

CS 526

Computer Graphics II

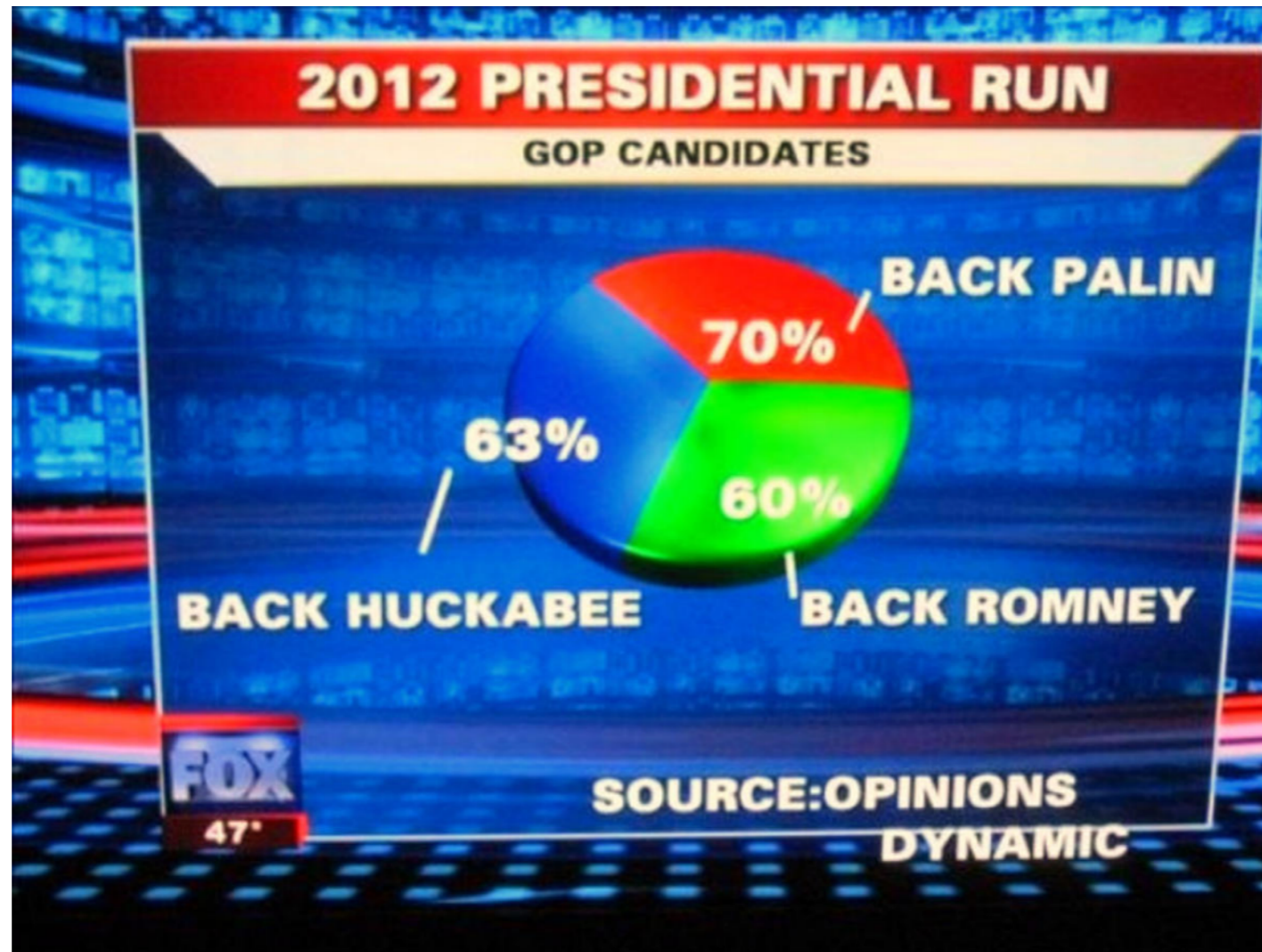
Visual Integrity

Khairi Reda | redak@uic.edu

UIC CS

Visual Integrity:

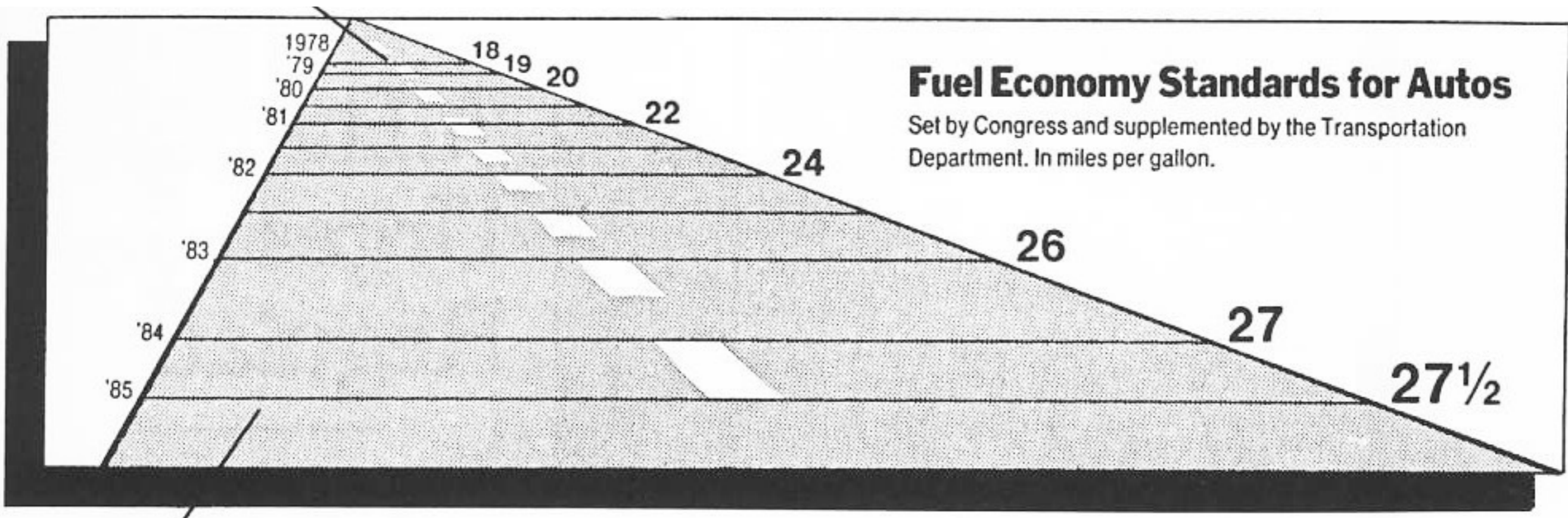
How to not lie with visualization

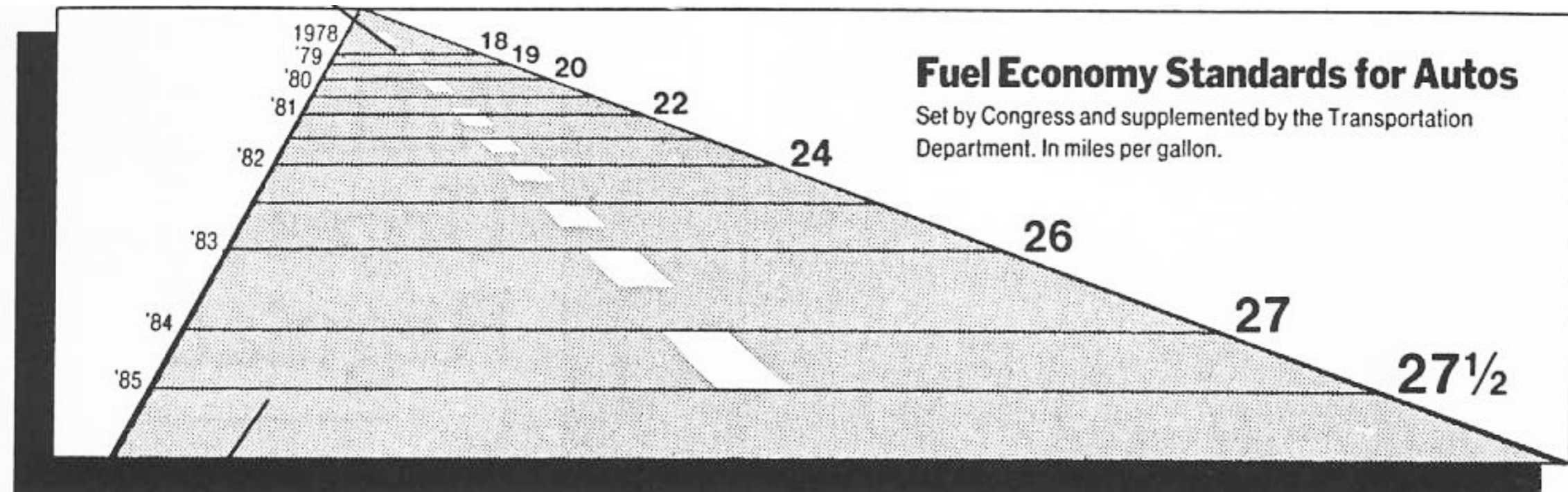


Visual Integrity: How to not lie with visualization

Visual Integrity: How to not lie with visualization

The representation of numbers, as physically measured on the surface of the graphic itself, should be directly proportional to the quantities represented

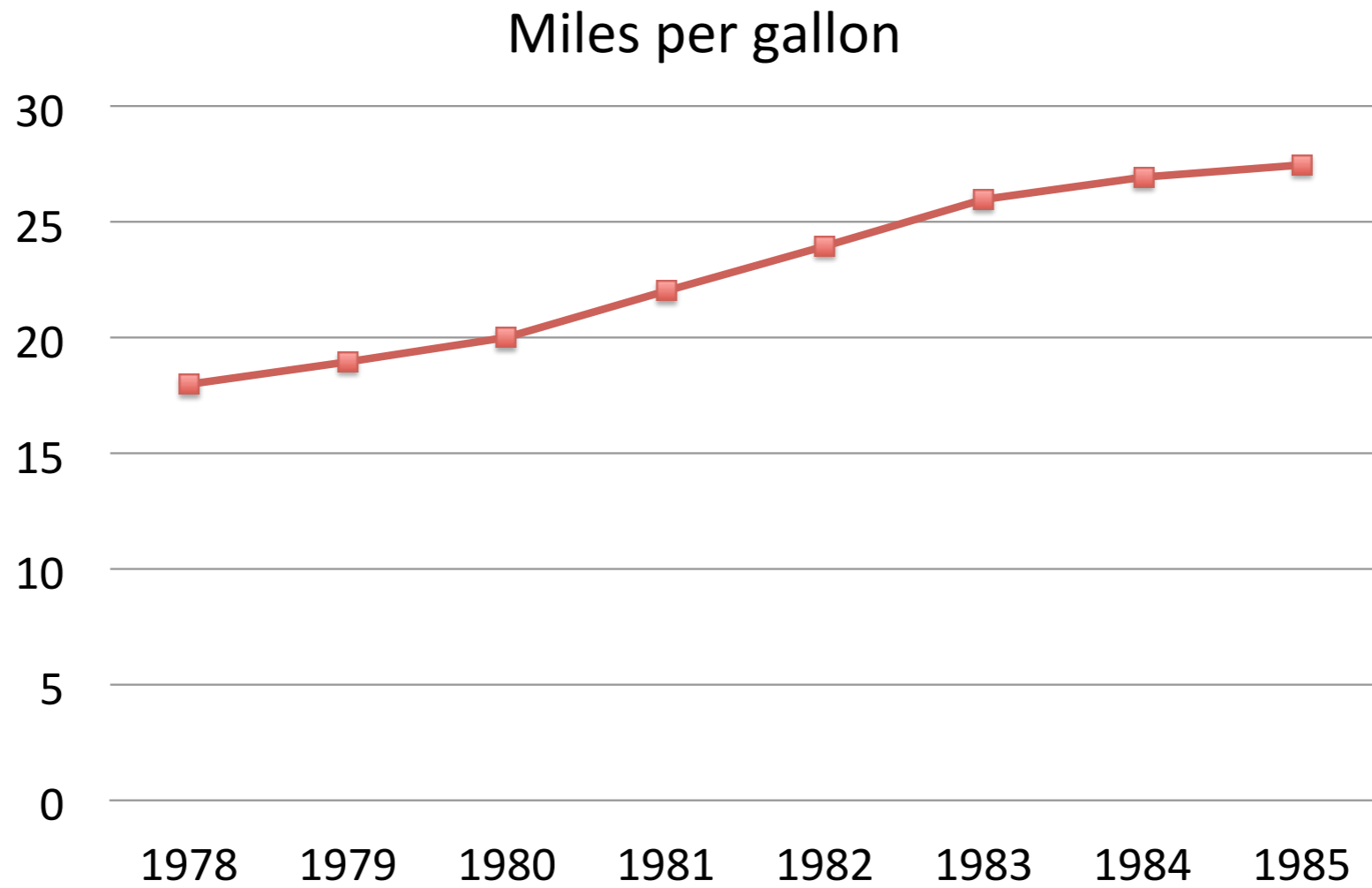
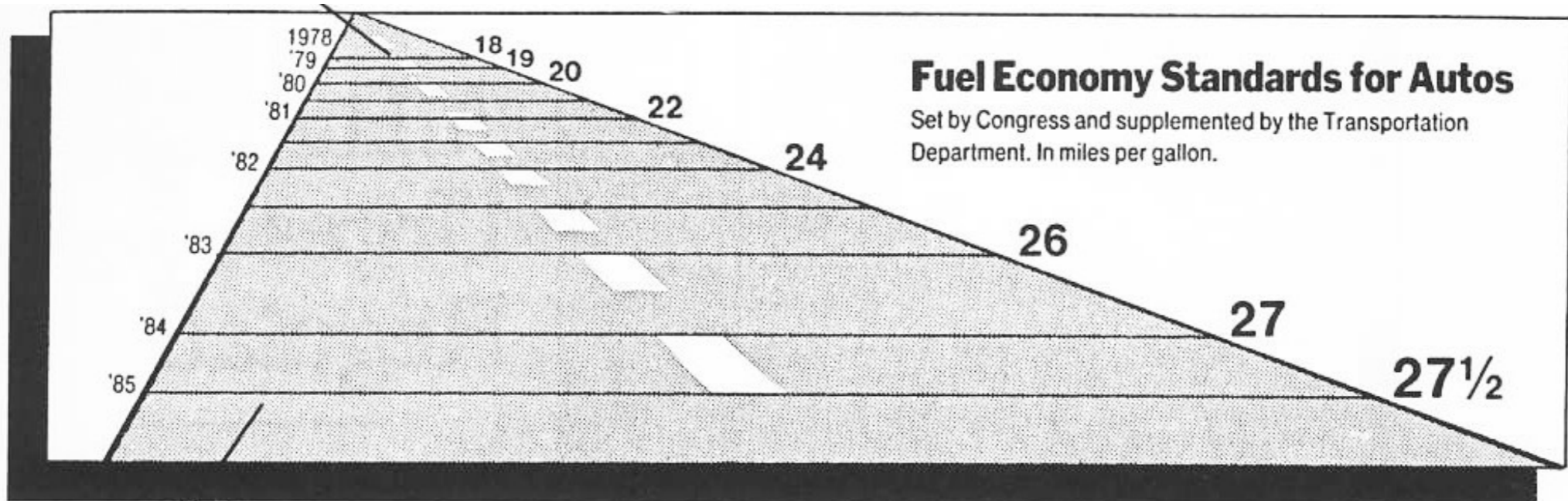




Lie Factor =
$$\frac{\text{Size of the effect in pixels/inches}}{\text{Size of the effect in the data}}$$

$$\frac{\text{Effect size in graphics}}{\text{Effect size in data}} = \frac{(5.3-0.6) / 0.6}{(27.5-18) / 18} = \frac{7.8}{0.5} = 15.6$$

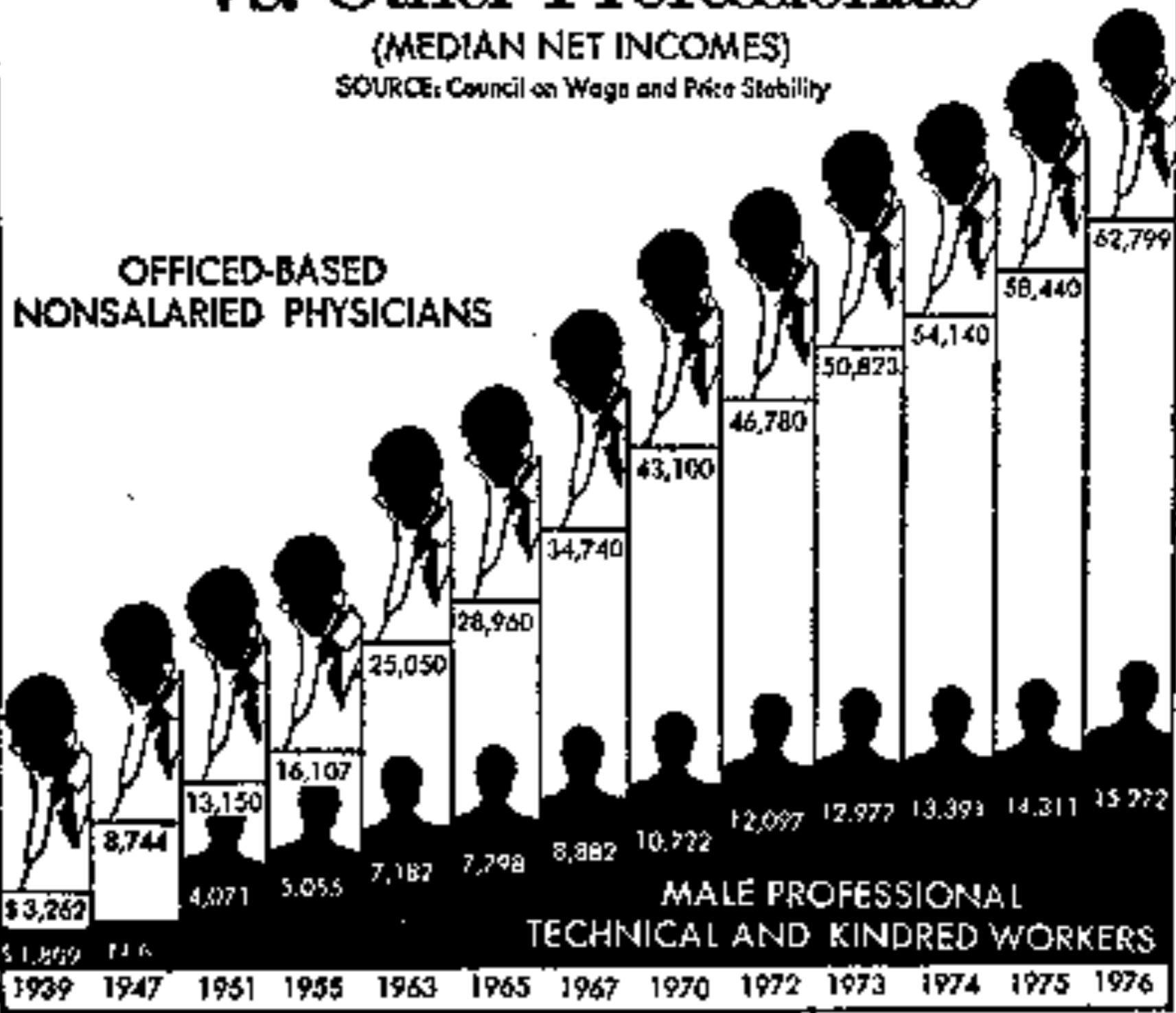
lie factor



Incomes of Doctors Vs. Other Professionals

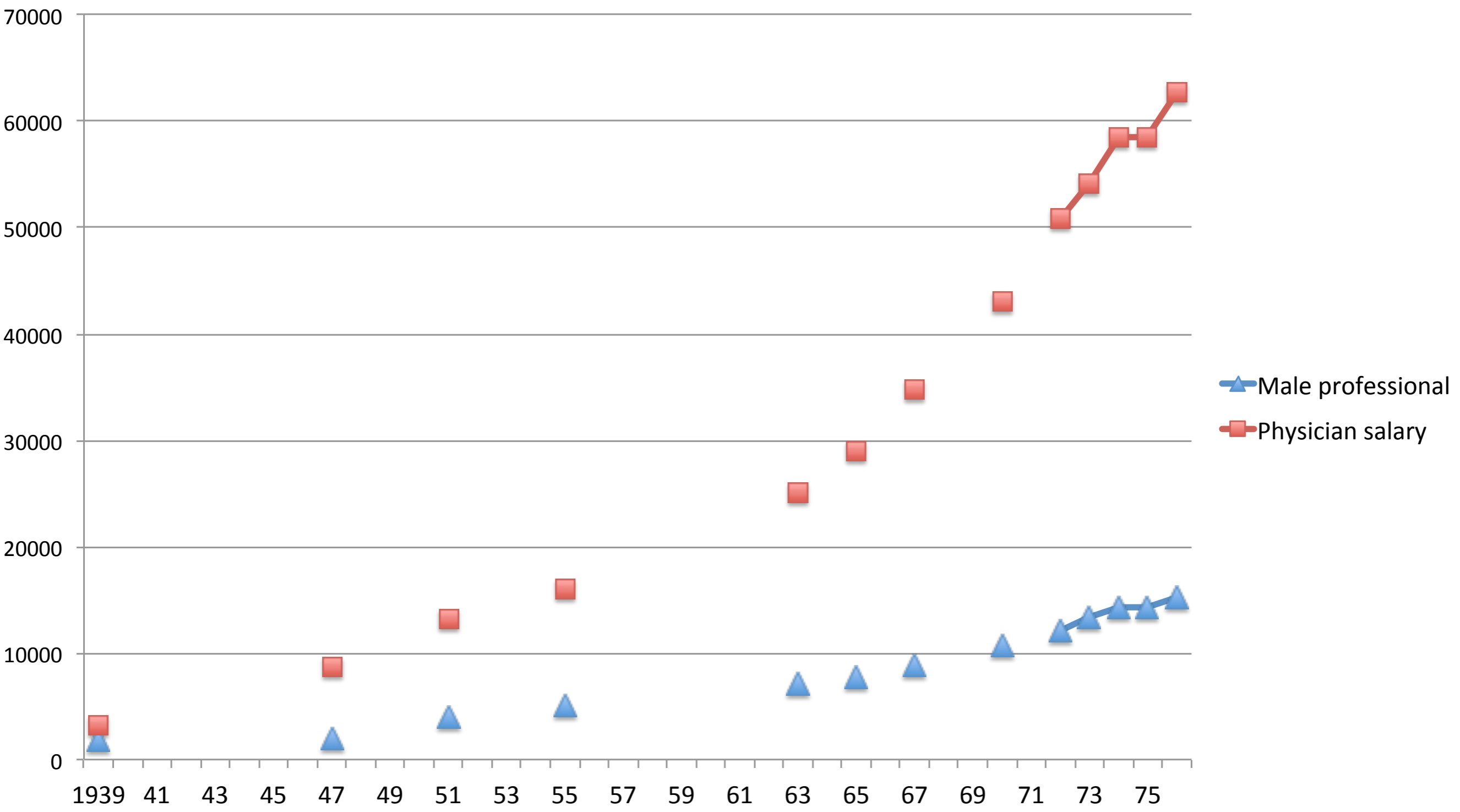
(MEDIAN NET INCOMES)

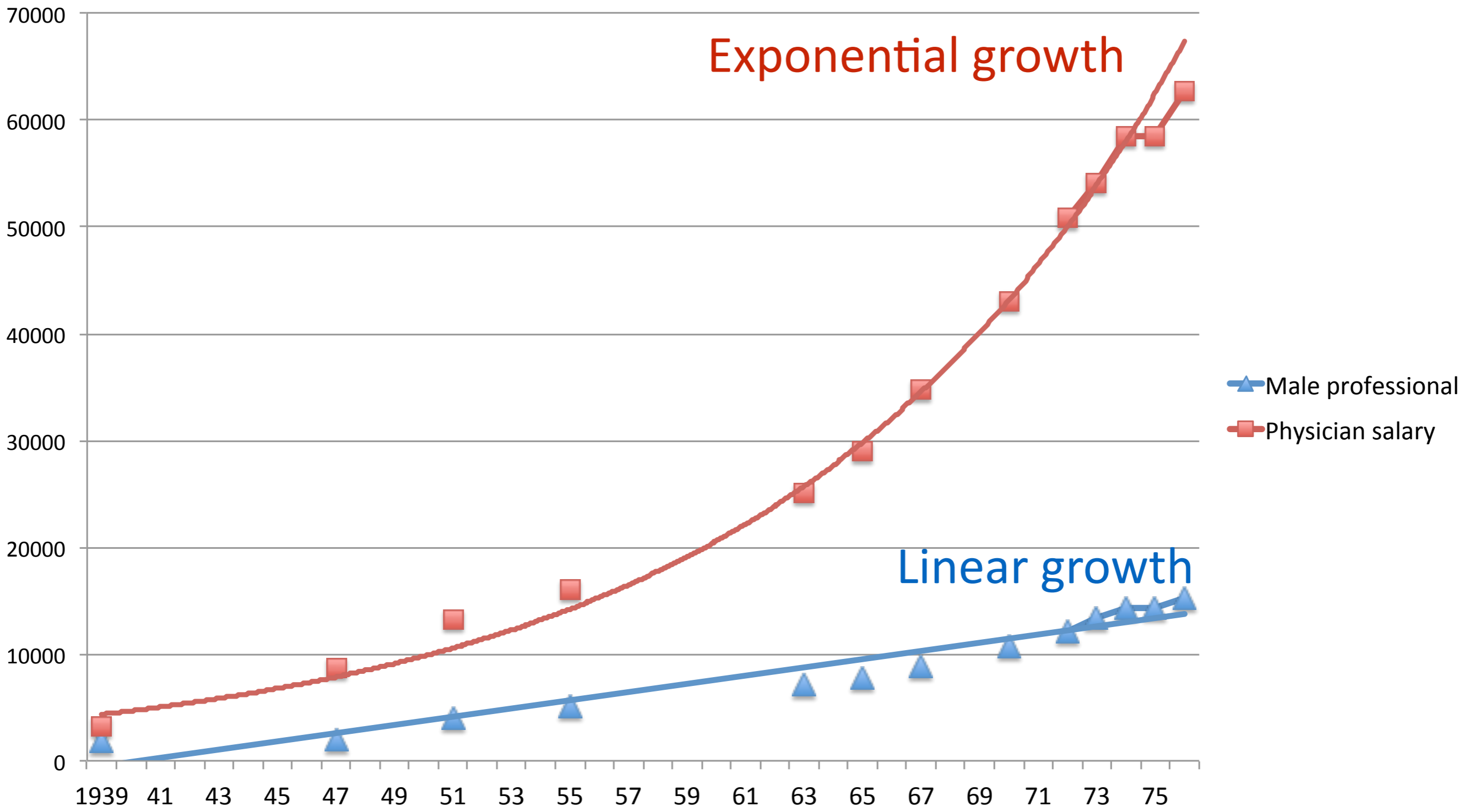
SOURCE: Council on Wage and Price Stability

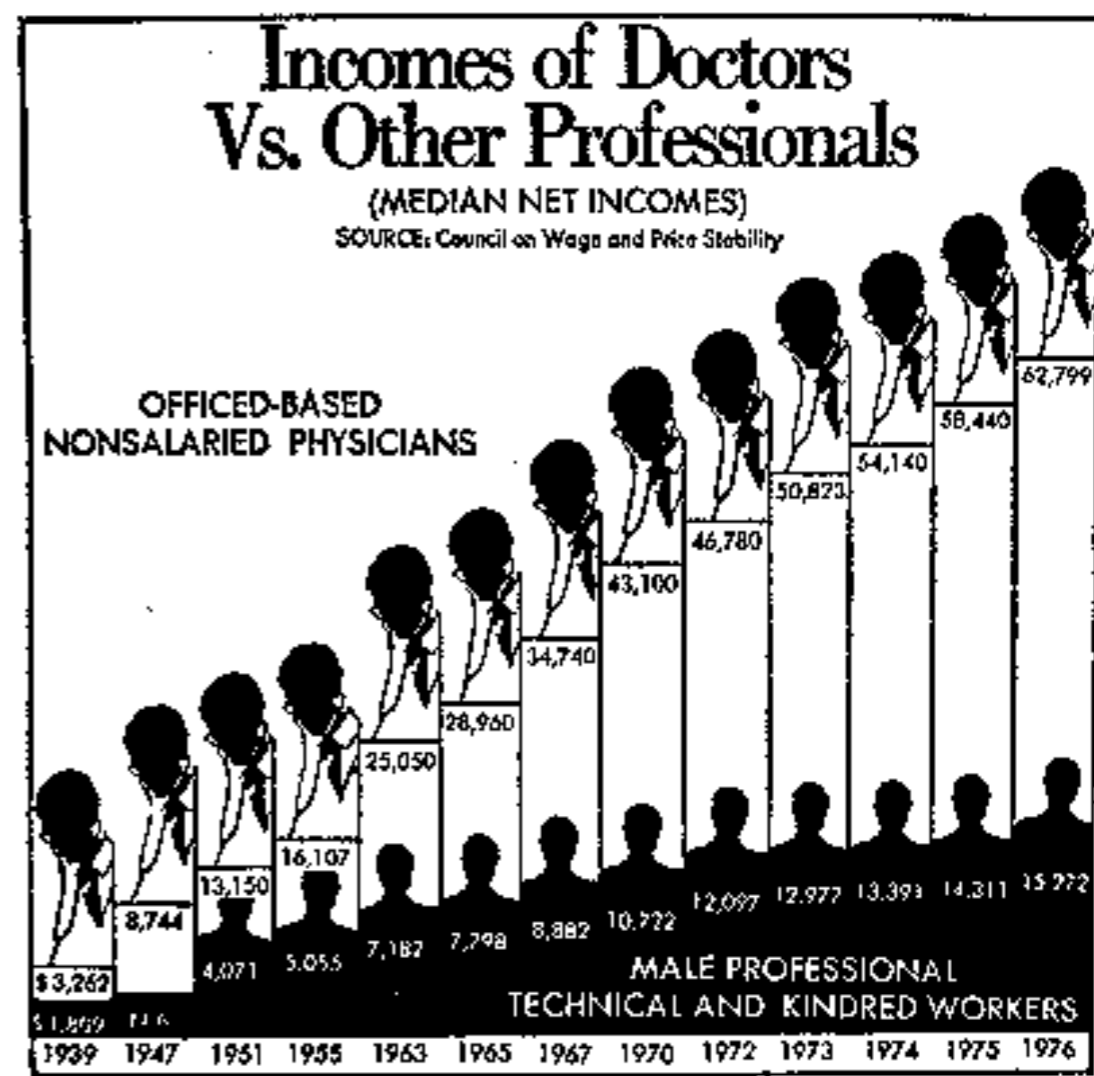
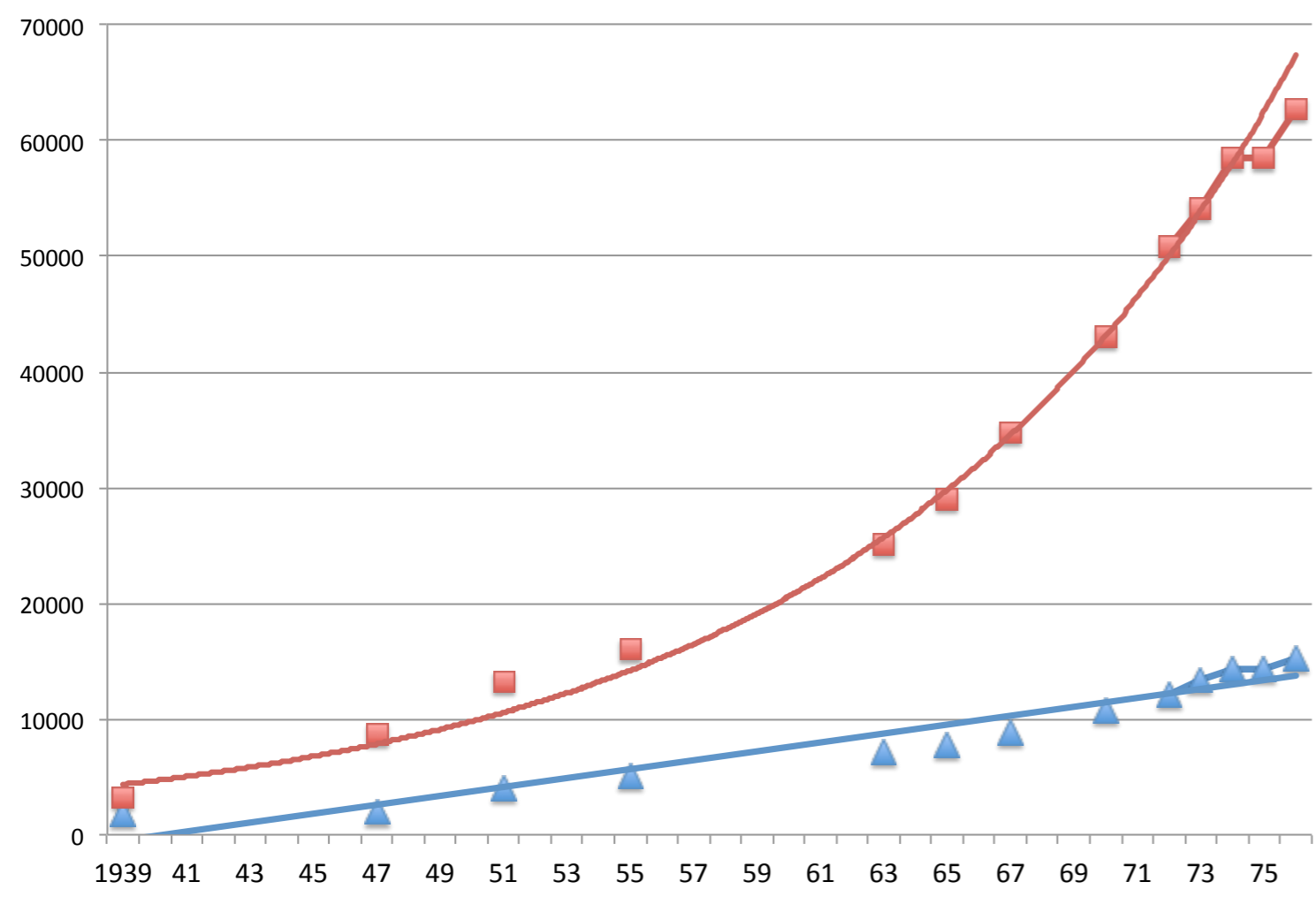


<http://www.math.yorku.ca/SCS/Gallery/lie-factor.html>

Via Andy Johnson







Edward Tufte

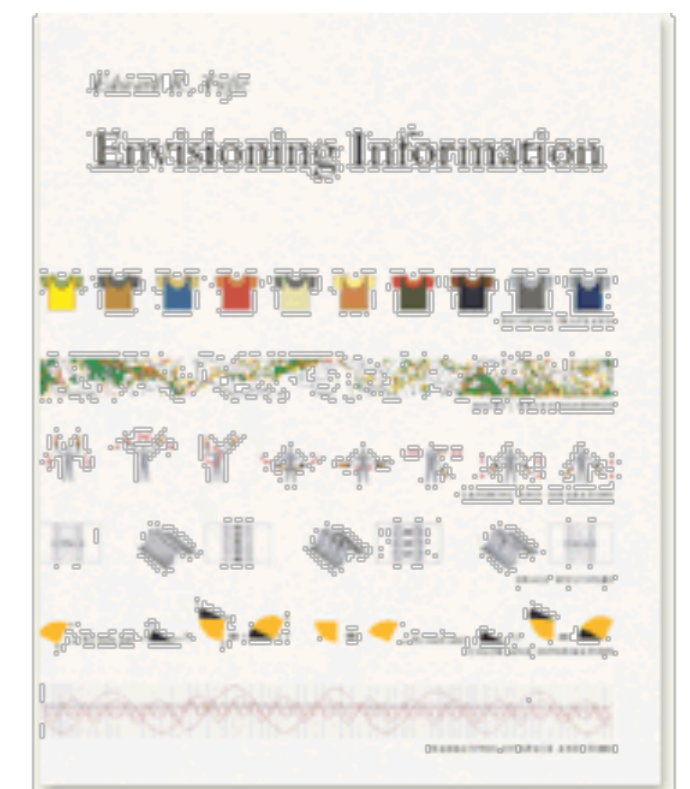
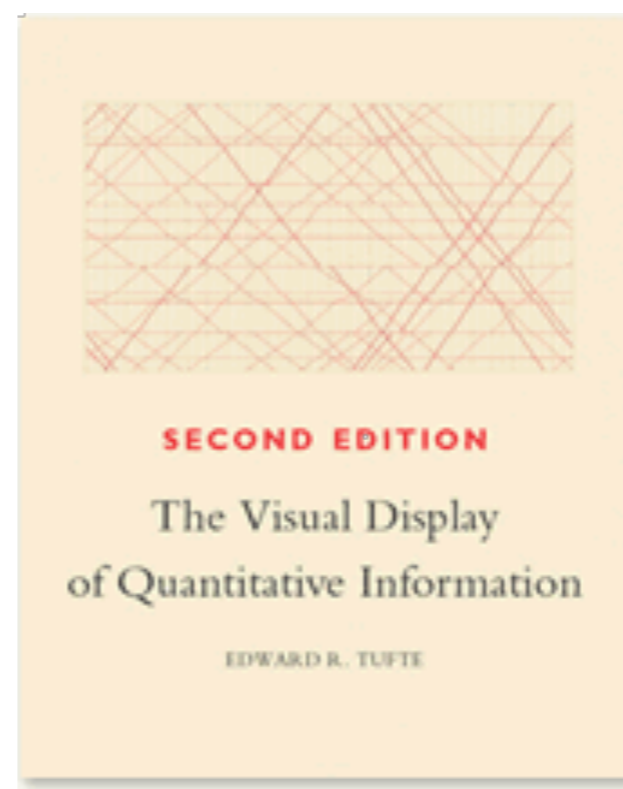
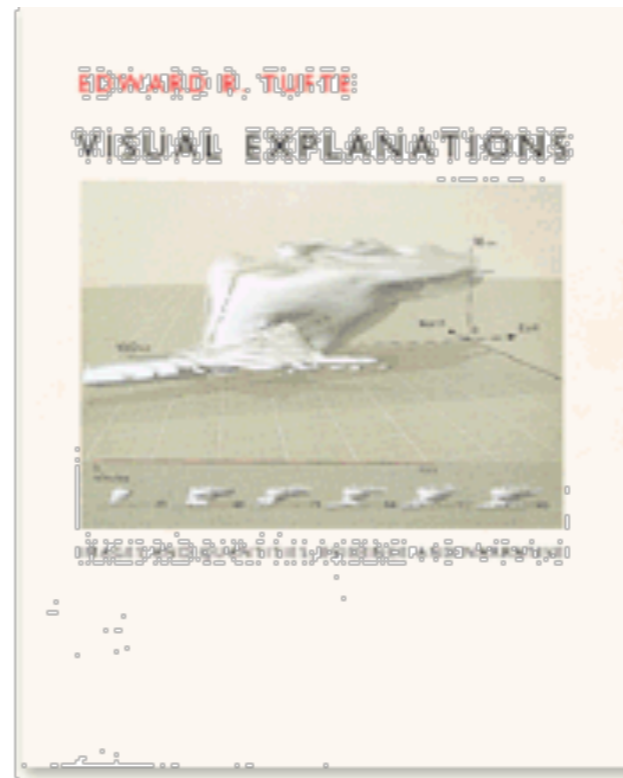
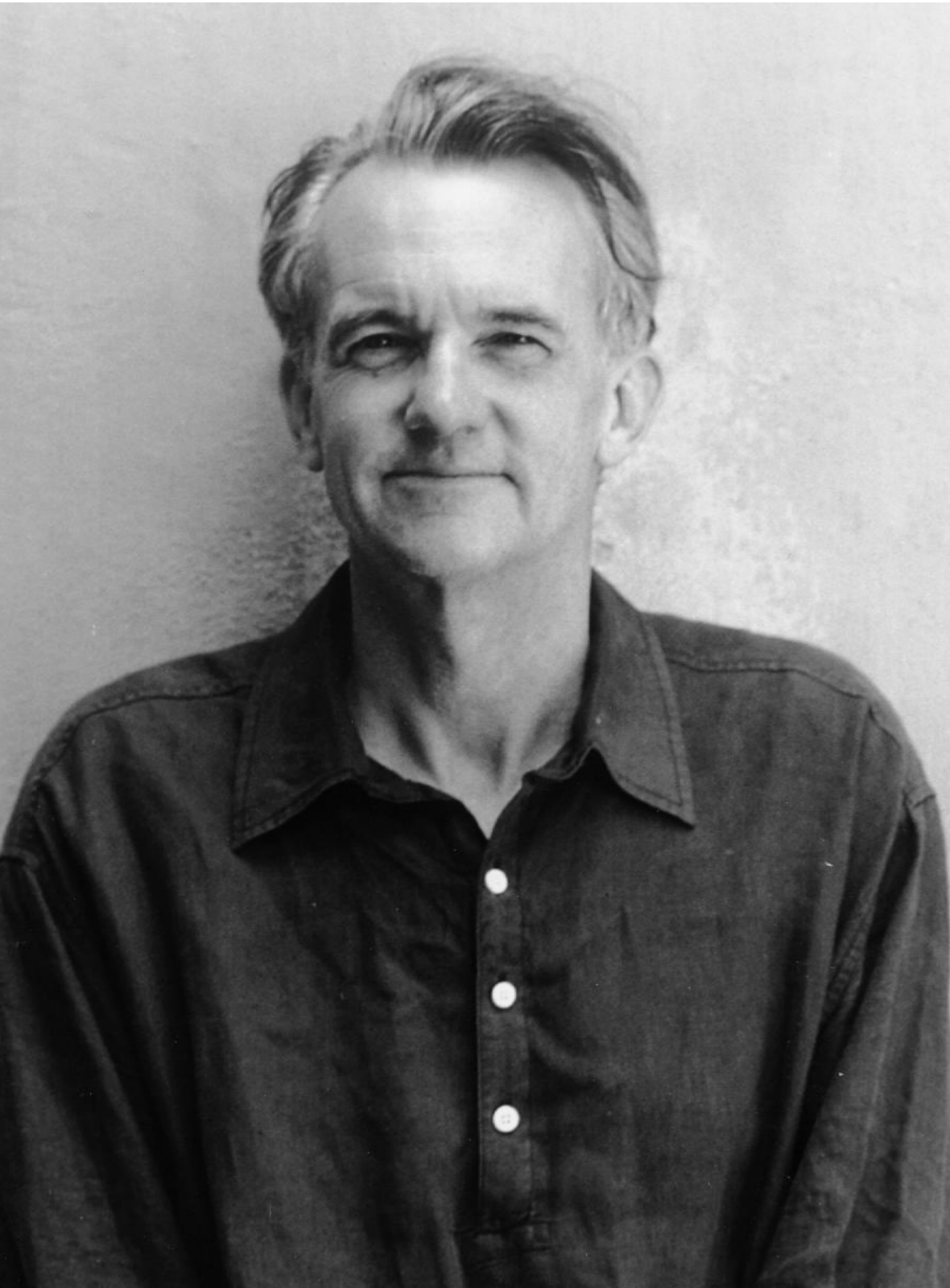
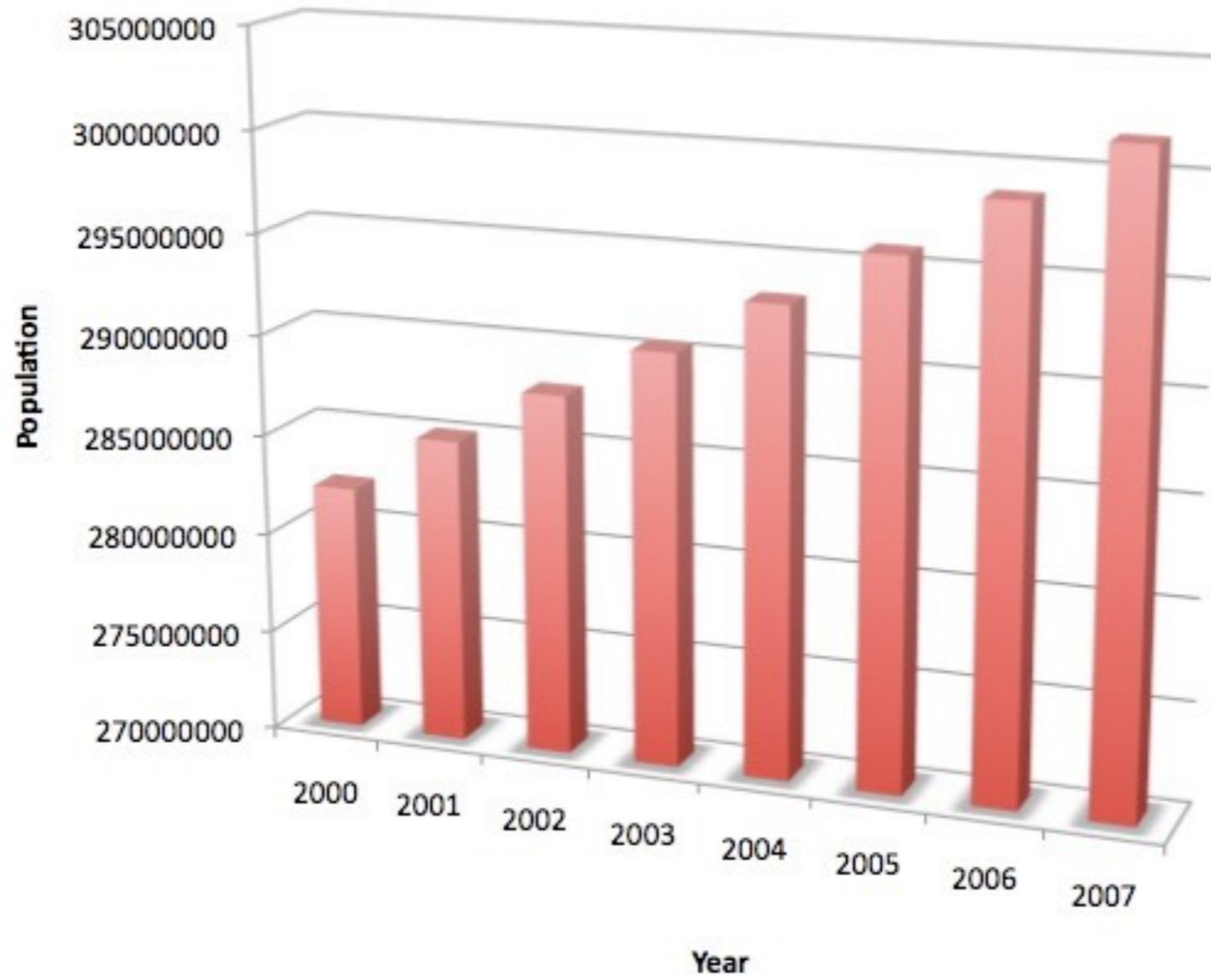


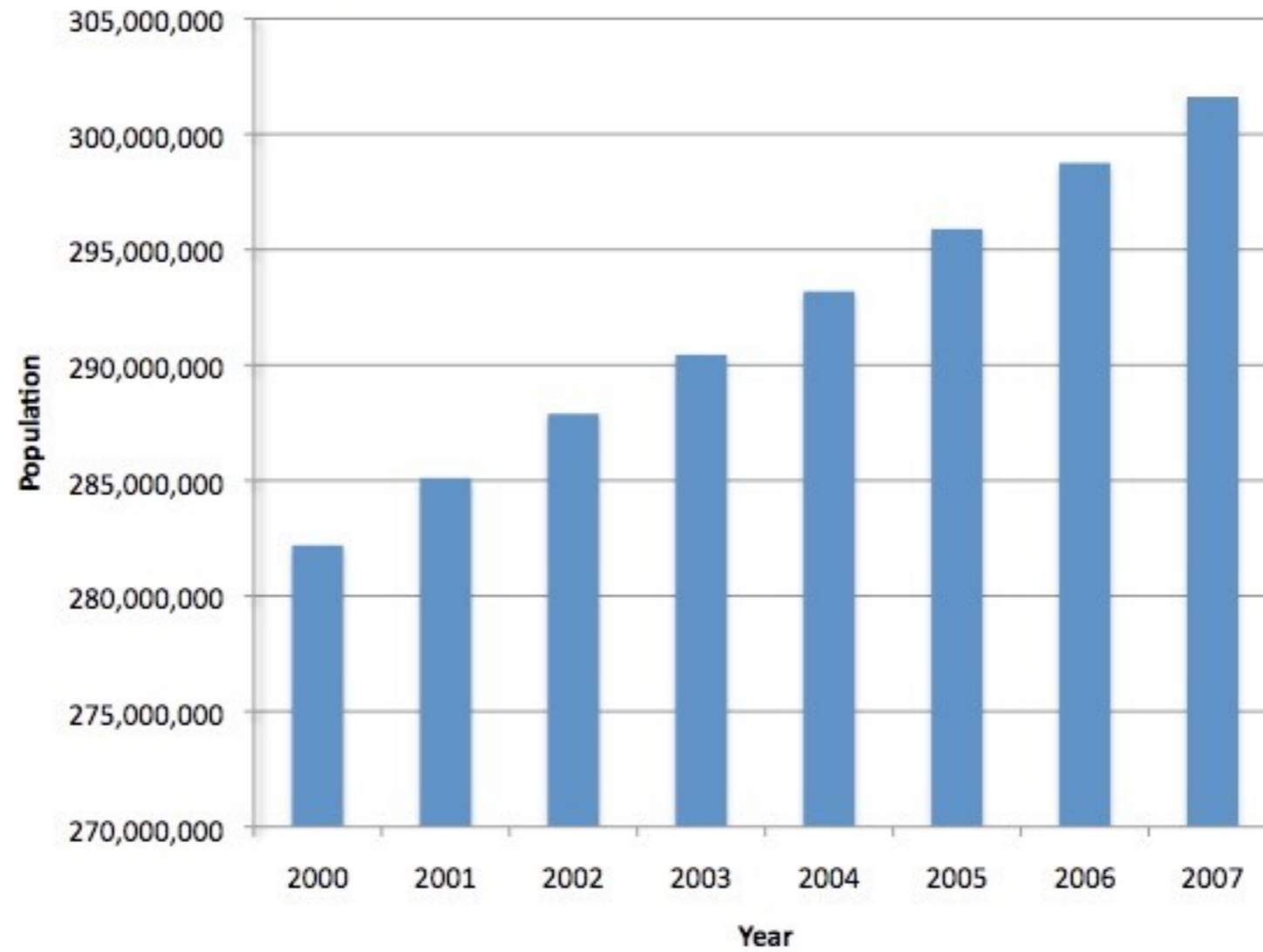
Chart junk

Visual elements in charts and graphs that are not necessary to comprehend the information represented on the graph, or that distract the viewer from this information

Population of the United States

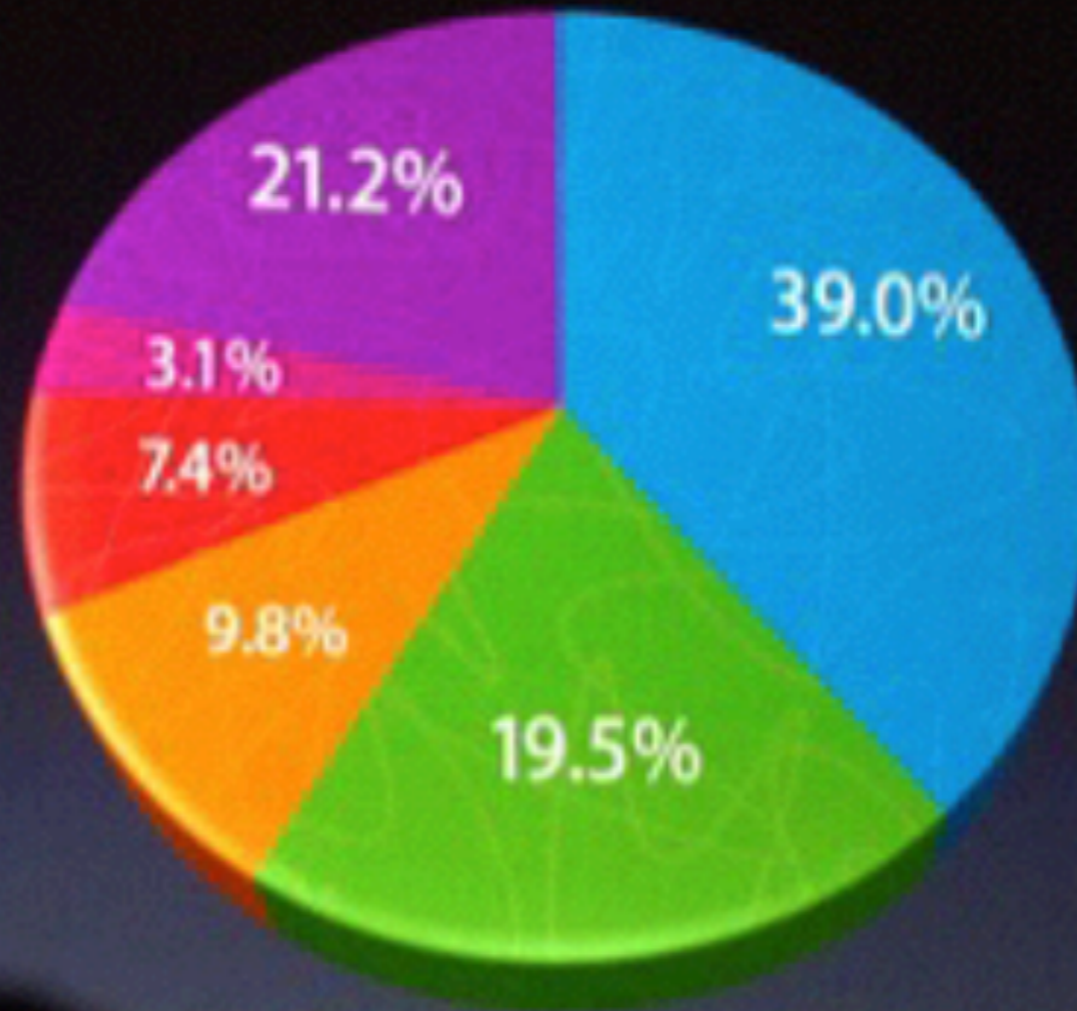


Population of the United States



U.S. SmartPhone Marketshare

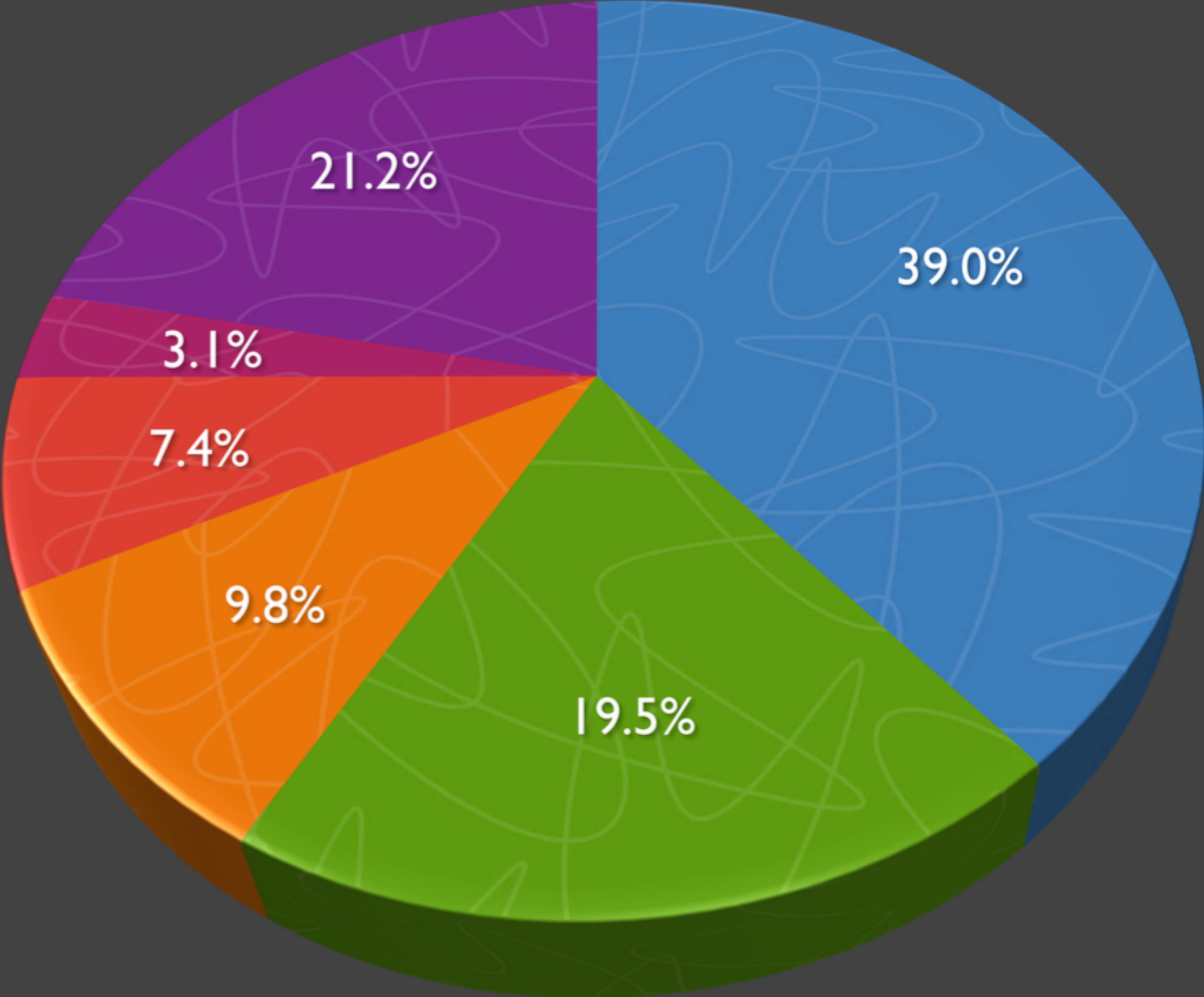
- RIM
- Apple
- Palm
- Motorola
- Nokia
- Other



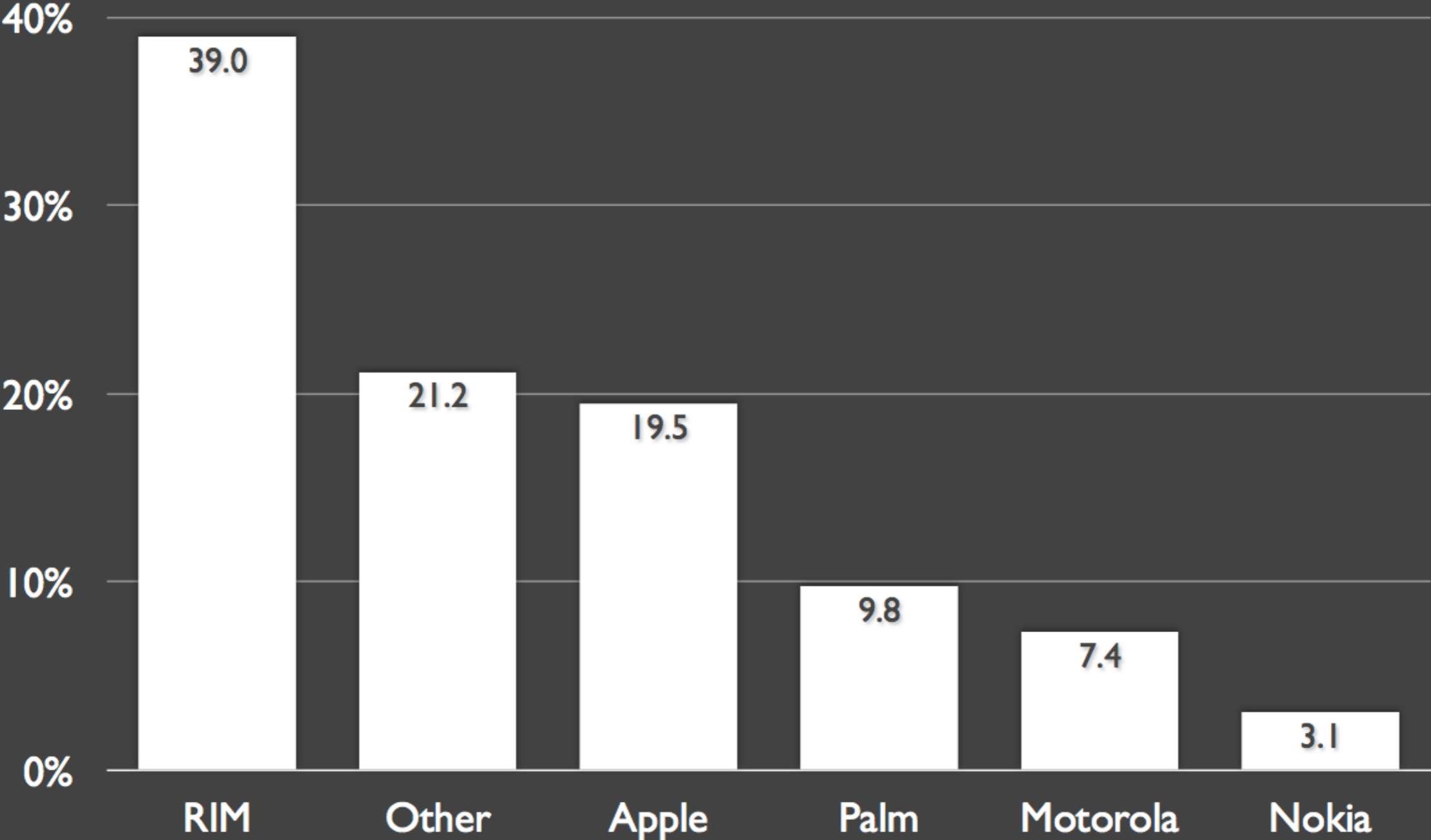
Based on reporting by the Guardian
(<https://www.theguardian.com/technology/blog/2008/jan/21/liesdamnliesandstevejobs>)
Via Miriah Meyer

US smart phone marketshare

- RIM
- Apple
- Palm
- Motorola
- Nokia
- Other

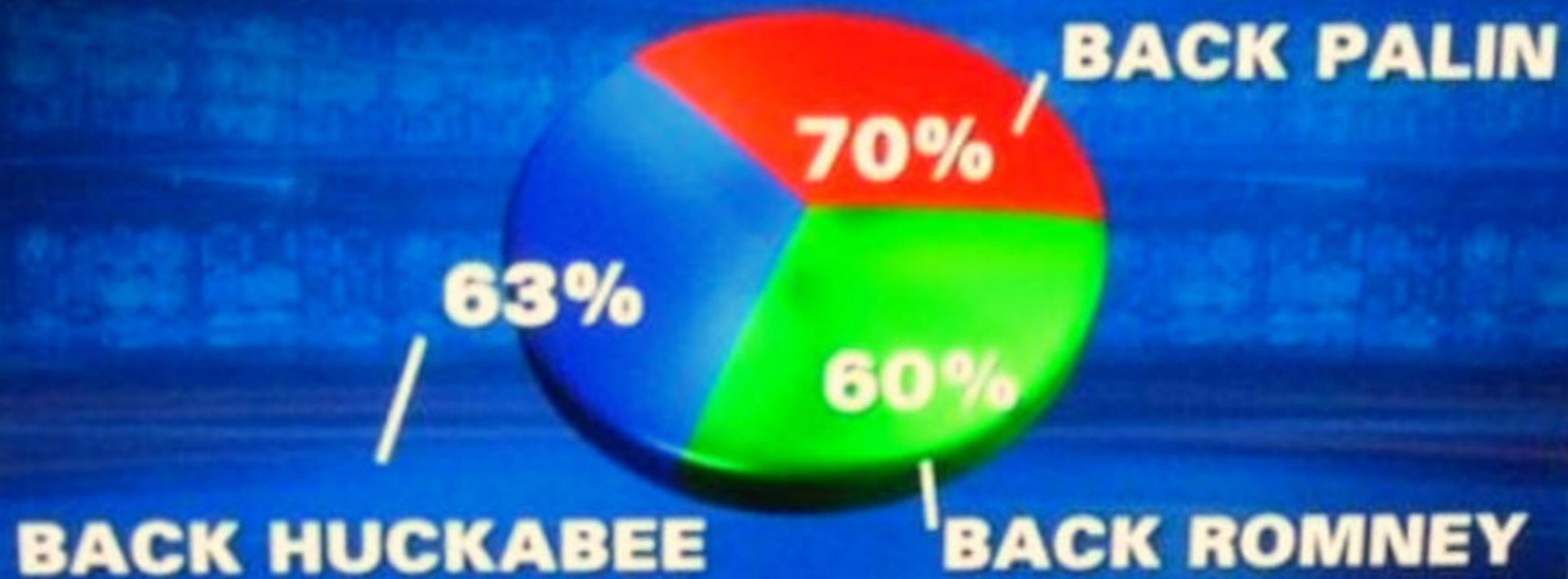


US smart phone marketshare



2012 PRESIDENTIAL RUN

GOP CANDIDATES



FOX

47'

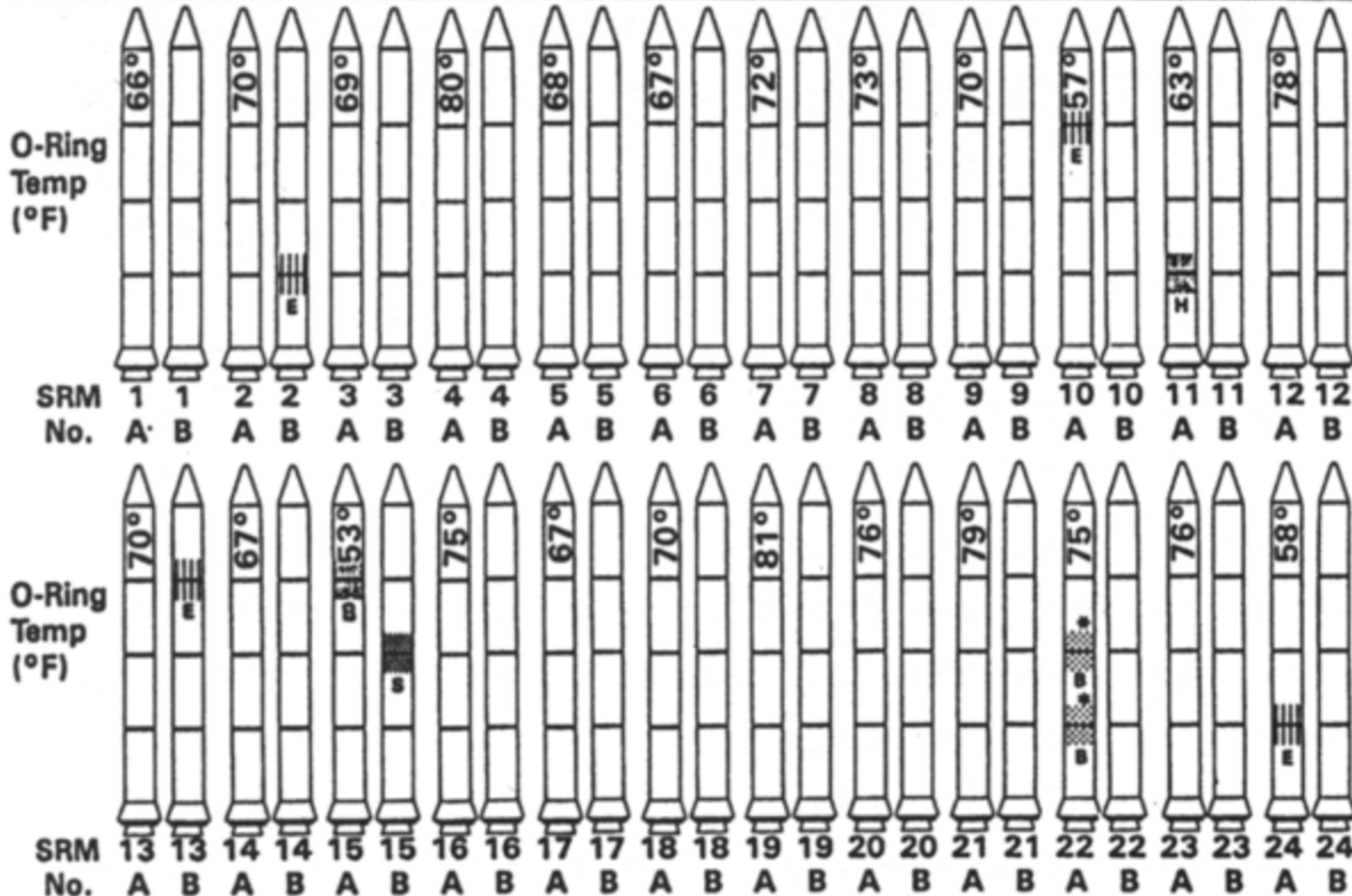
SOURCE: OPINIONS

DYNAMIC

Space Shuttle Challenger Disaster



History of O-Ring Damage in Field Joints (Cont)

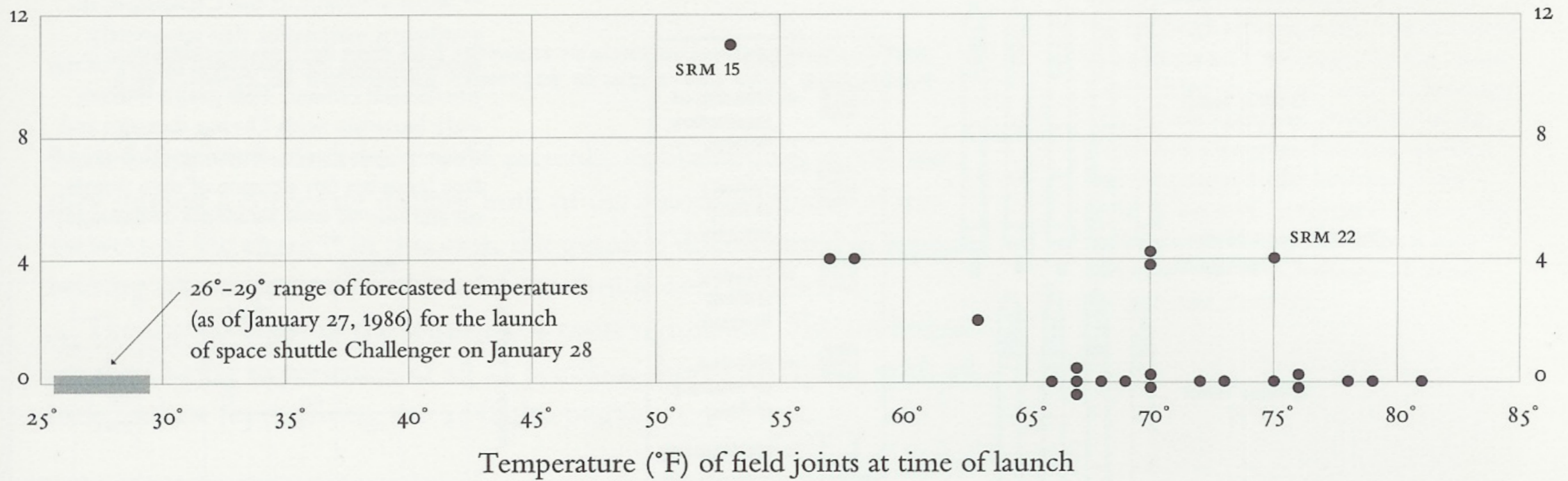


MORTON THOKOL, INC.
Wasatch Operations

* No Erosion

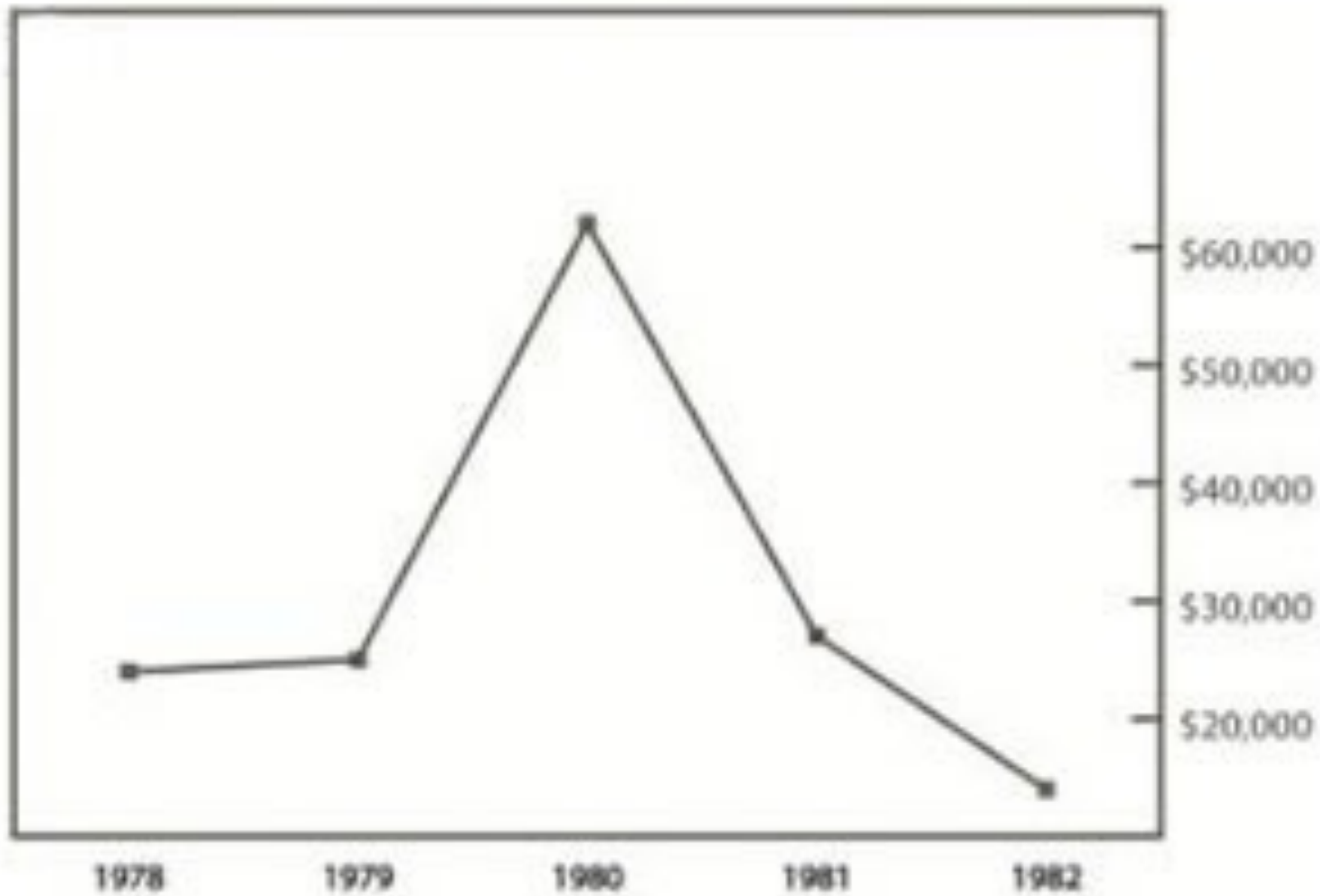
20-10-10

O-ring damage index, each launch

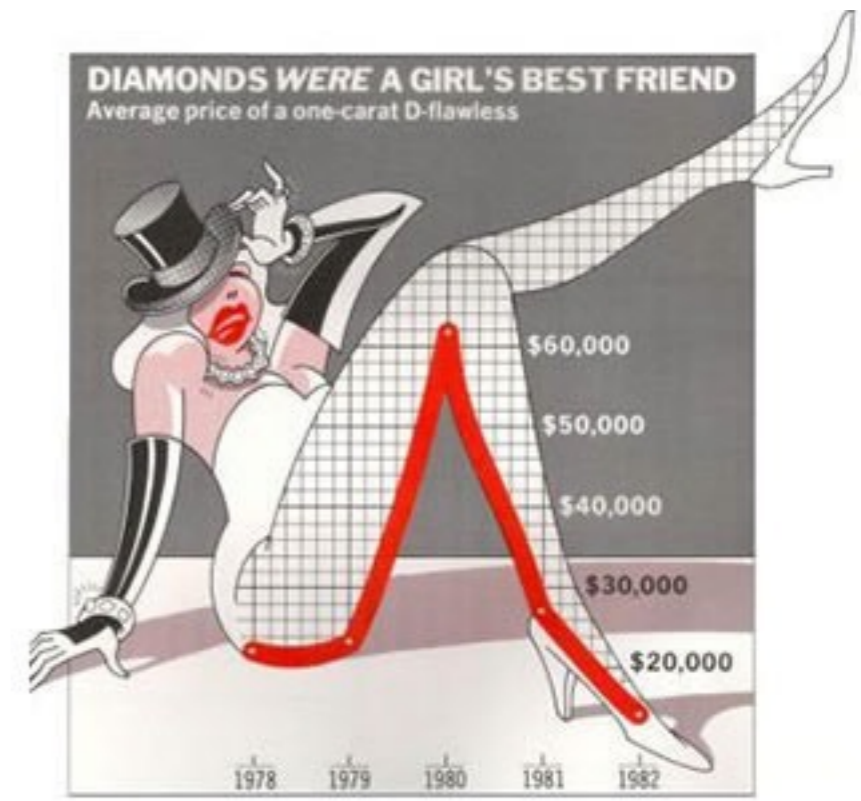
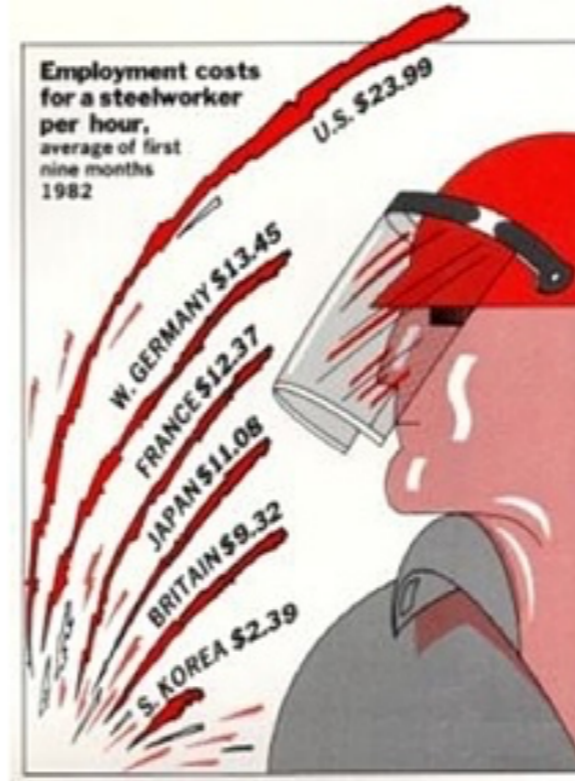


DIAMONDS WERE A GIRL'S BEST FRIEND

Average price of a one-carat D-flawless



Nigel Holmes



Holiday Candy Sold in 2015

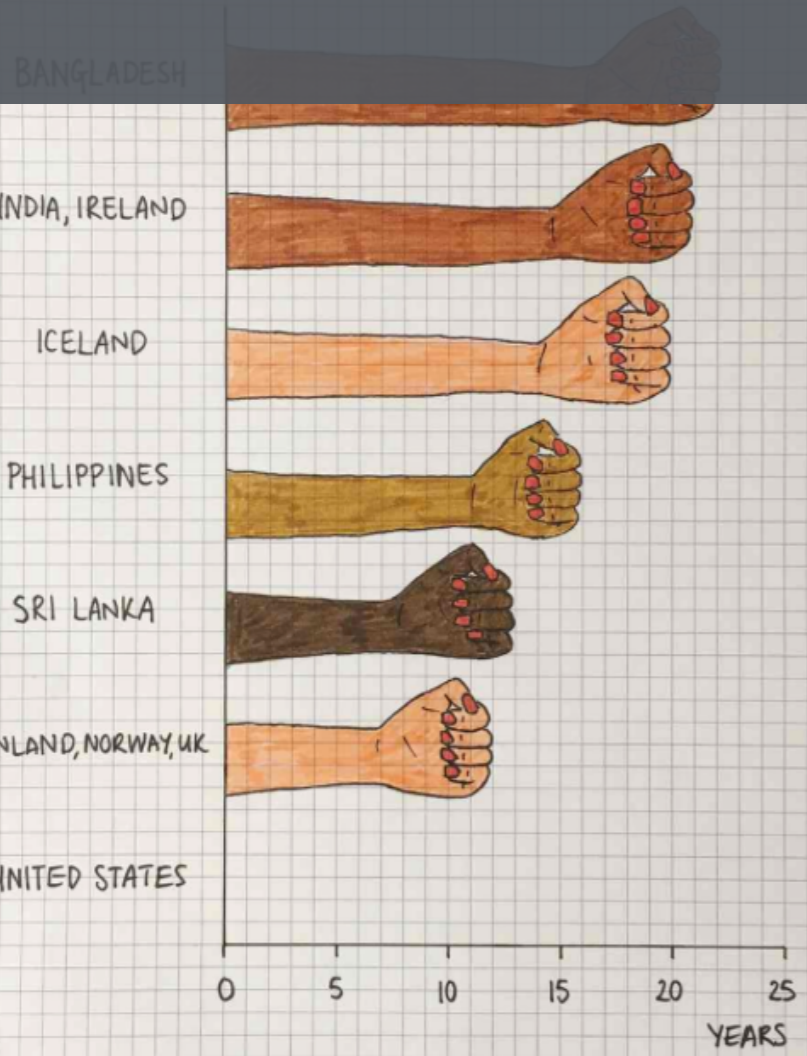


Can chartjunk be useful?

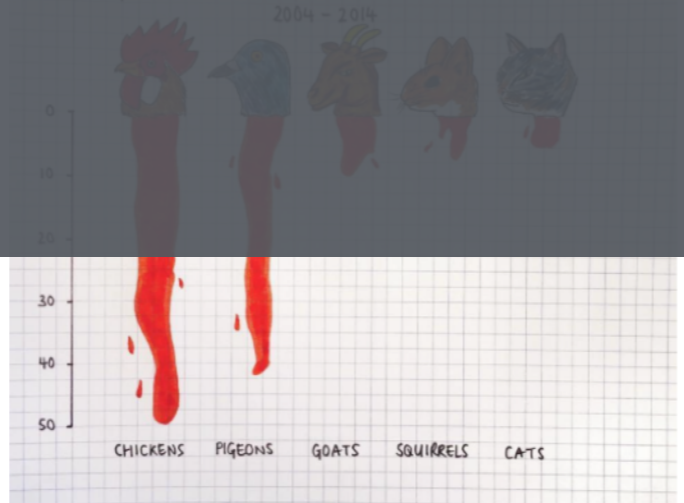
“Informing without alienating”

Mona Chalabi

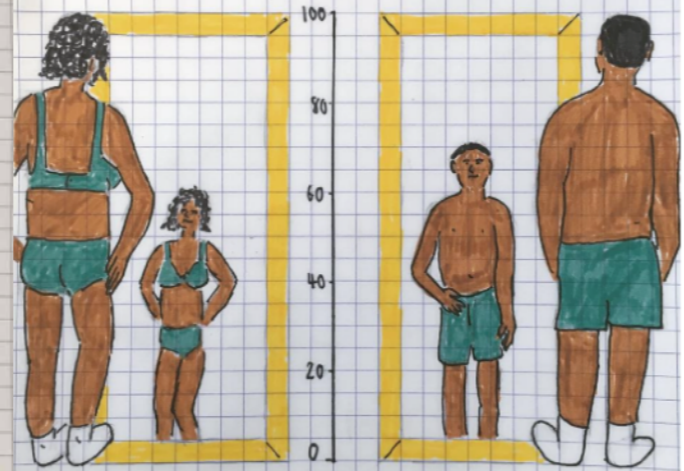
Years With A Female Head of State



Decapitated Animals Found in New York Parks 2004 - 2014



% of People Who Are Satisfied With Their Physical Appearance



Useful Junk? The Effects of Visual Embellishment on Comprehension and Memorability of Charts

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ABSTRACT

Guidelines for designing information charts often state that the presentation should reduce ‘chart junk’ – visual embellishments that are not essential to understanding the data. In contrast, some popular chart designers wrap the presented data in detailed and elaborate imagery, raising the questions of whether this imagery is really as detrimental to understanding as has been proposed, and whether the visual embellishment may have other benefits. To investigate these issues, we conducted an experiment that compared embellished charts with plain ones, and measured both interpretation accuracy and long-term recall. We found that people’s accuracy in describing the embellished charts was no worse than for plain charts, and that their recall after a two-to-three-week gap was significantly better. Although we are cautious about recommending that all charts be produced in this style, our results question some of the premises of the minimalist approach to chart design.

Author Keywords

Charts, information visualization, imagery, memorability.

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms

Design, Human Factors

INTRODUCTION

Many experts in the area of chart design, such as Edward Tufte, criticize the inclusion of visual embellishment in charts and graphs; their guidelines for good chart design often suggest that the addition of *chart junk*, decorations and other kinds of non-essential imagery, to a chart can make interpretation more difficult and can distract readers from the data [22]. This *minimalist* perspective advocates plain and simple charts that maximize the proportion of

data-ink – or the ink in the chart used to represent data.

Despite these minimalist guidelines, many designers include a wide variety of visual embellishments in their charts, from small decorations to large images and visual backgrounds. One well-known proponent of visual embellishment in charts is the graphic artist Nigel Holmes, whose work regularly incorporates strong visual imagery into the fabric of the chart [7] (e.g., Figure 1).

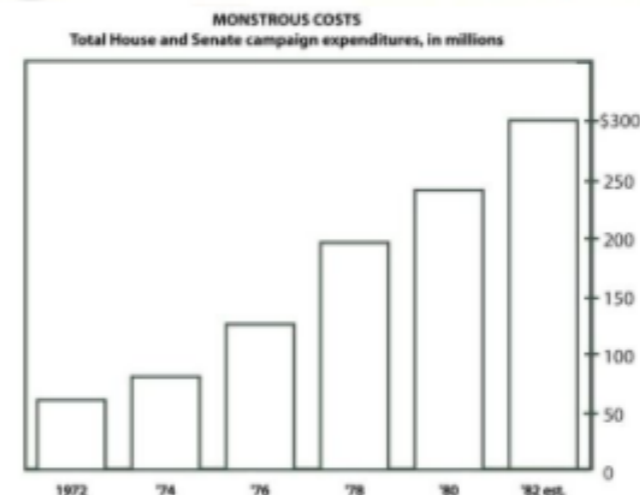
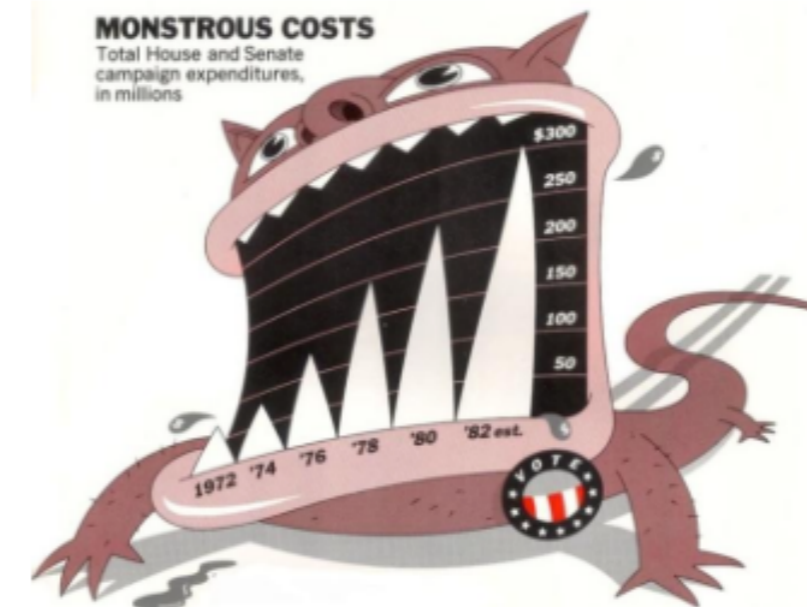
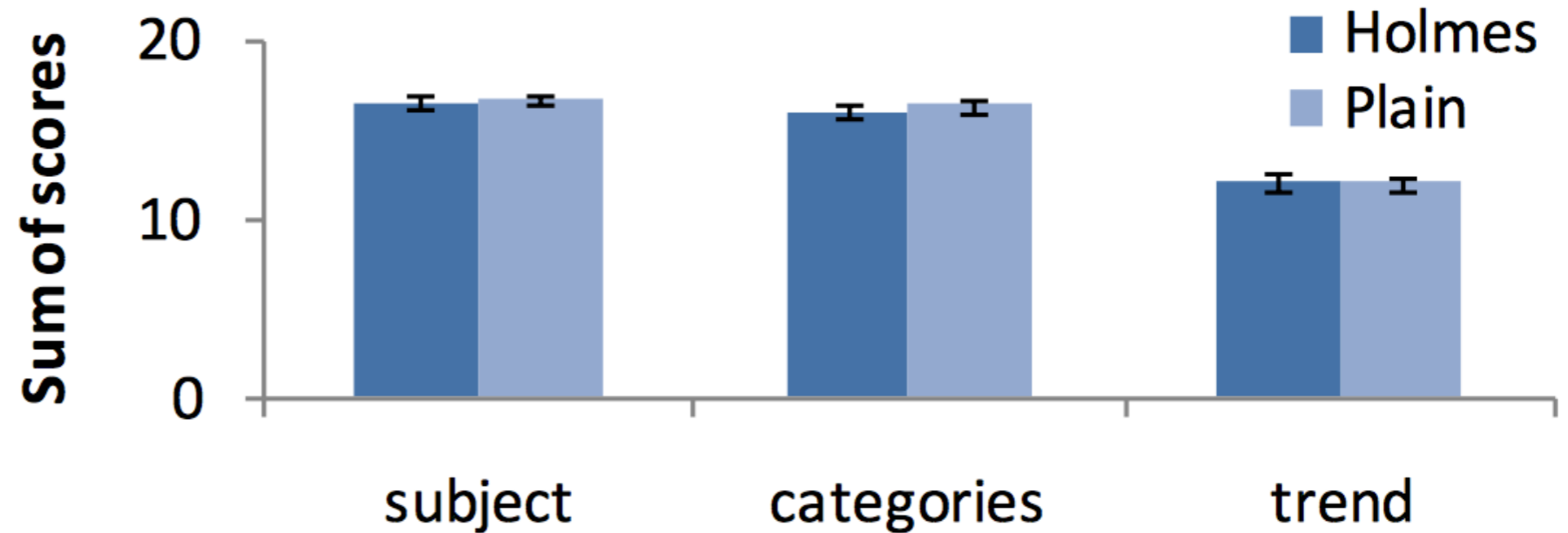
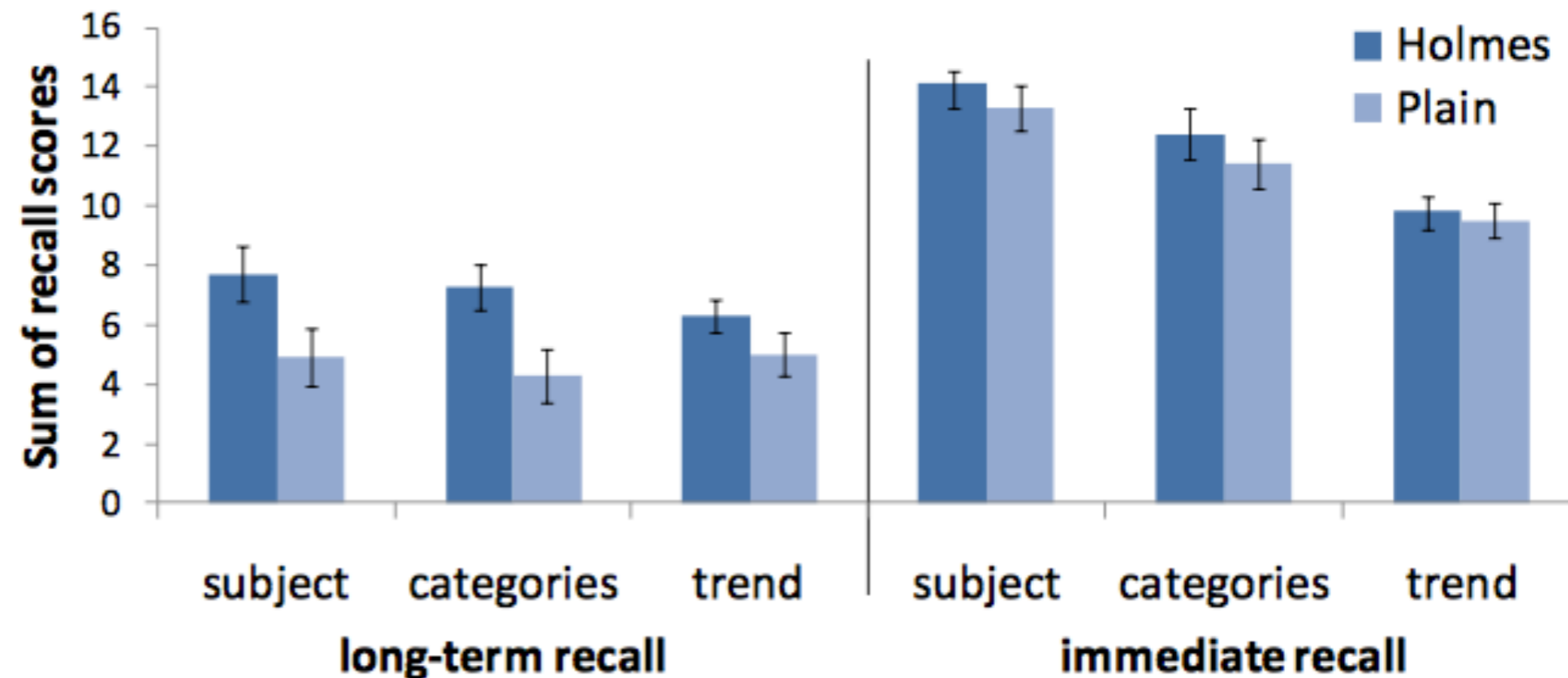


Chart junk: Bateman's et al. study

Accuracy



Recall



Visual embellishment

Pros

- Memorability
- Engagement
- Persuasion
- Effective communication of well-scoped messages

Cons

- “Loading” visualizations with messages
- Potential for bias and stereotyping
- Reduces accuracy of “reading” the data
- Can taint trustworthiness of graphics

Primer on data analysis

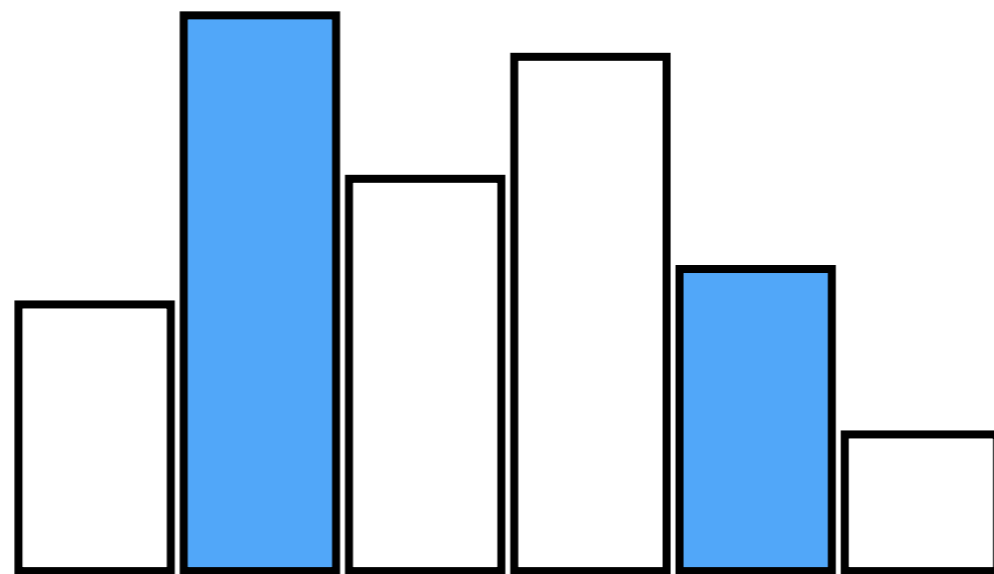
- Collect data from participants
- Compute accuracy measurement:
- $\log_2(|\text{true_percent} - \text{judged_percent}| + 1/8)$
- Compute average accuracy and error bars (R code)

Creating the experiment interface

Create a bar chart visualization similar to Cleveland & McGill's

Add a prompt for the user + slider to enter their response

What percentage of the longer bar is the shorter one?



go.uic.edu/slider



Creating the experiment interface

For next week:

- have a version that can generate data with a specific ground truth (10%, 20%, 30%, ...) difference between the two bars
- Generate random set of “distractors”

