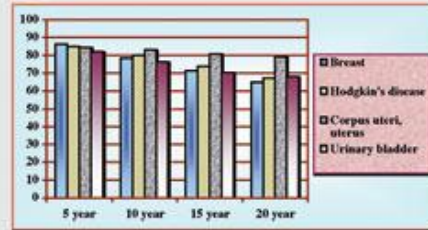




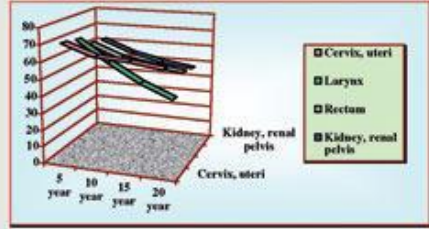
### I. Cancer Survival Rates



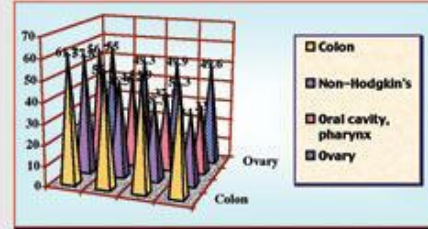
### II. Cancer Survival Rates



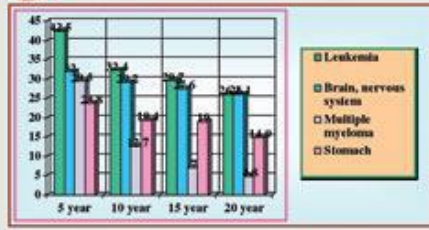
### III. Cancer Survival Rates



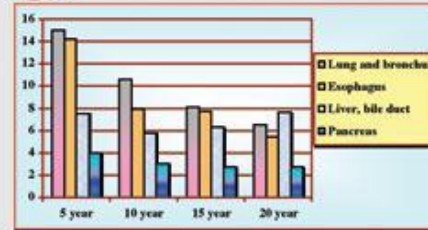
### IV. Cancer Survival Rates



### V. Cancer Survival Rates



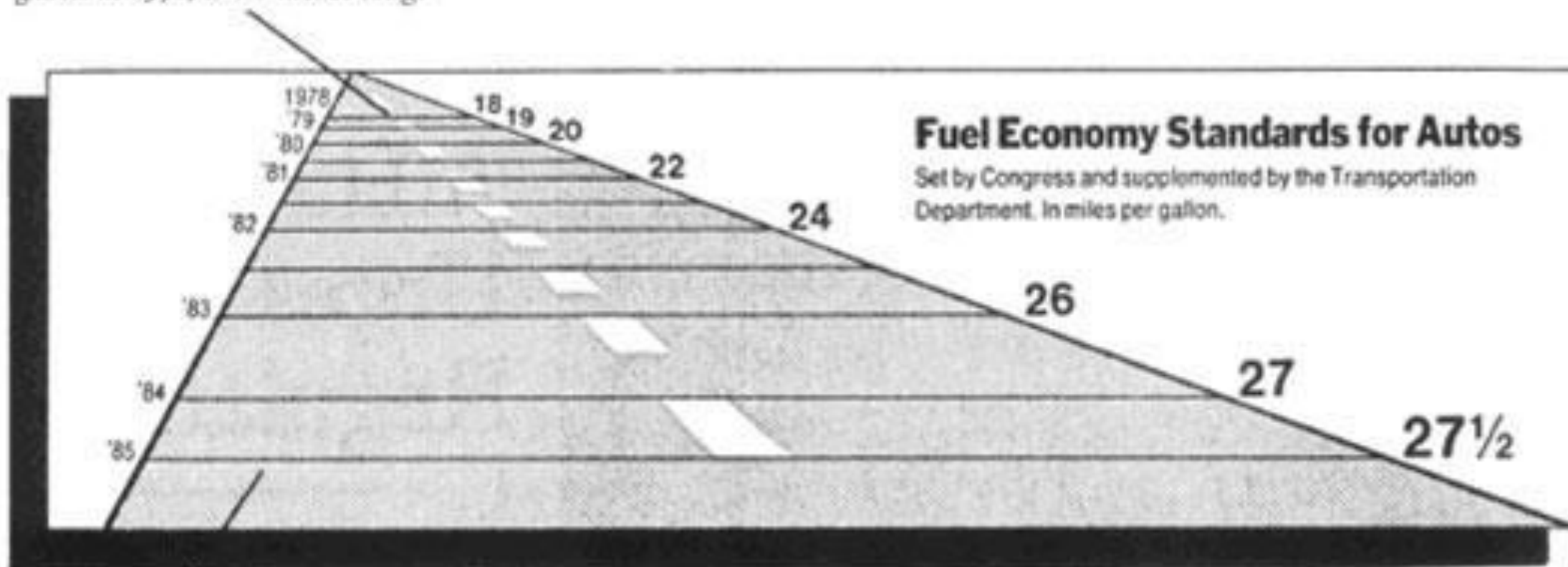
### VI. Cancer Survival Rates



	Estimates of % survival rates			
	5 year	10 year	15 year	20 year
Prostate	99	95	87	81
Thyroid	96	96	94	95
Testis	95	94	91	88
Melanomas	89	87	84	83
Breast	86	78	71	65
Hodgkin's disease	85	80	74	67
Corpus uteri, uterus	84	83	81	79
Urinary, bladder	82	76	70	68
Cervix, uteri	71	64	63	60
Larynx	69	57	46	38
Rectum	63	55	52	49
Kidney, renal pelvis	62	54	50	47
Colon	62	55	54	52
Non-Hodgkin's	58	46	38	34
Oral cavity, pharynx	57	44	38	33
Ovary	55	32	30	26
Leukemia	43	29	28	26
Brain, nervous system	32	13	7	5
Multiple myeloma	30	19	19	15
Stomach	24	11	8	6
Lung and bronchus	15	8	8	5
Esophagus	14	6	6	8
Liver, bile duct	8	3	3	3
Pancreas	4			



This line, representing 18 miles per gallon in 1978, is 0.6 inches long.



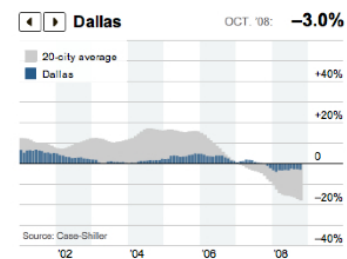
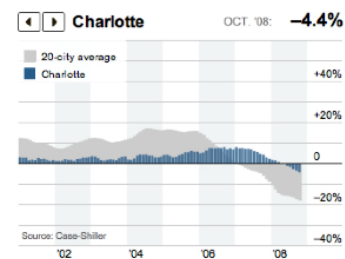
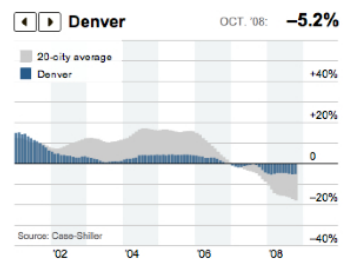
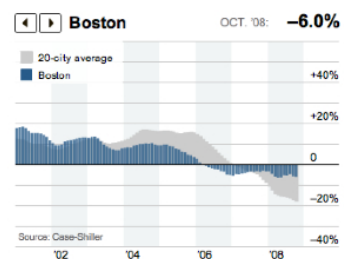
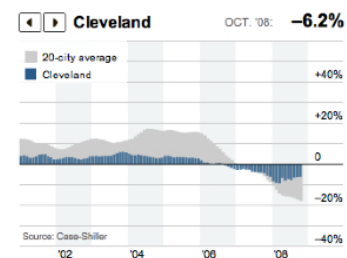
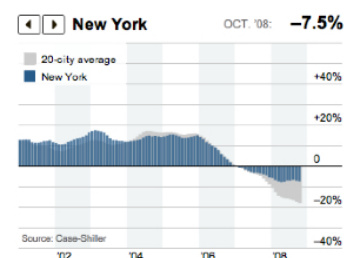
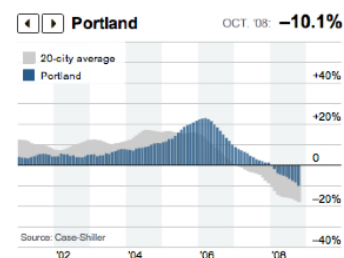
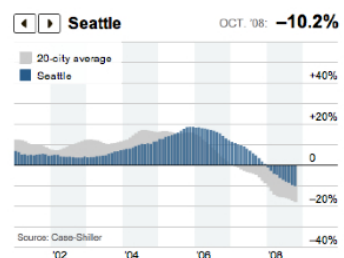
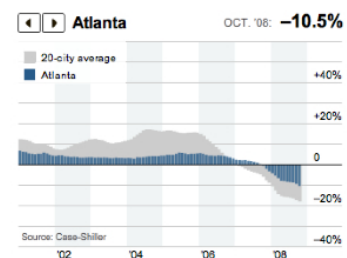
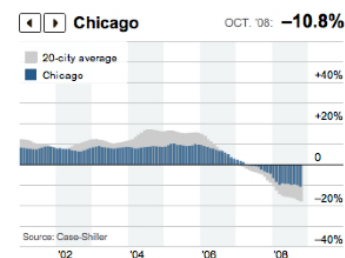
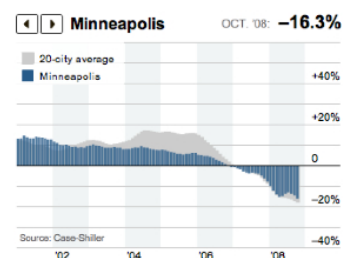
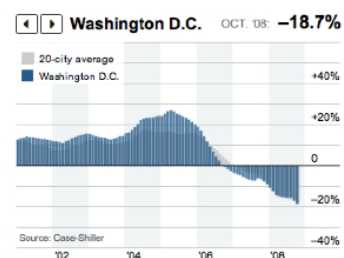
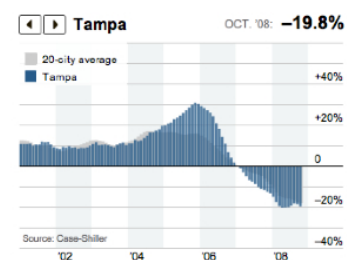
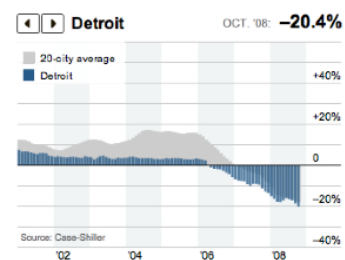
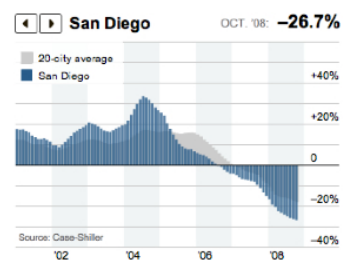
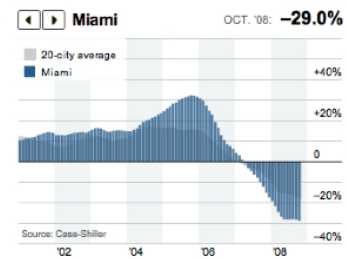
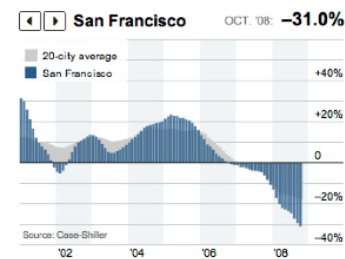
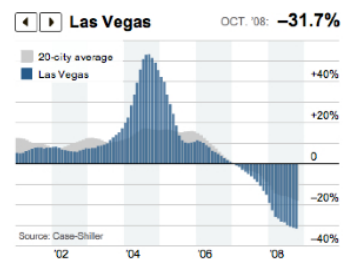
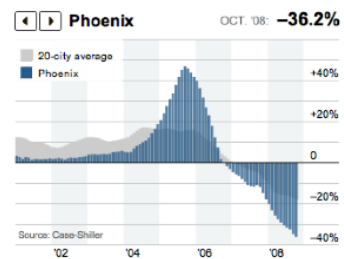
This line, representing 27.5 miles per gallon in 1985, is 5.3 inches long.





# Change in Home Prices (year over year)

From New York Times Economix blog



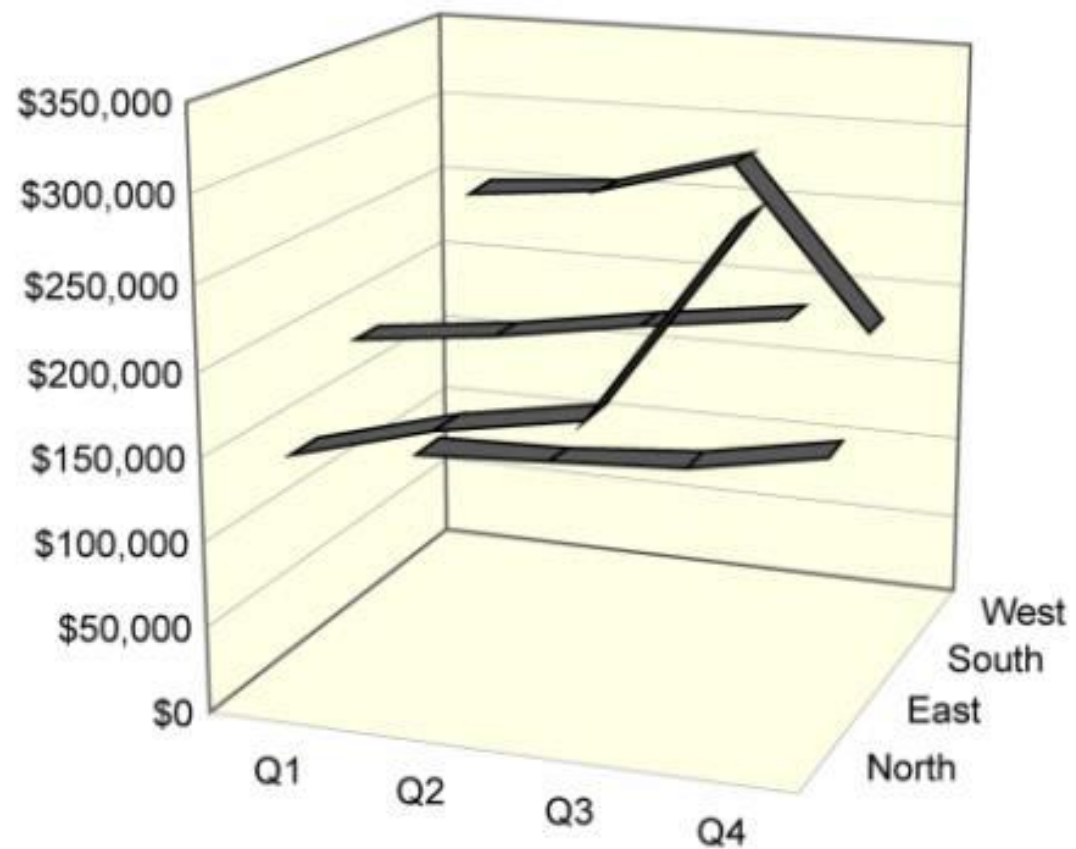
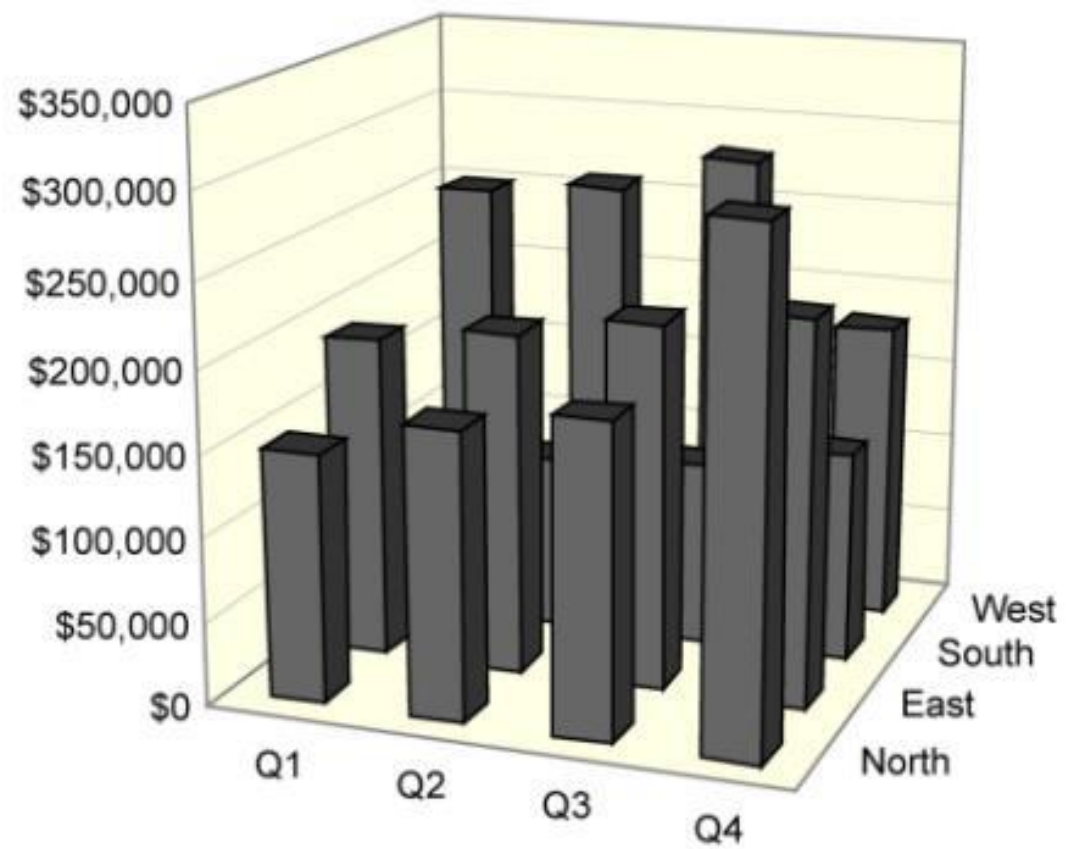
# Change in Home Prices (year over year)

From New York Times Economix blog



# BAD IDEAS: THE THIRD DIMENSION, PIE CHARTS





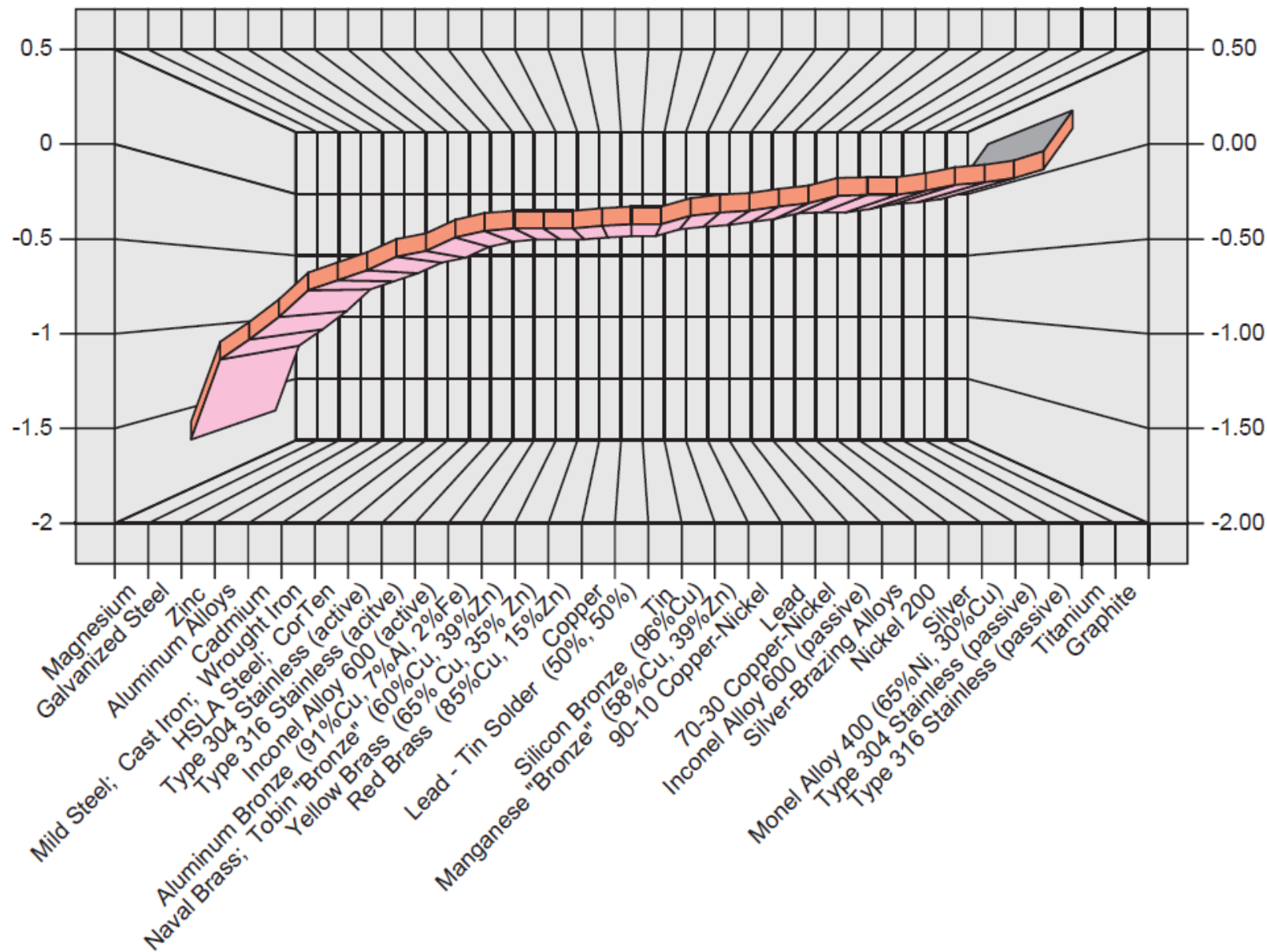


# 2012 PRESIDENTIAL RUN

GOP CANDIDATES



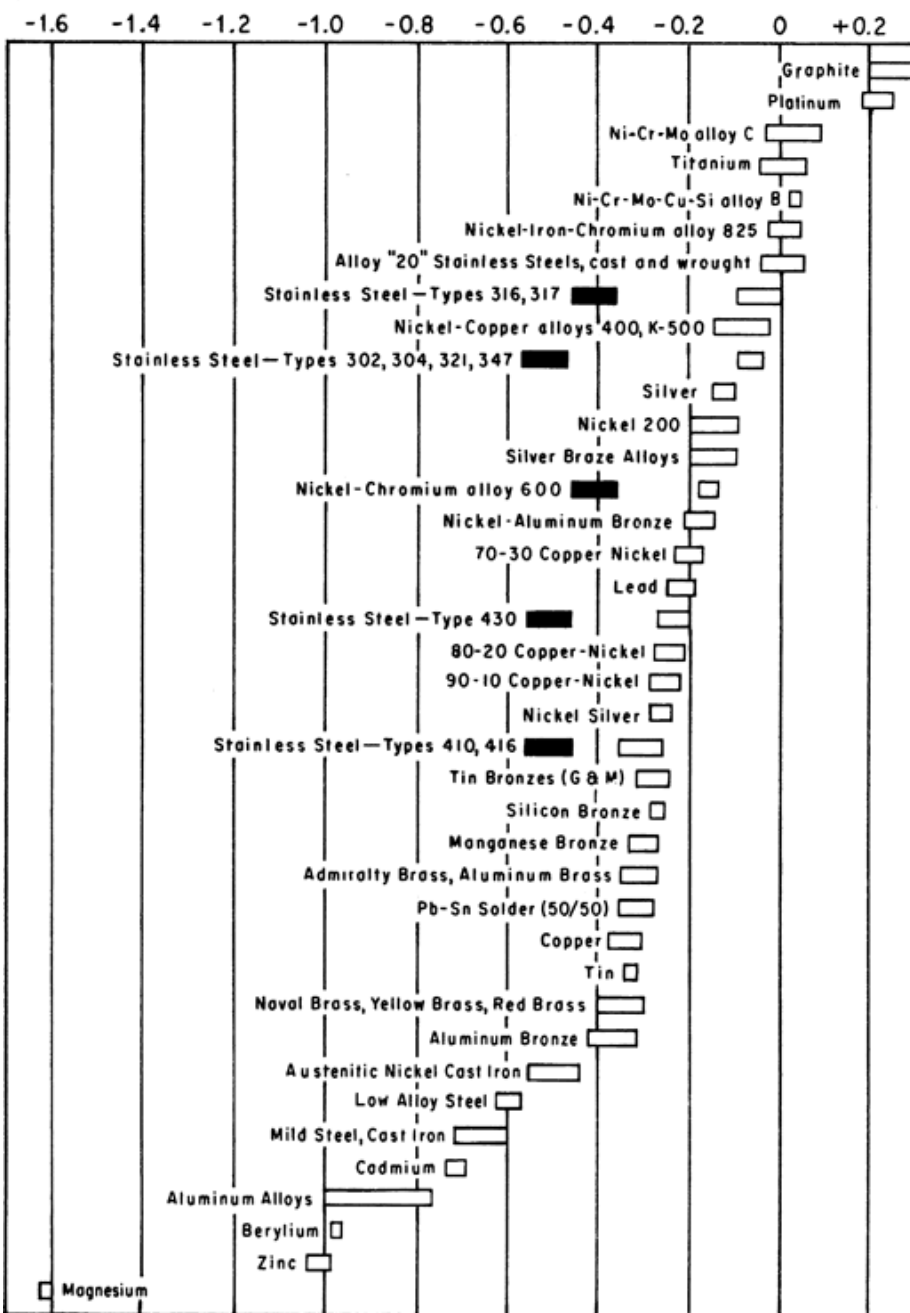
# Average Voltage in Seawater



# VOLTS VERSUS SATURATED CALOMEL REFERENCE ELECTRODE

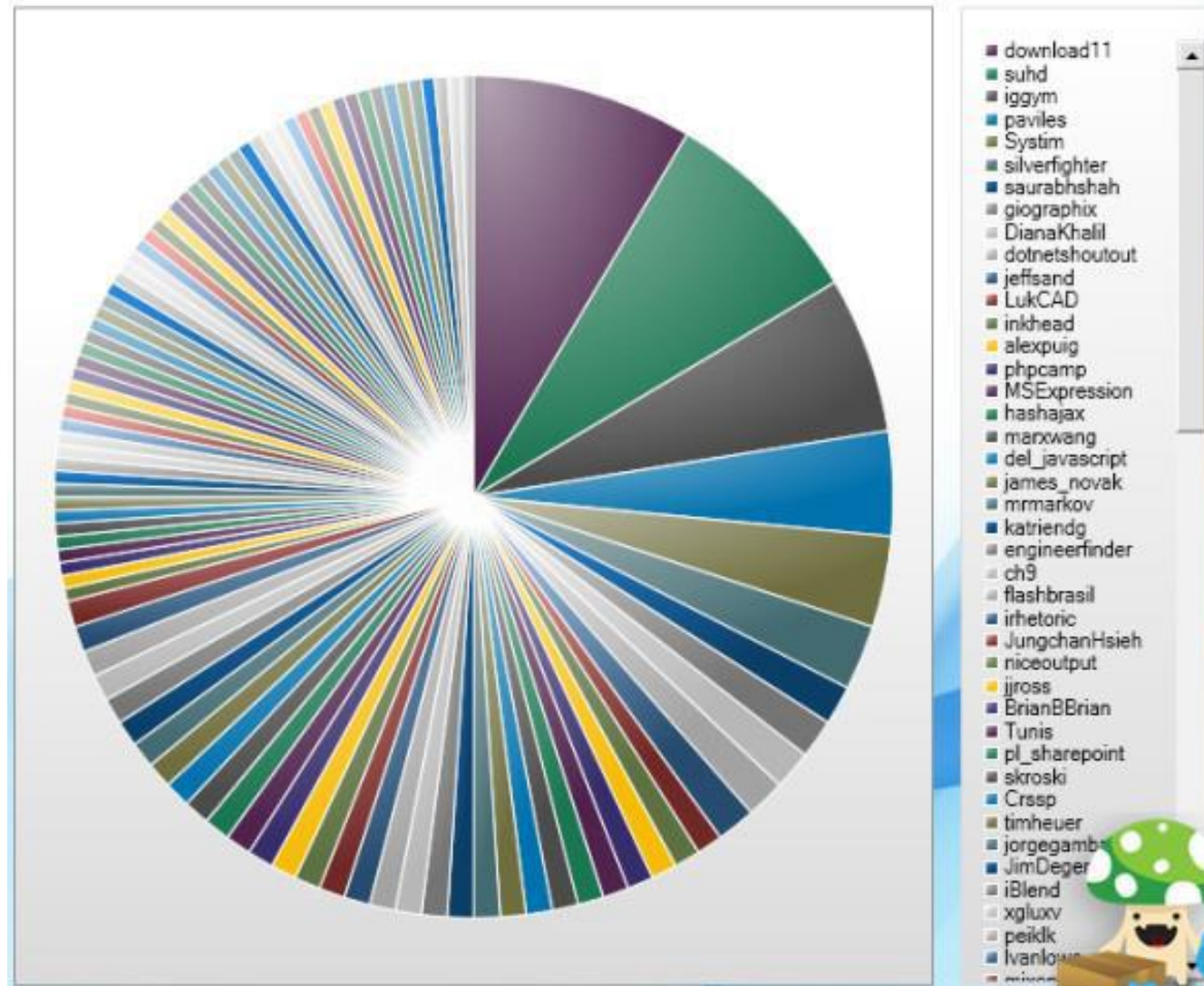
(Active)

(Noble)

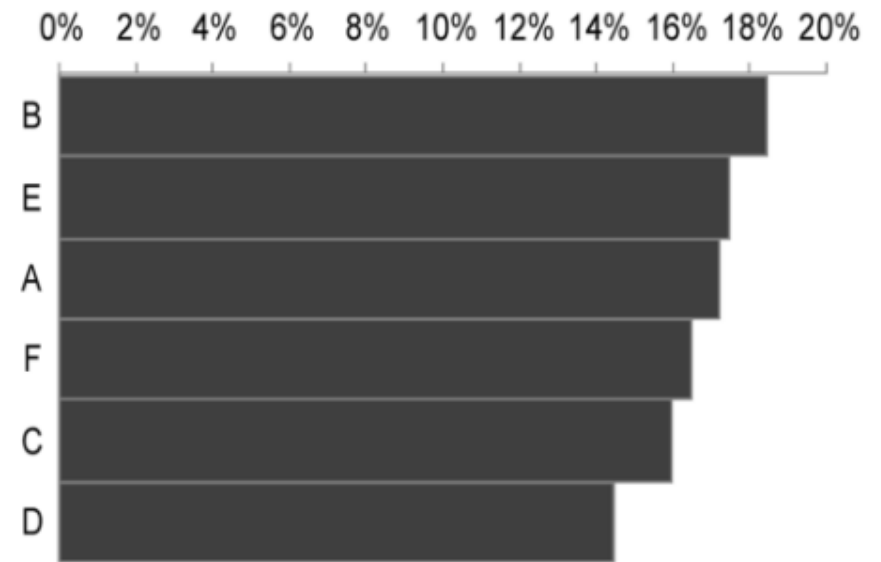
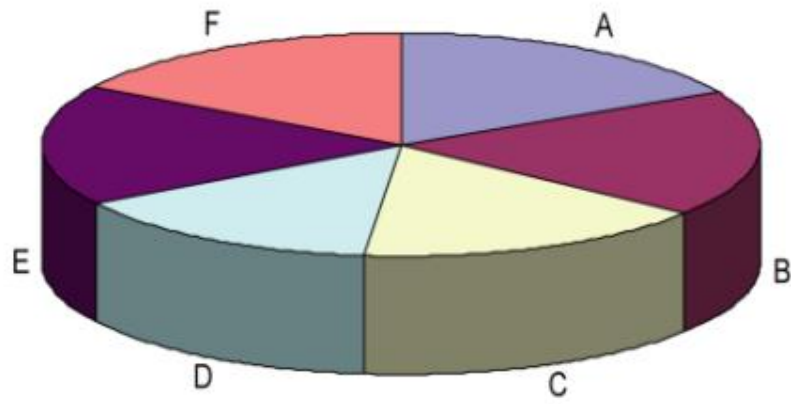
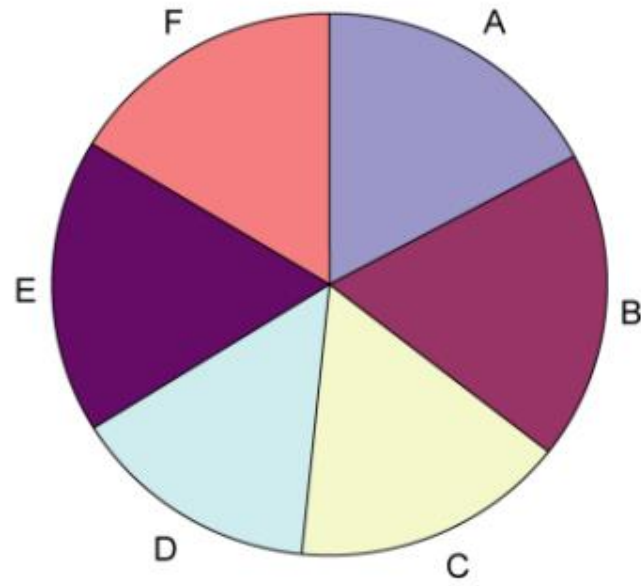




## 100 Most Active Tweeters





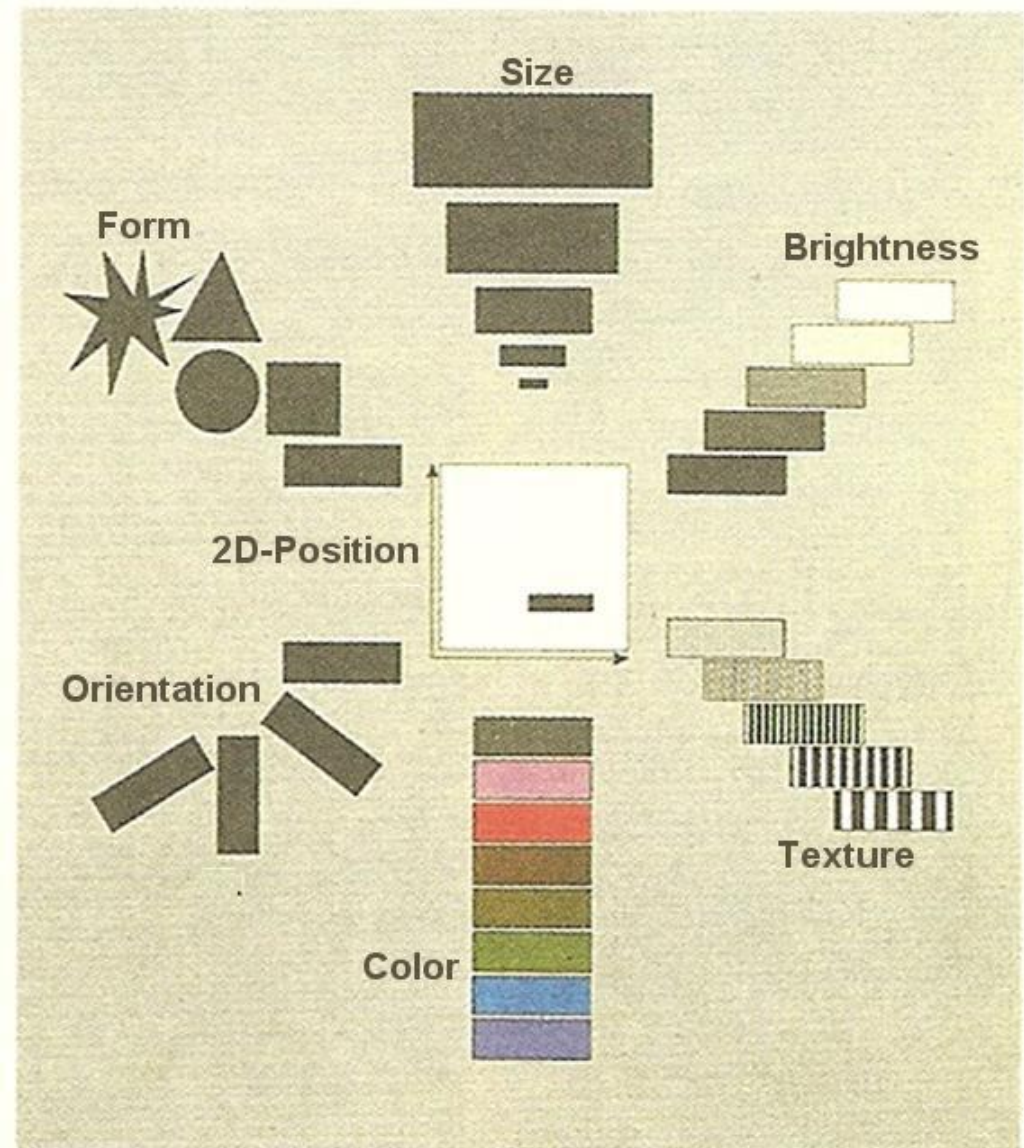




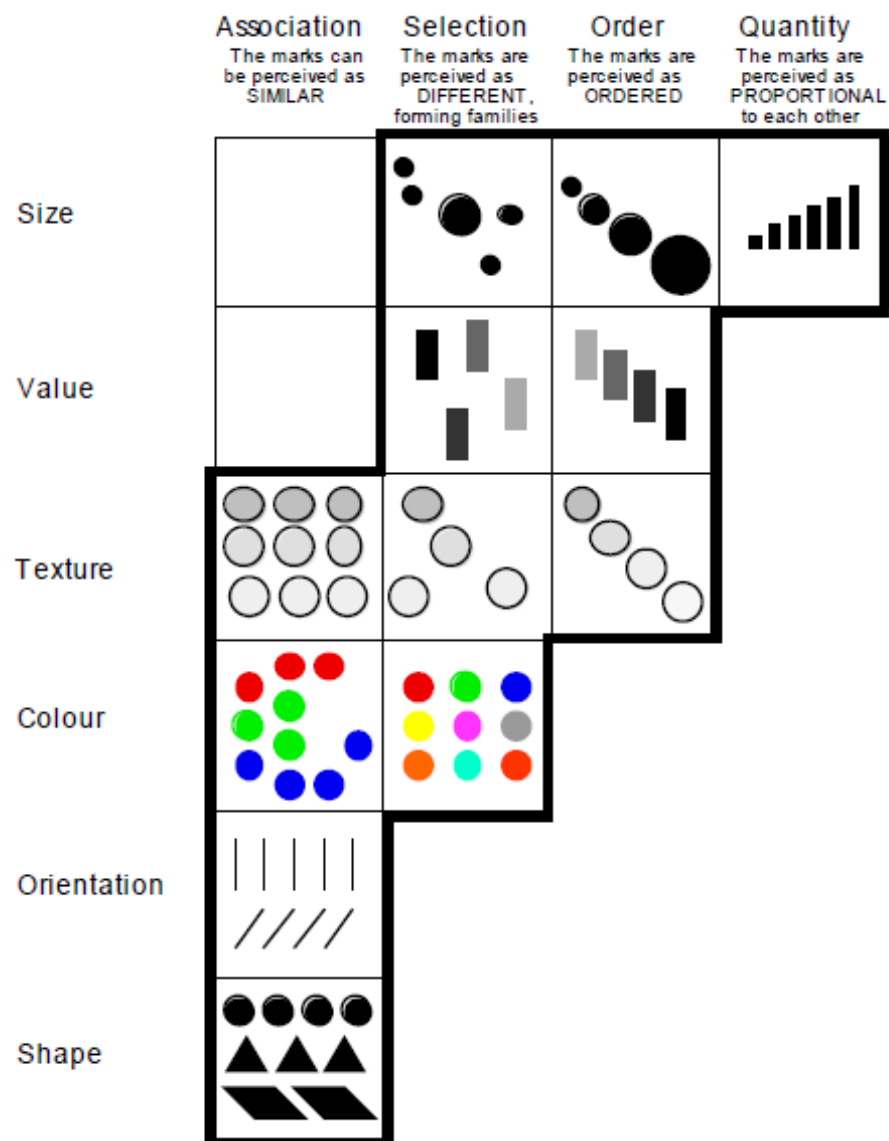
# VISUAL CLUES: BERTIN, CLEVELAND, MCGILL



*Jacques  
Bertin*





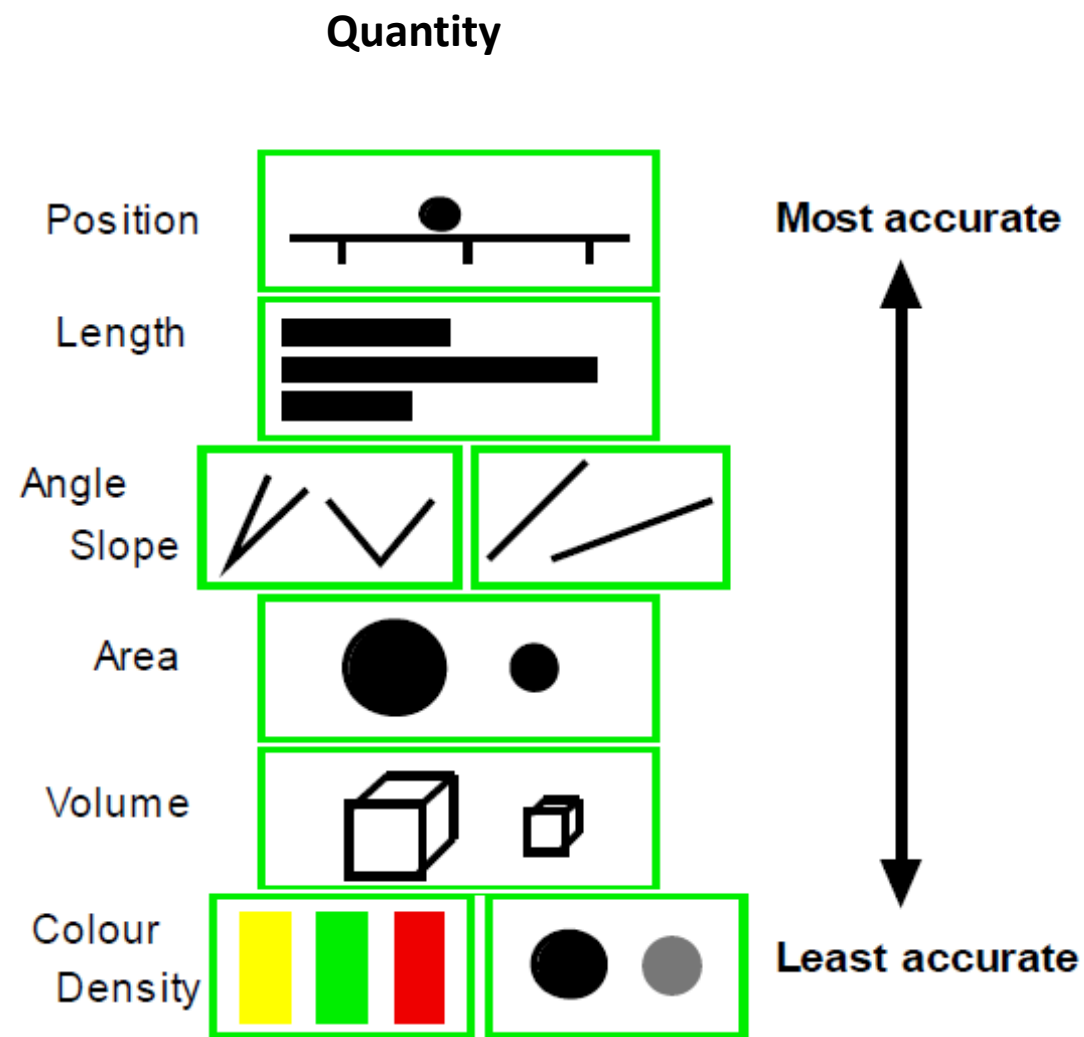


Visual variables	Measurement scales			
	Nominal	Ordinal	Interval	Ratio
Dimensions of the plane	2*x	2*x	2*x	2*x
Size		x	x	x
(Grey) value		x	x	
Grain/texture		x	x	
Colour hue	x			
Orientation	x			
Shape	x			

<https://ltb.itc.utwente.nl/page/481/concept/78736>



	Association The marks can be perceived as SIMILAR	Selection The marks are perceived as DIFFERENT, forming families	Order The marks are perceived as ORDERED	Quantity The marks are perceived as PROPORTIONAL to each other
Size				
Value				
Texture				
Colour				
Orientation				
Shape				

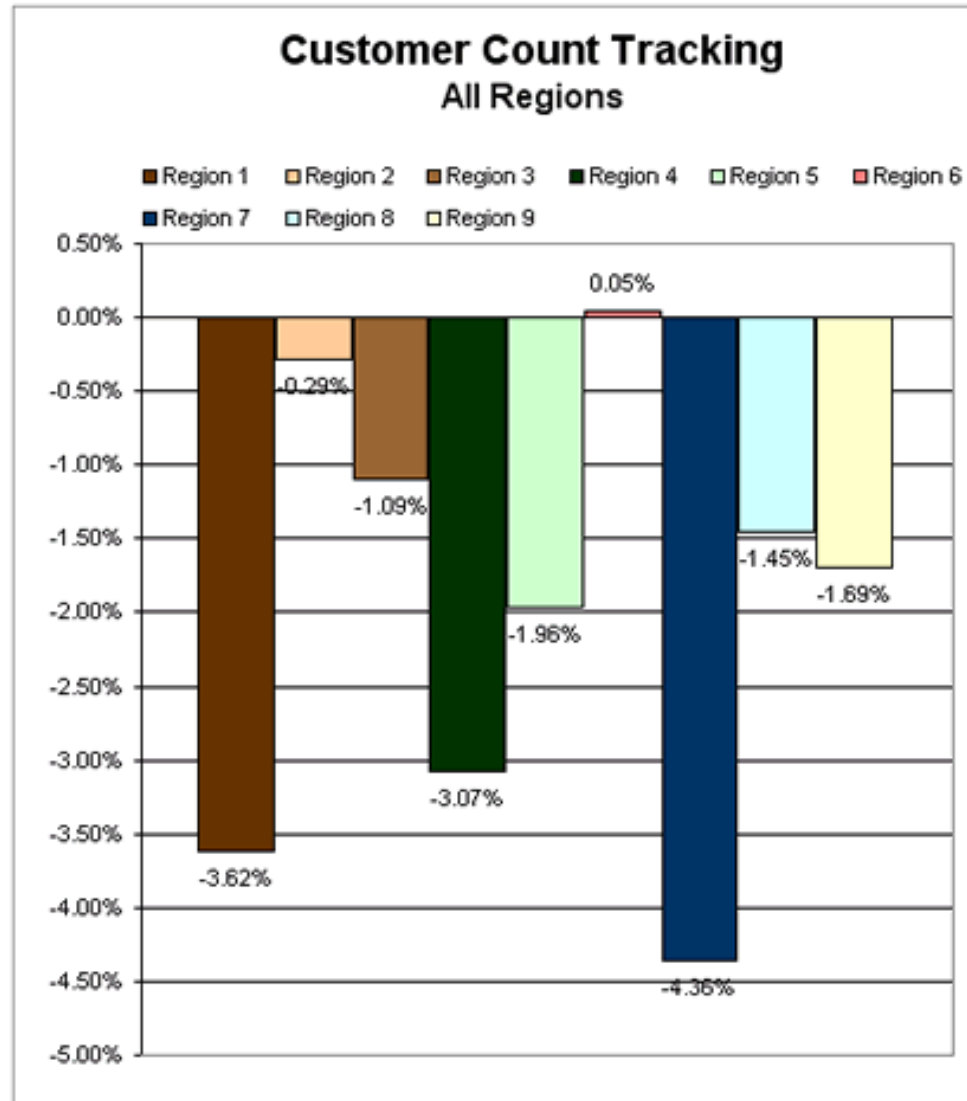


The relative difficulty of assessing quantitative value as a function of encoding mechanism, as established by Cleveland and McGill

# EXAMPLES: BEFORE AND AFTER

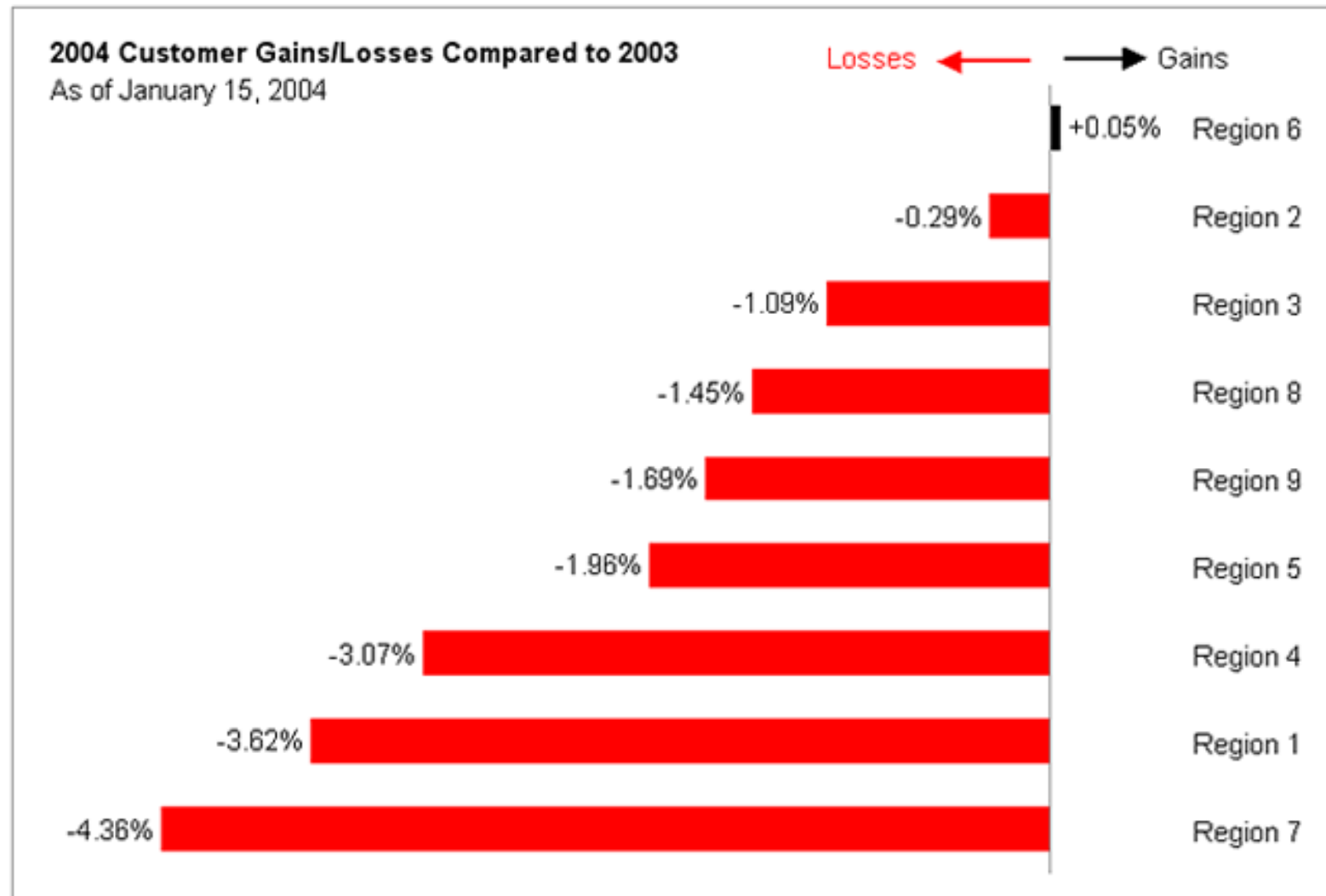


# BEFORE

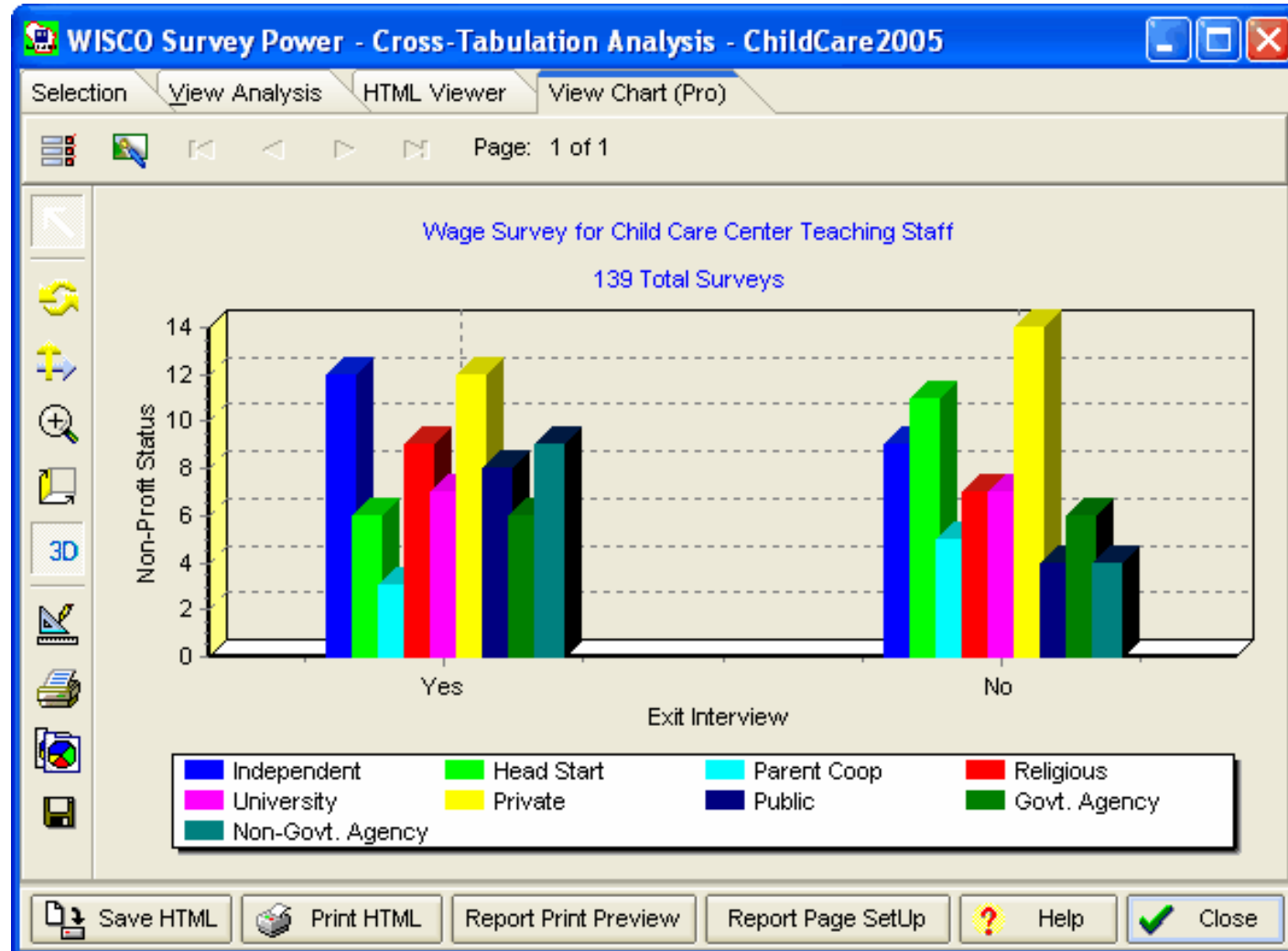




# AFTER

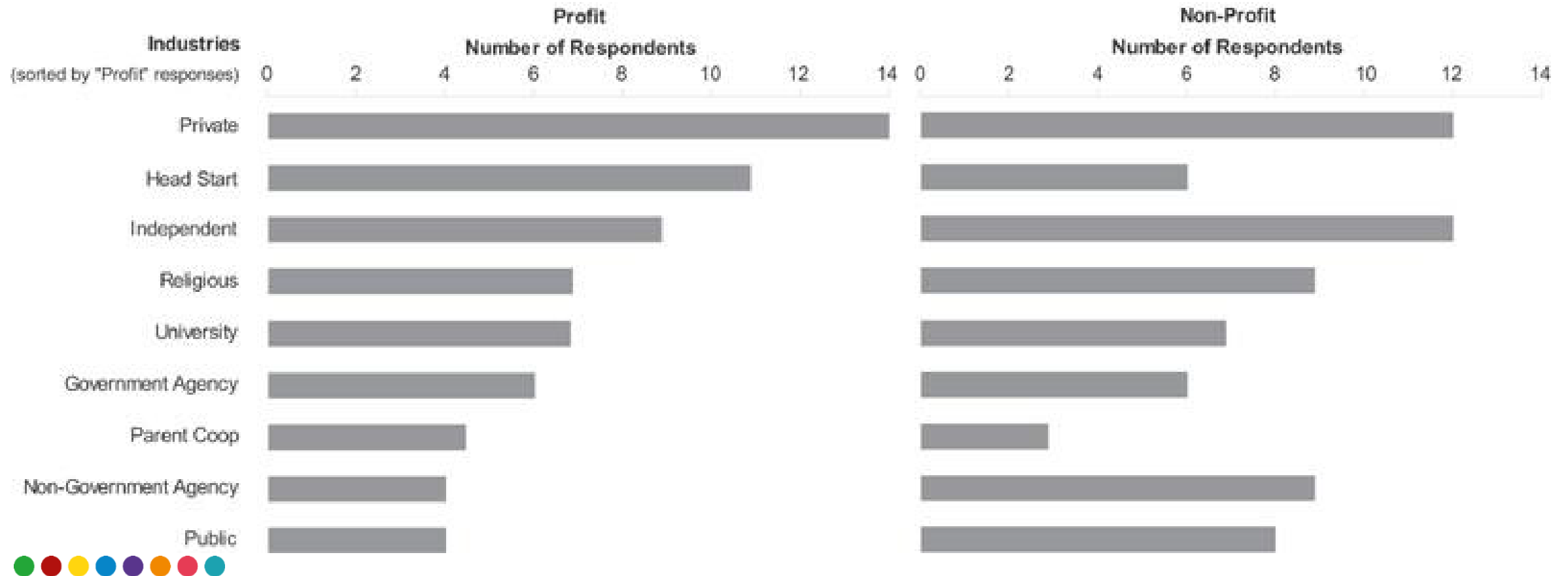


# BEFORE



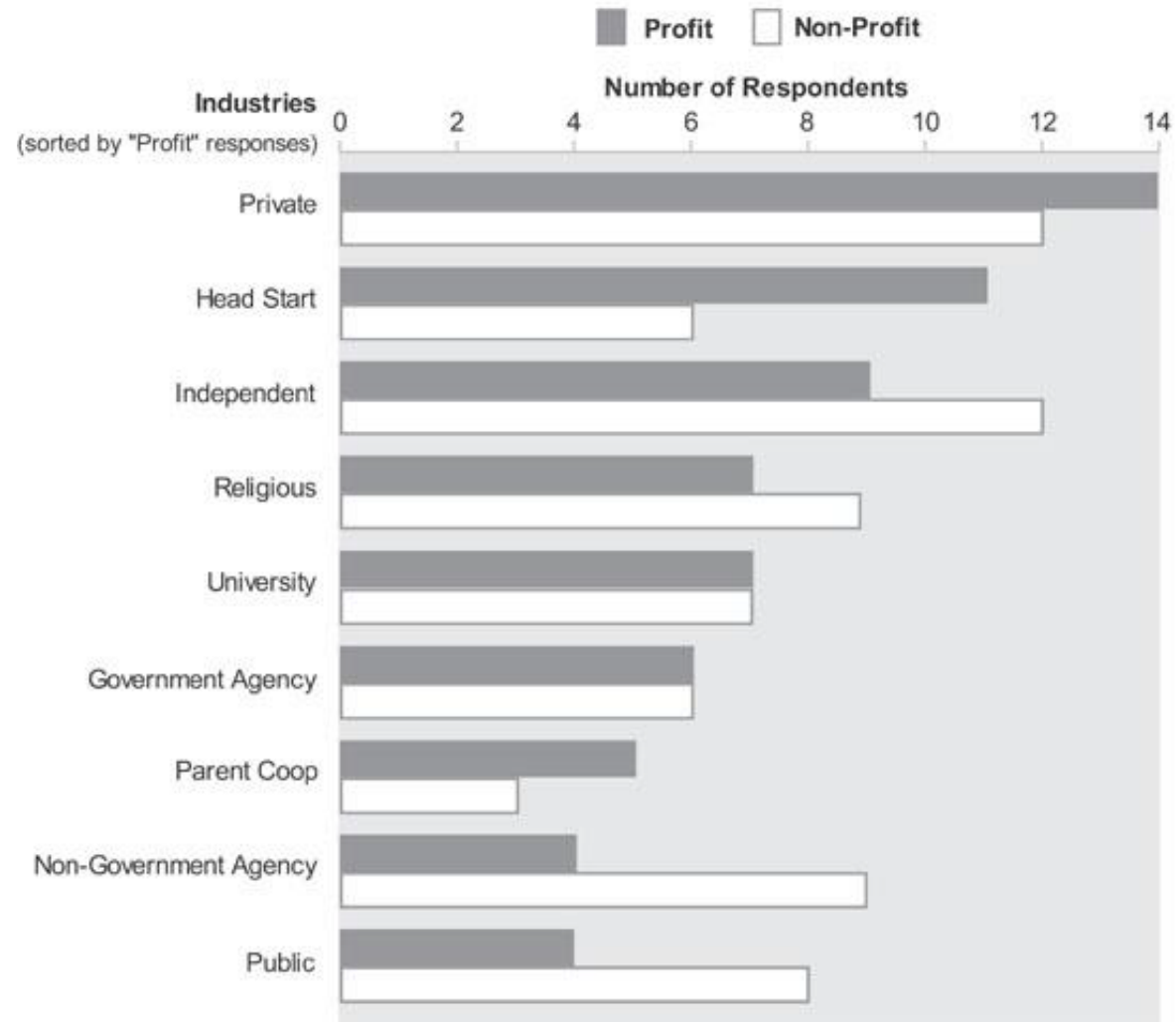
# AFTER

Profit vs. Non-Profit Breakdown by Industry of Child Care Center Teachers  
Who Responded to the Survey



# AFTER

Profit vs. Non-Profit Breakdown by Industry of Child Care Center Teachers Who Responded to the Survey



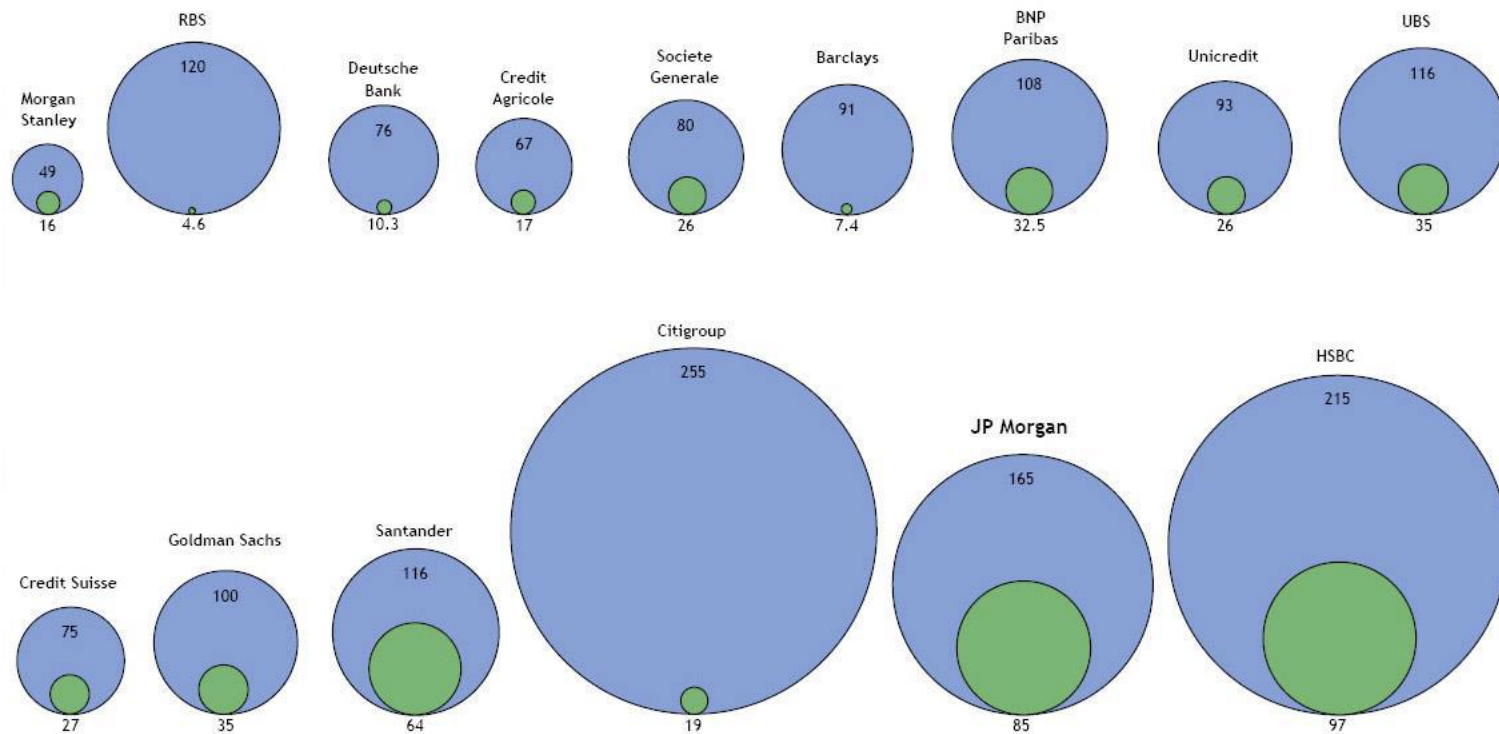


# BEFORE

## Banks: Market Cap

● Market Value as of January 20<sup>th</sup> 2009, \$Bn

● Market Value as of Q2 2007, \$Bn



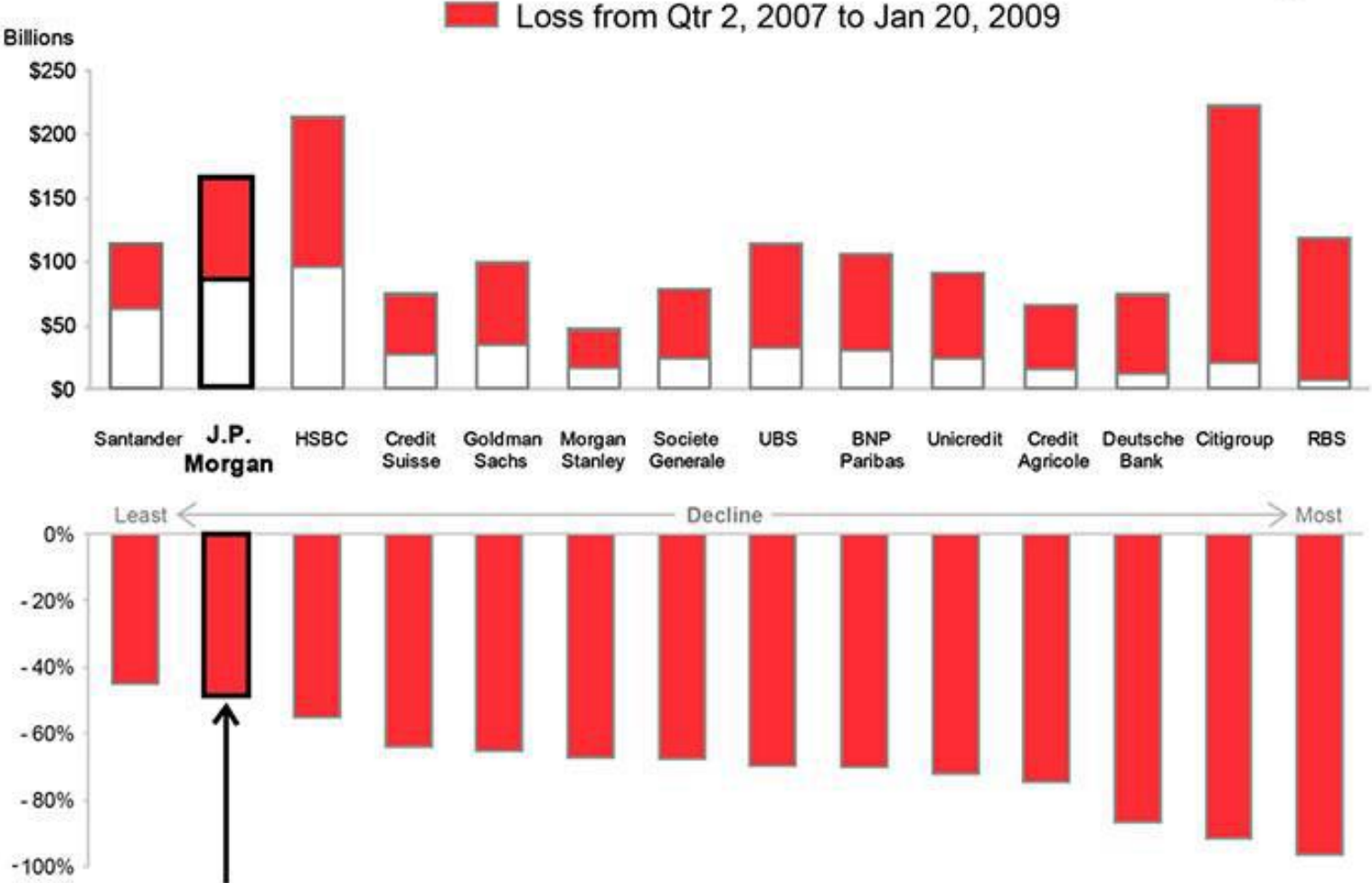
J.P.Morgan

While JPMorgan considers this information to be reliable, we cannot guarantee its accuracy or completeness

Source: Bloomberg, Jan 20<sup>th</sup> 2009

# AFTER

## Declines in Bank Market Values Since the Financial Crisis Began



Among major banks, J.P. Morgan had the second least percentage decline in market value.

## EXERCISE: INFORMATION VISUALISATION

1. Is there a north-south economic divide in Italy?
2. Has the social gap in Germany been widening since the 2000s?
3. How bad is the opioid crisis in the USA? Show the progression since 2000.
4. Does educational success in Germany depend on social background?
5. Is road traffic in Germany getting safer over the last decades? Compare with at least one other country.
6. How widespread were and are different programming languages?



# EXCERCISE: INFORMATION VISUALISATION

Based on your research about the topic selected:

1. Create a nice chart to visualize your data
2. Use your knowledge about cognitive aspects and design guidelines you have learned about so far

