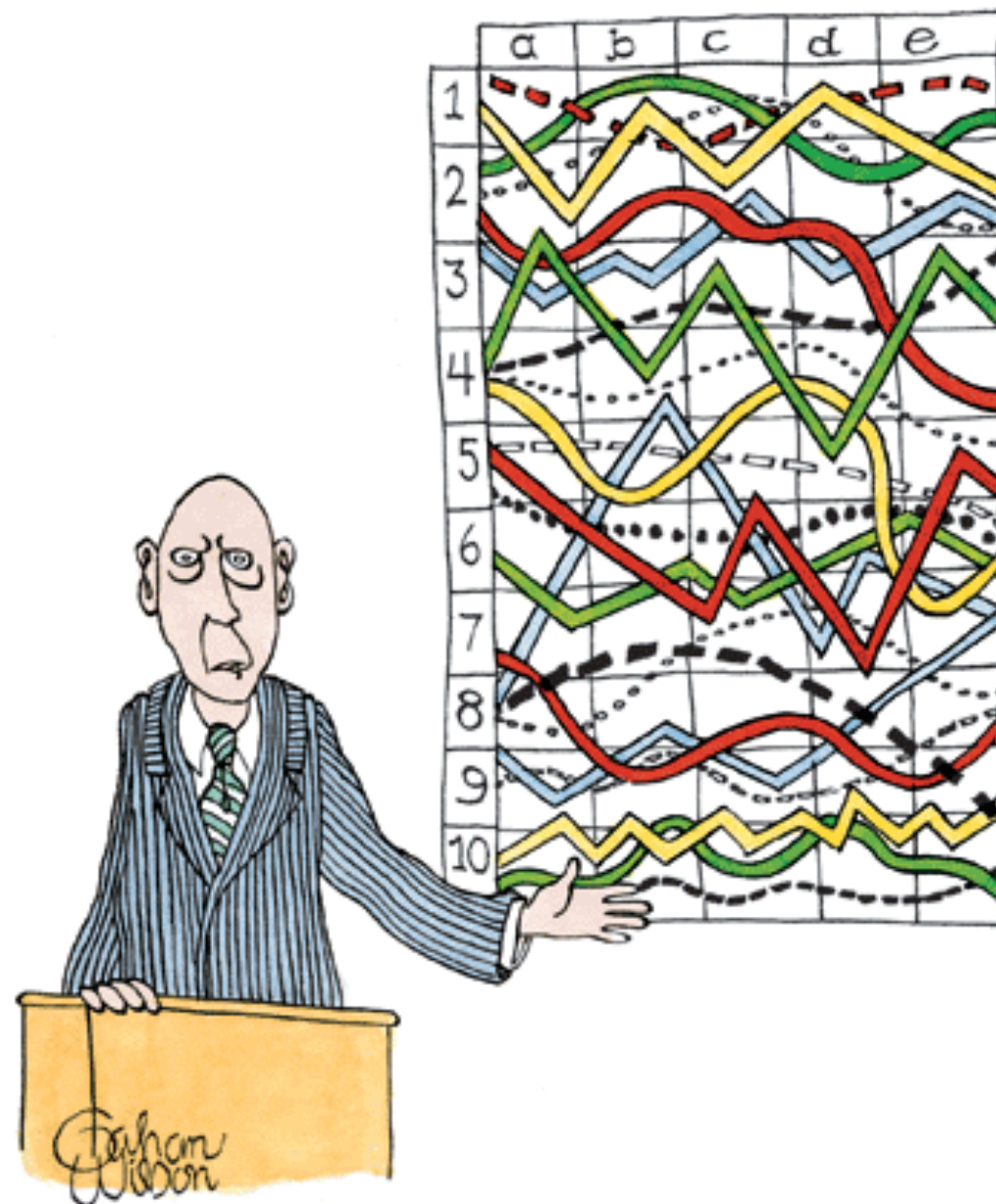# Data Visualization

Ellianna Abrahams & Thomas Robitaille

Why is Data Visualization useful?

"I'll pause for a moment so you can let this information sink in."

Cartoon by Gahan Wilson

"Good data visualization leads you to see what might otherwise go unnoticed"

- Daniela Huppenkothen -

✦ **To Discover**

    ✦ Exploratory plots and charts allow us to find relationships

✦ **To Explain**

    ✦ Published figures allow us to disseminate results with the community

    ✦ Outreach visualizations allow us to share our findings with the public
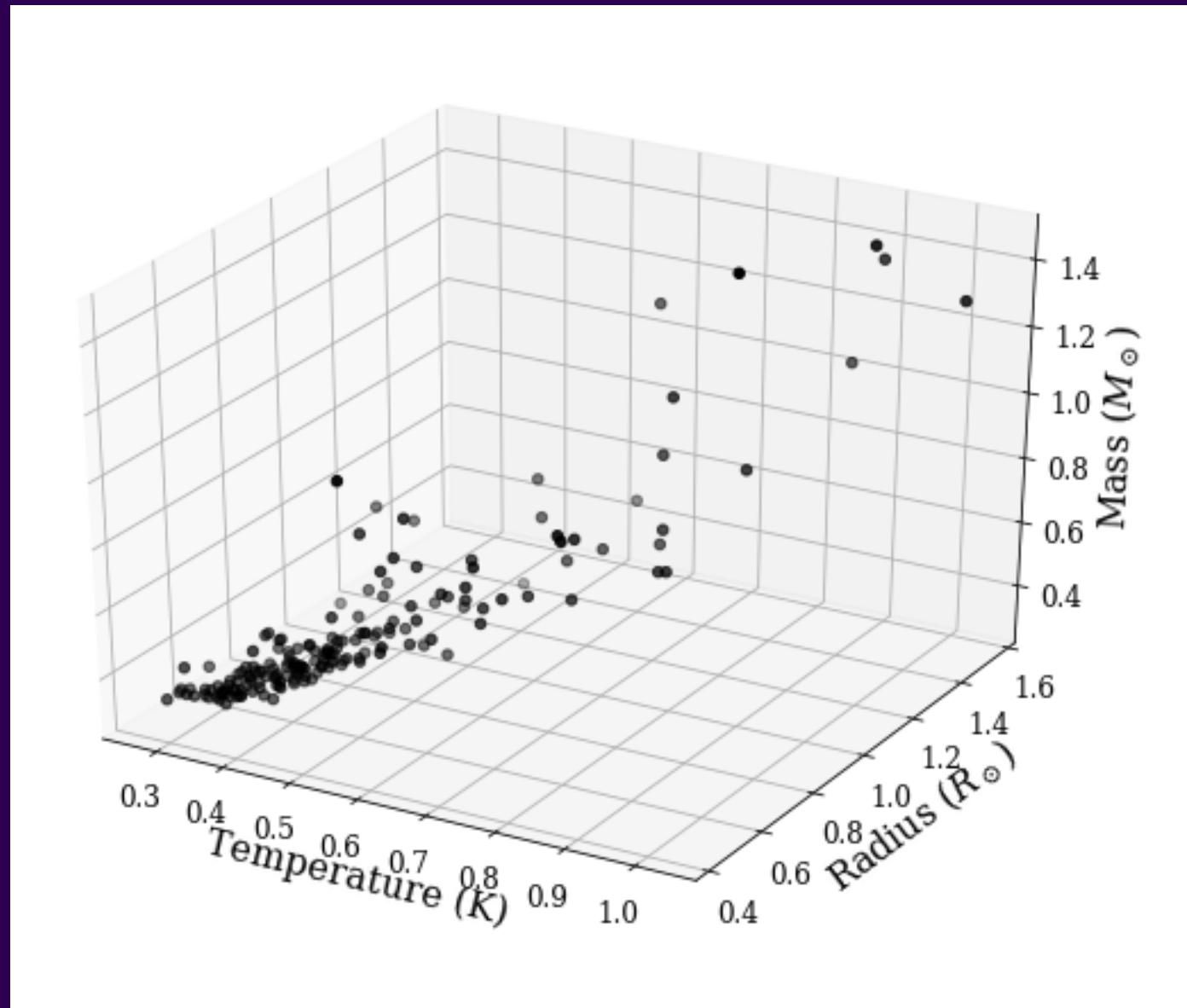
Kelleher & Waganer 2011

✦ **To Discover**

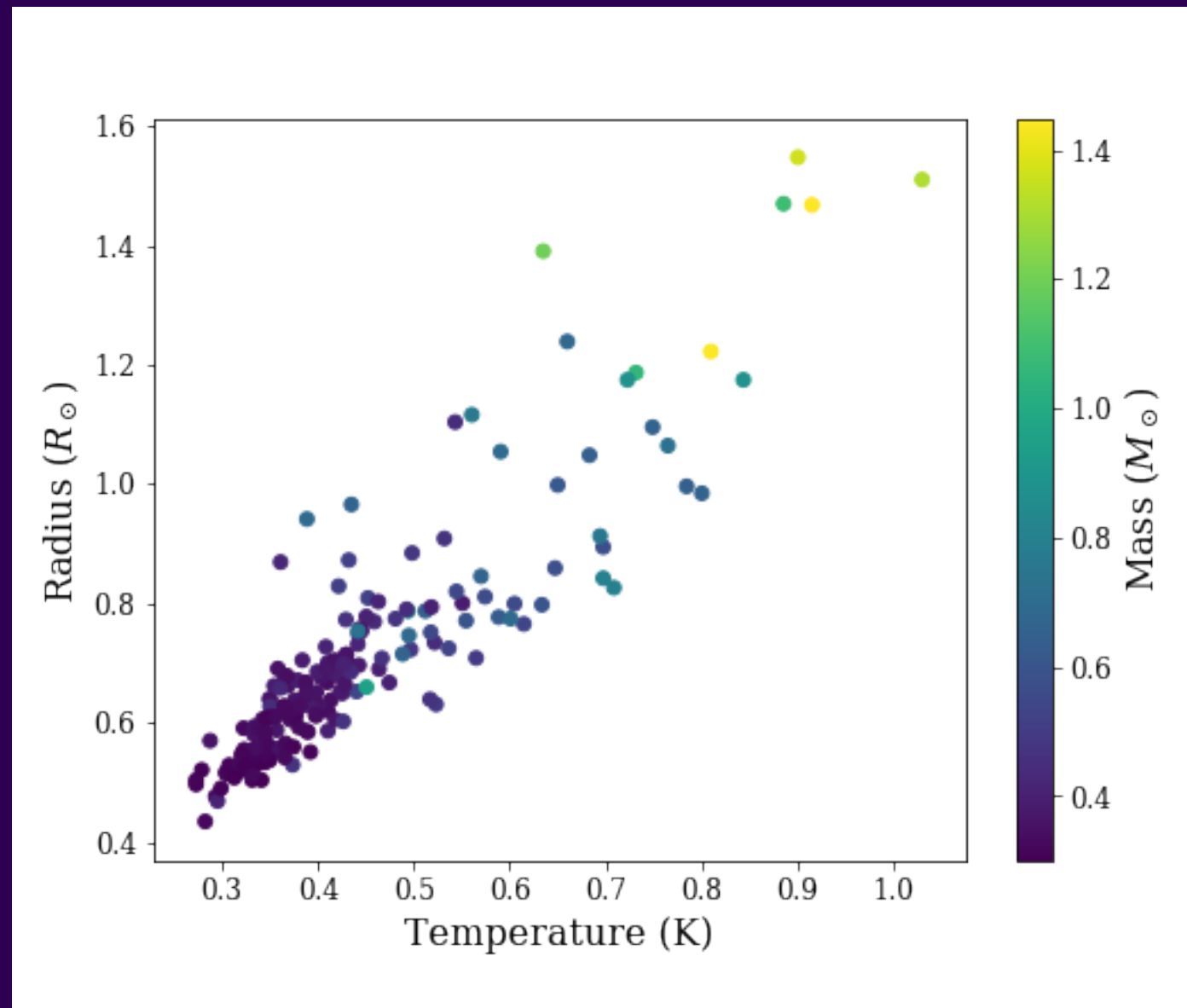✦ Exploratory plots and charts allow us to find relationships

✦ **To Explain**

✦ Published figures allow us to disseminate results with the community

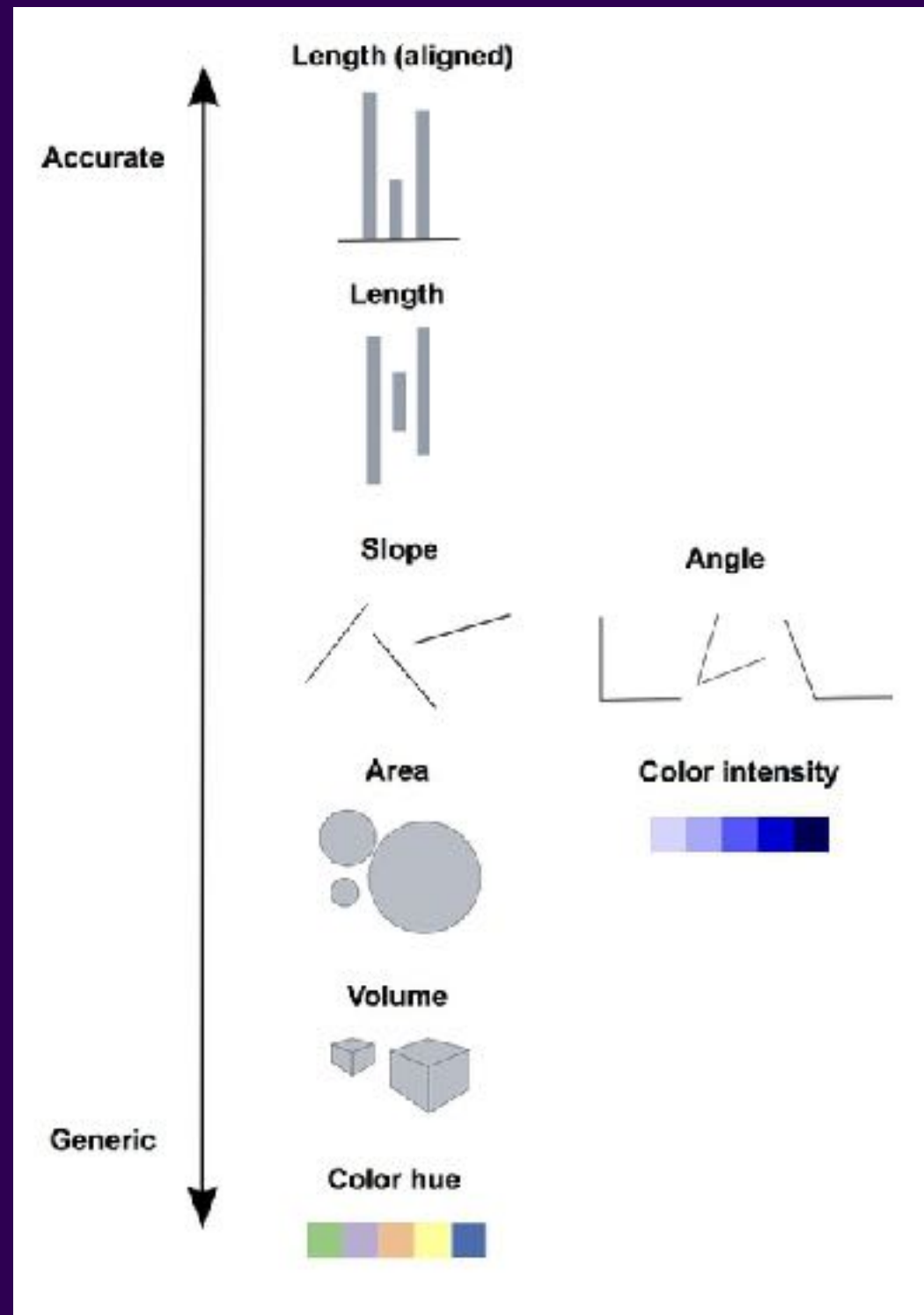✦ Outreach visualizations allow us to share our findings with the public

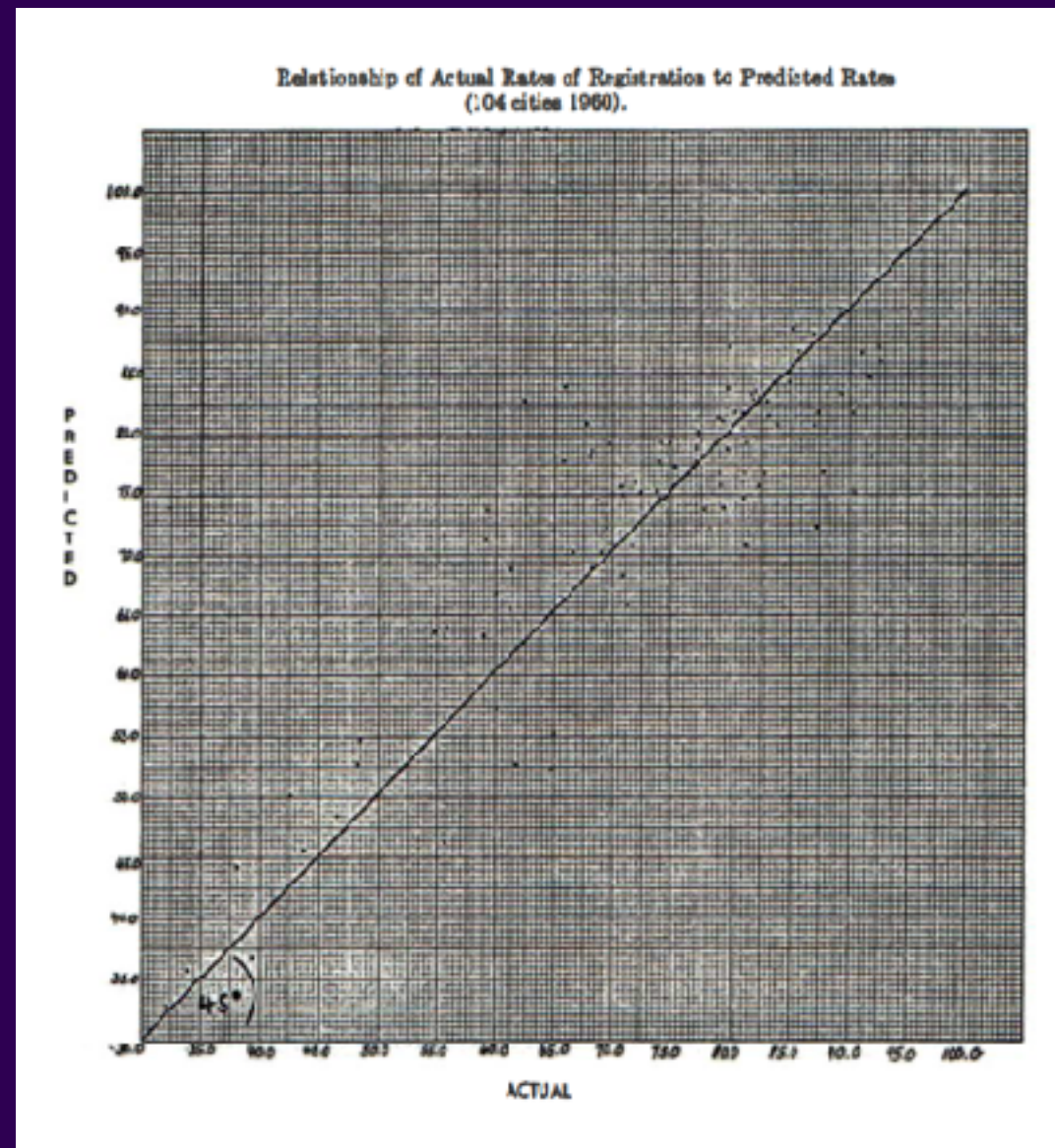Kelleher & Waganer 2011

1. Simpler is Better

Kelleher & Waganer 2011, Few 2004

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Kelleher & Waganer 2011, Few 2004

Perceptual Hierarchy

Cleveland & McGill 1984
Graphic by P. Aldhous

2. "Spend Ink" on Data
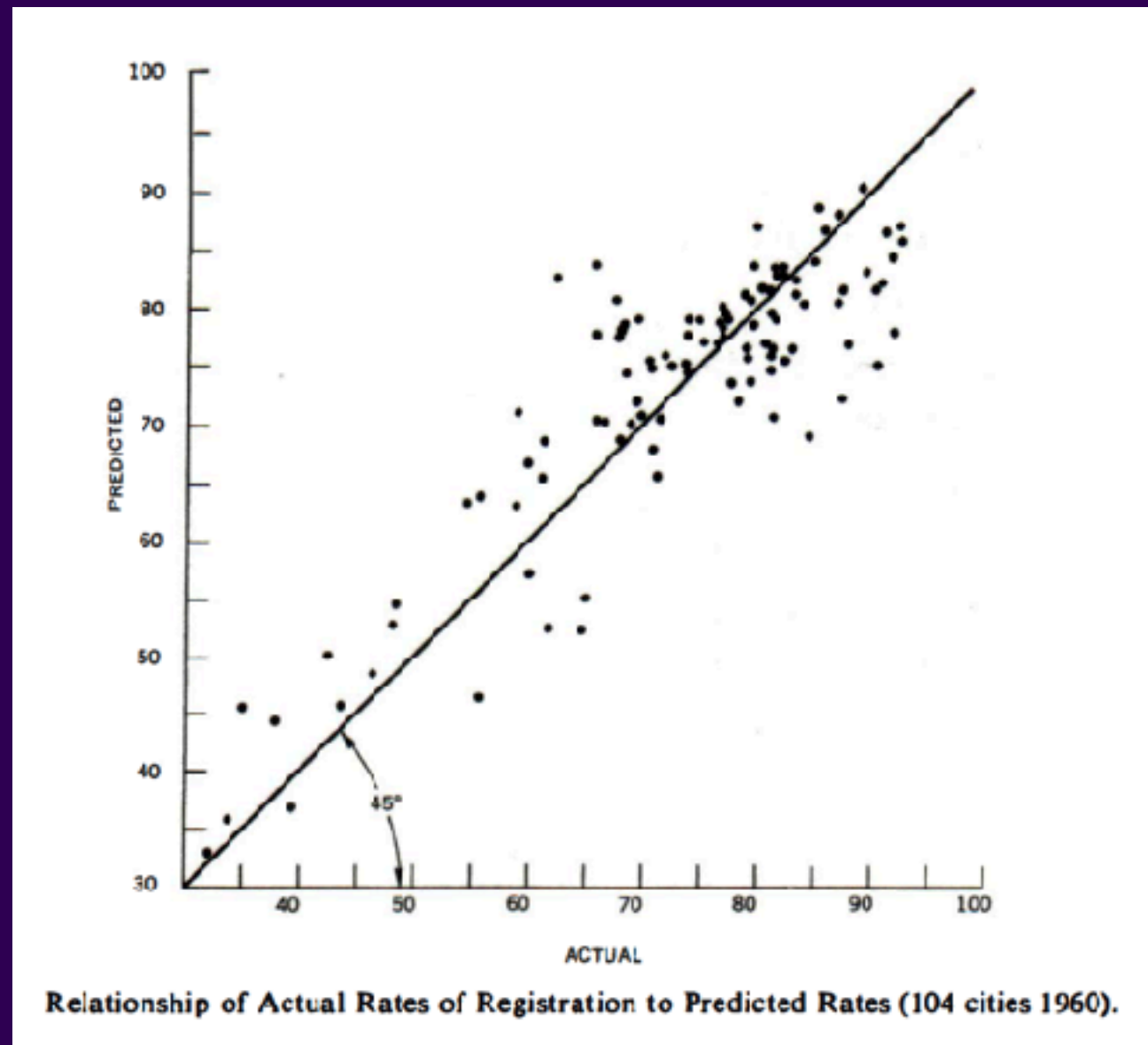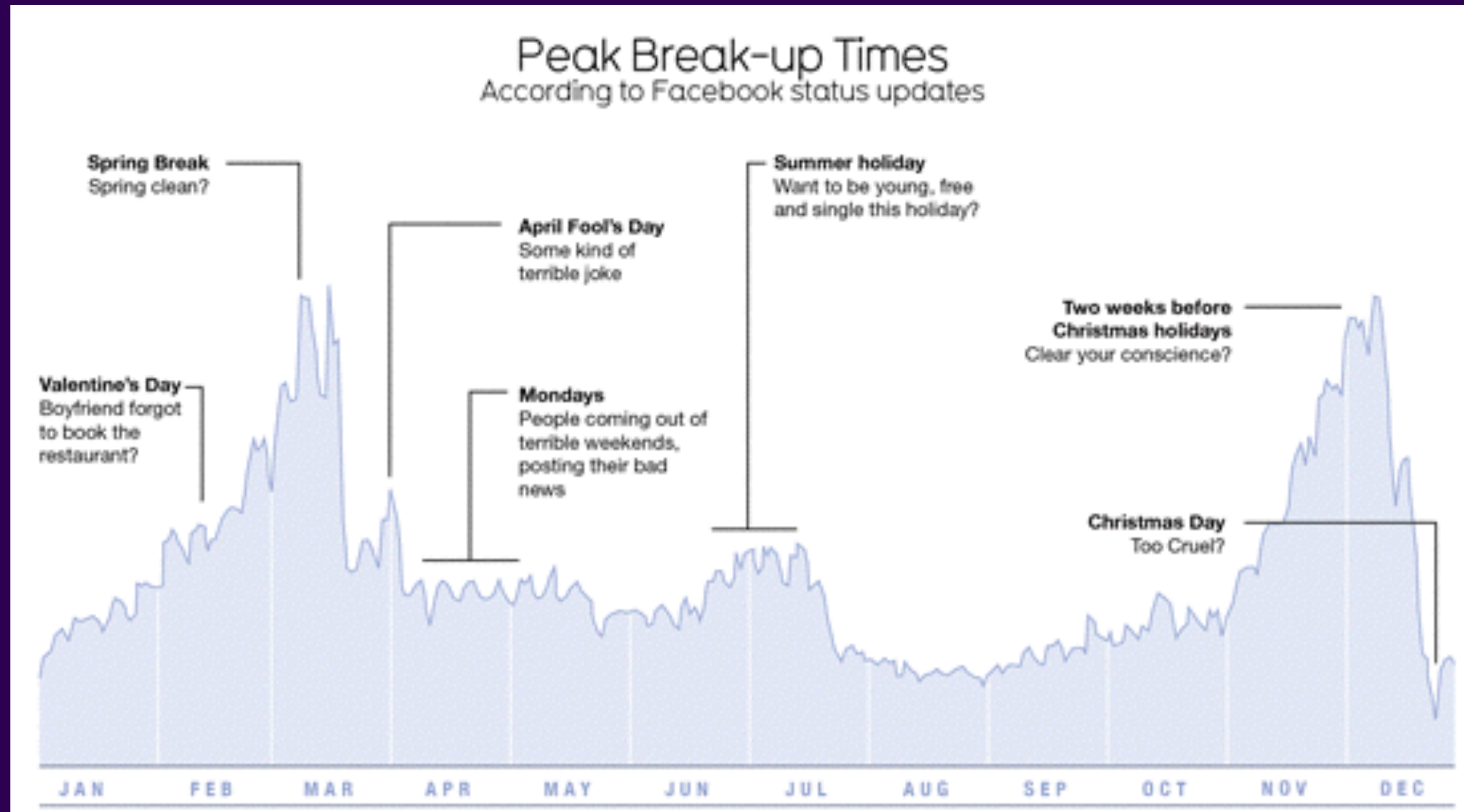
Relationship of Actual Rates of Registration to Predicted Rates
(104 cities 1960).

Tufte 1983

2. "Spend Ink" on Data

Relationship of Actual Rates of Registration to Predicted Rates (104 cities 1960).

3. Make Data Coherent

Peak Break-up Times
According to Facebook status updates

Pre-Attentive Processing

Few 2009, Kelleher & Waganer 2011
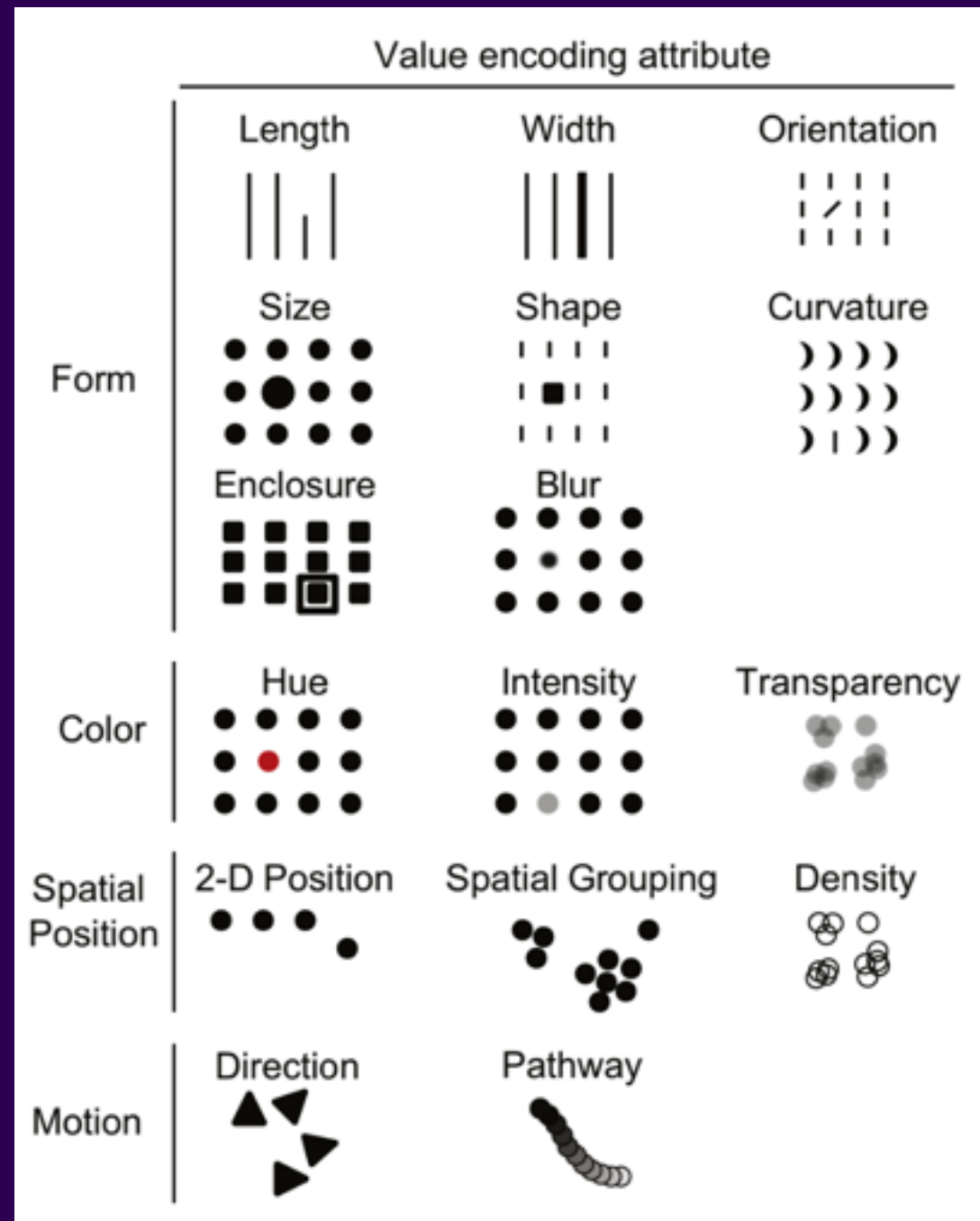
Pre-Attentive Processing

4. Accessibility

Normal vision

Deuteranopia

Protanopia

Tritanopia

Graphic by R. Cravitt
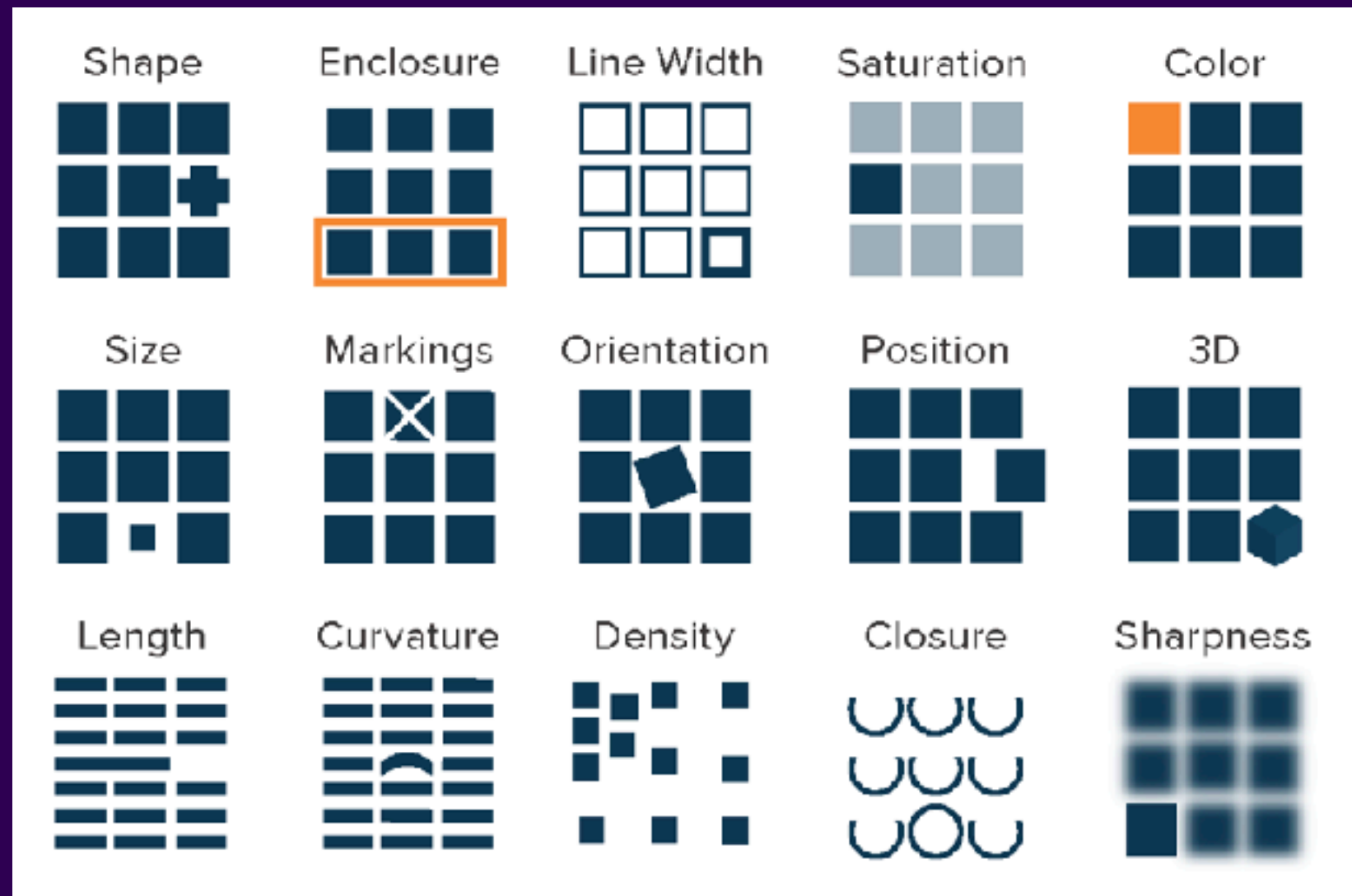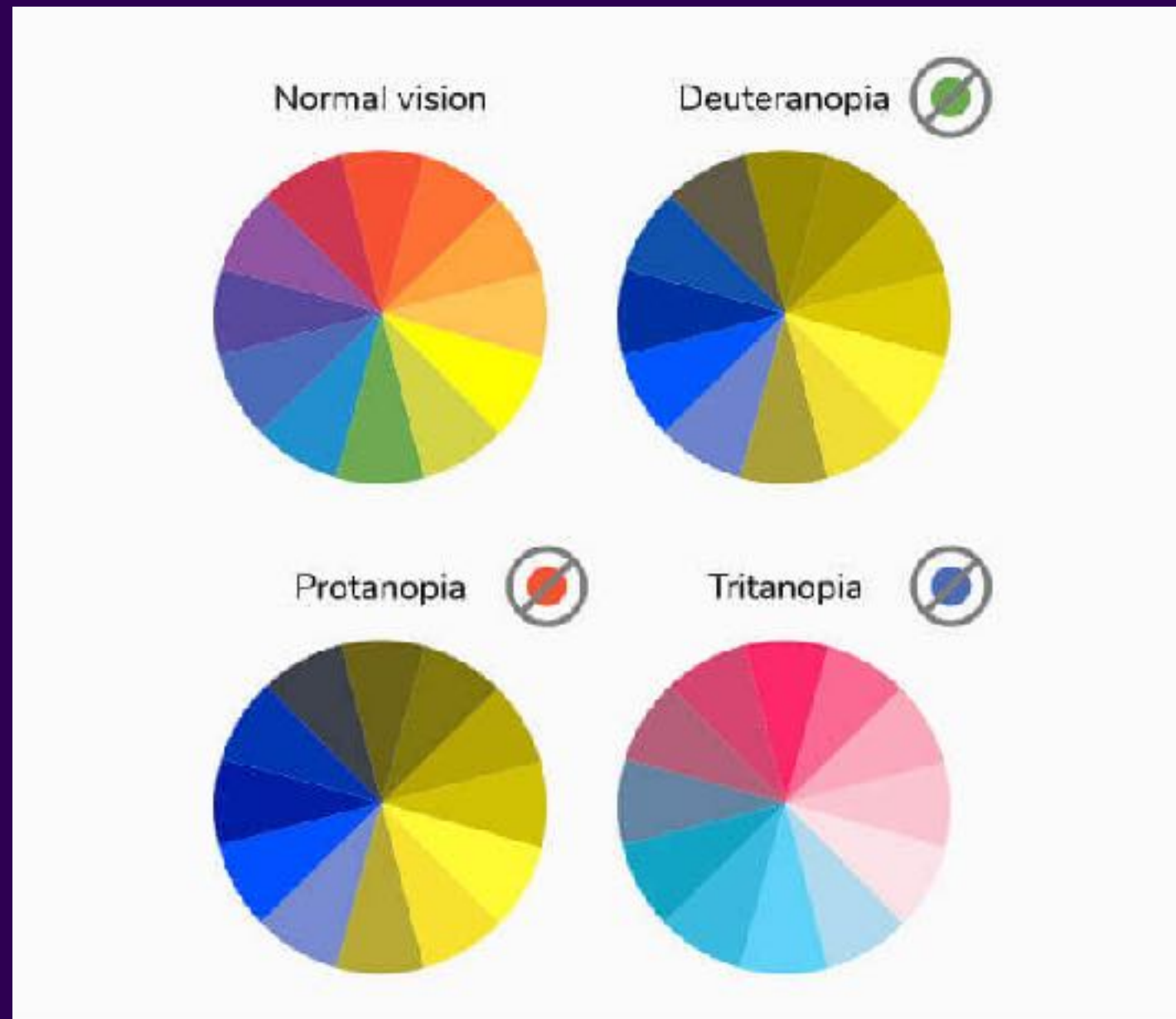
Perceptual Uniformity
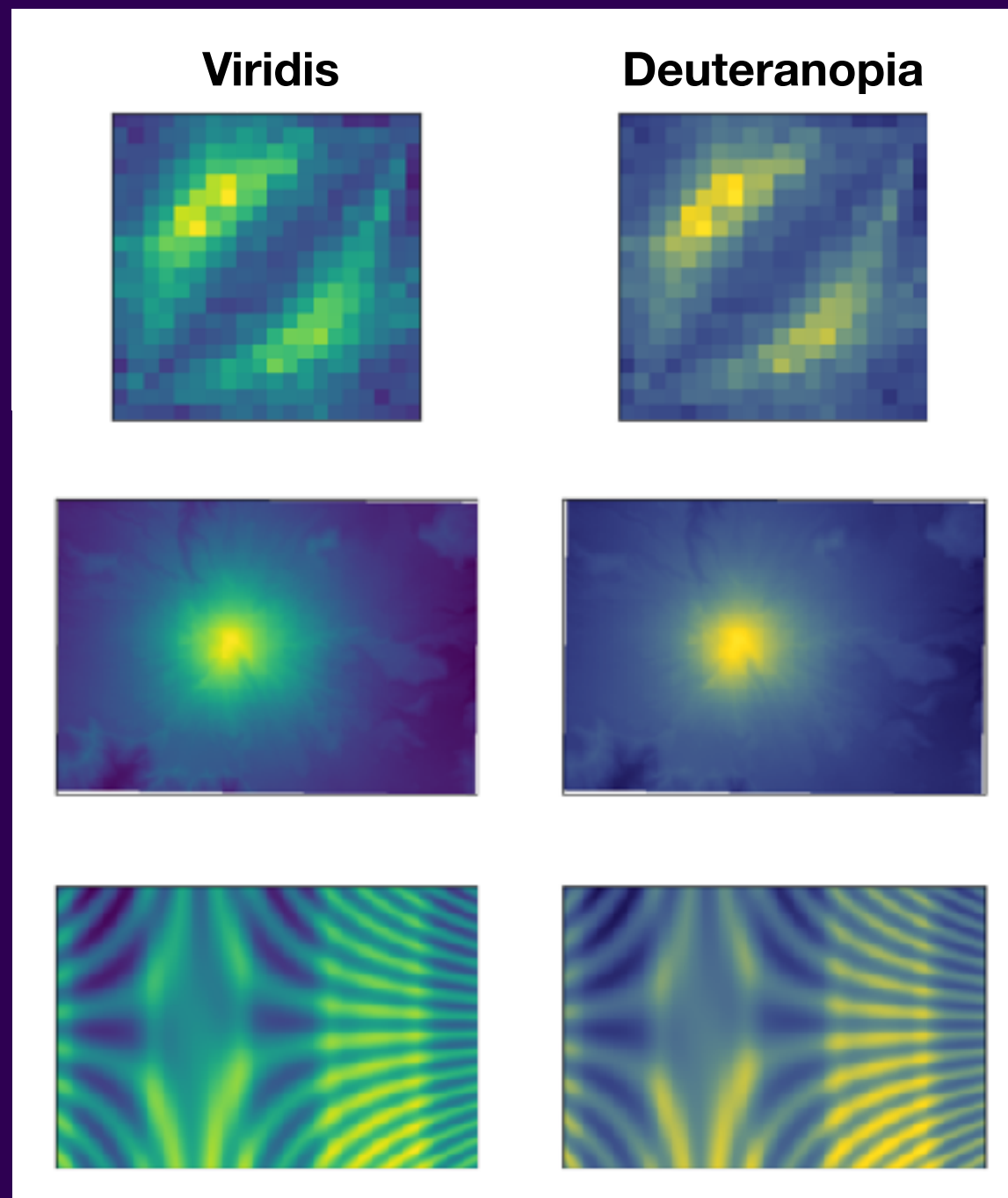
Further Reading

✦ **Simpler is Better**

    ✦ Ten Guidelines for Effective Data Visualization in Scientific Publications, Kelleher & Wagener

    ✦ Show Me the Numbers, Designing Tables & Graphs to Enlighten, Few 2004

    ✦ Introduction to Data Visualization, P. Aldhous Fall 2016 *(Course Notes)*

    ✦ Graphical Perception: Theory, Experimentation, and Application to the Development of Graphical Methods, Cleveland & McGill 1987

✦ **"Spend Ink" on Data**

    ✦ The Visual Display of Quantitative Information, Tufte 1983
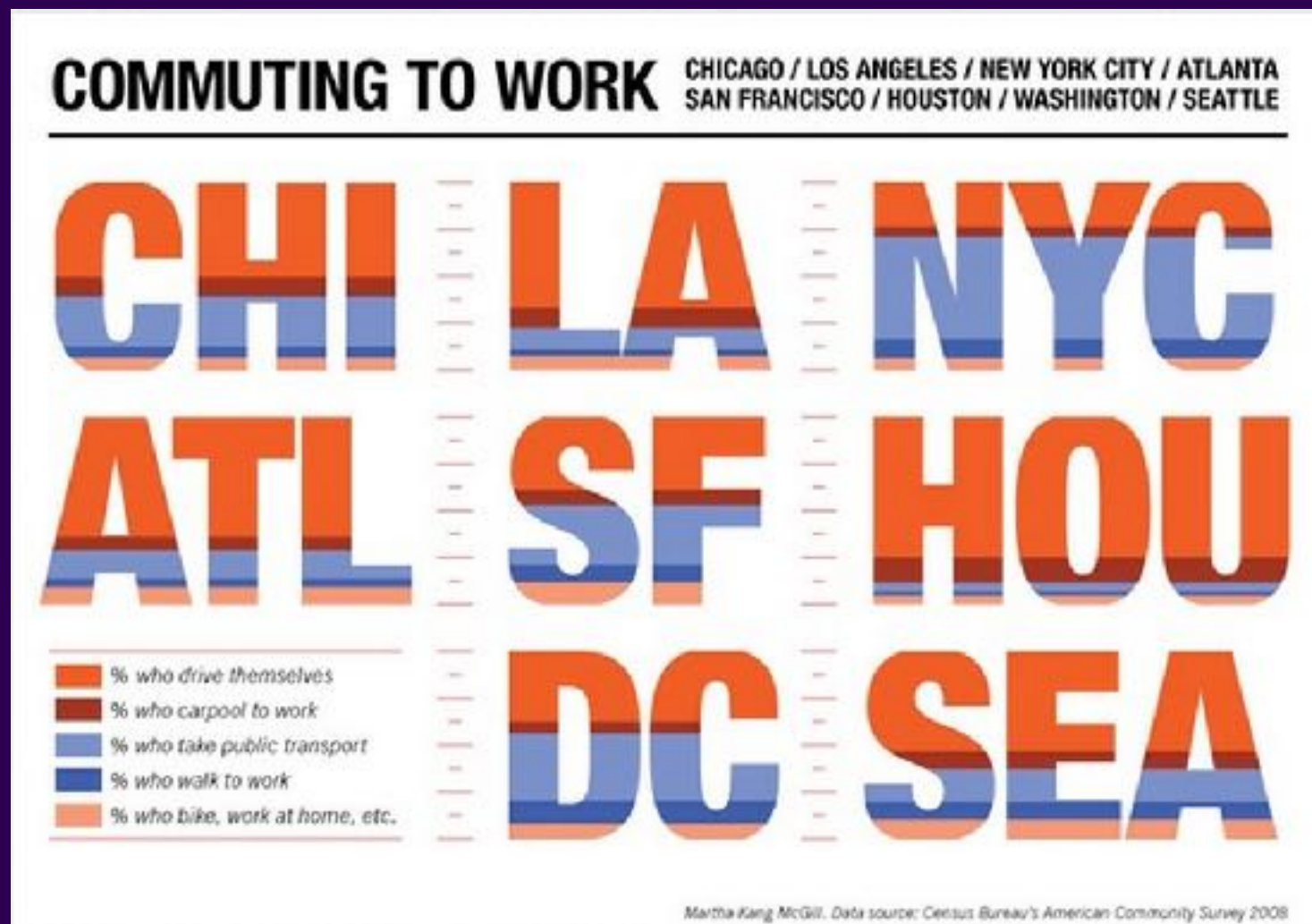
    ✦ Form and Function, Small 1947

Further Reading

✦ **Make Data Coherent**

   ✦ Beautiful Evidence, Tufte 2006

   ✦ Graphical Perception: Theory, Experimentation, and Application to the Development of Graphical Methods, Cleveland & McGill 1987

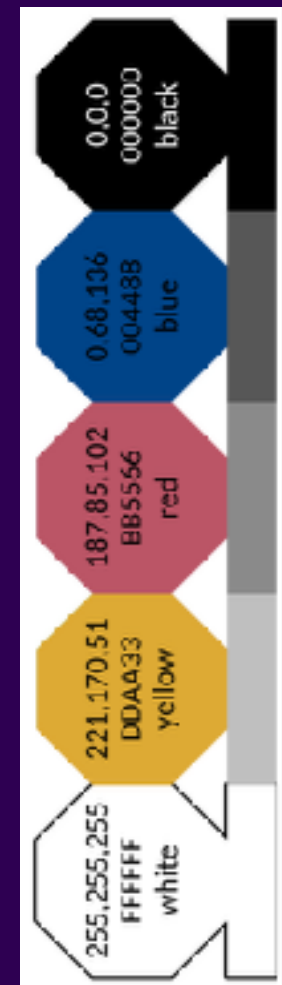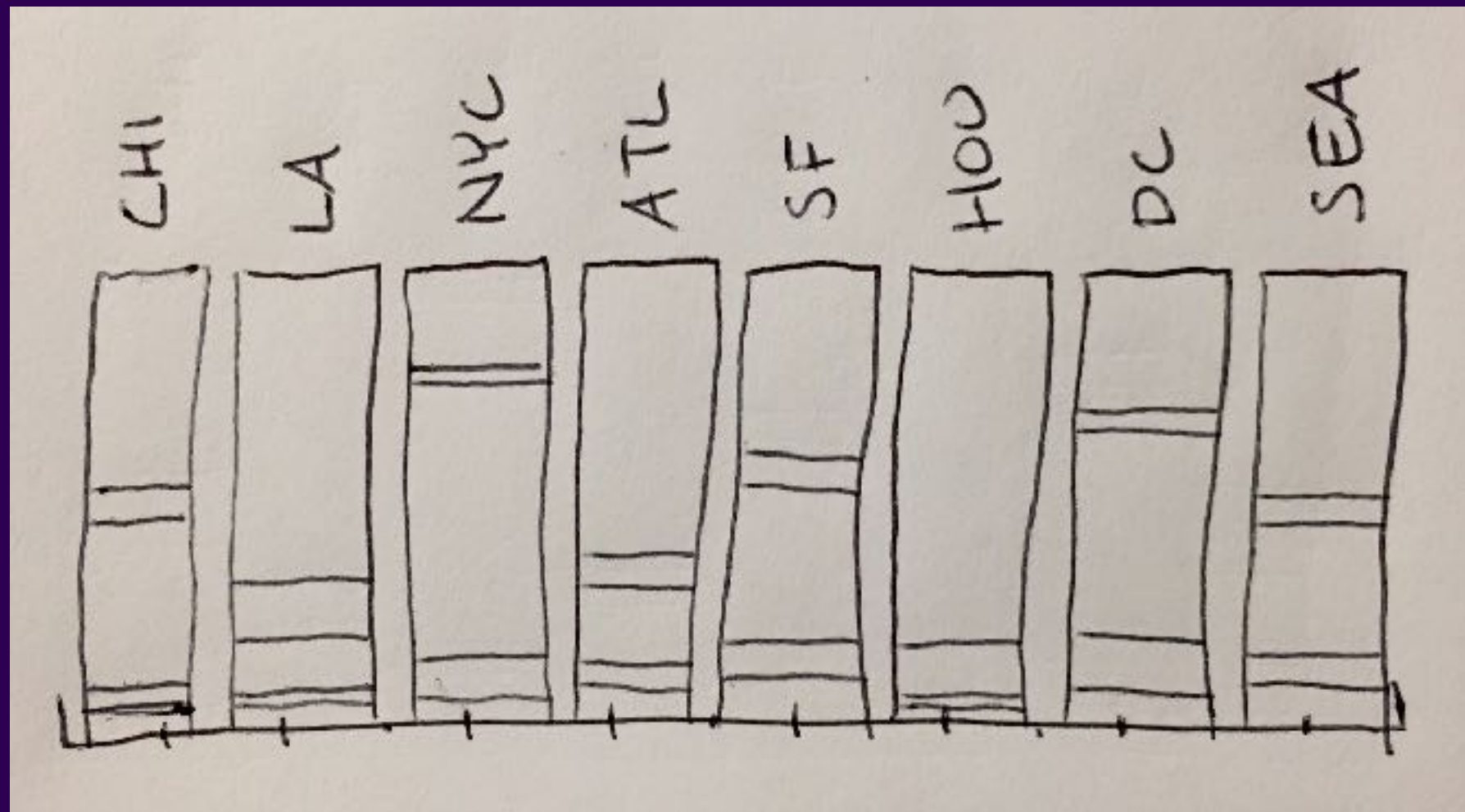   ✦ Information Visualization: Perception for Design, Kauffman 2004

✦ **Accessibility**

   ✦ How to Make Your Charts More Accessible with Color Blind Friendly Pallettes, R. Cravit (*Venngage Article*)

   ✦ A Better Default Color Map for Matplotlib, Smith & van der Walt (*Scipy Con Talk*)

   ✦ An Improved Rainbow Colormap for Visualization (*Google AI Blog*)

Walkthrough:
Improve a Visualization

COMMUTING TO WORK   CHICAGO / LOS ANGELES / NEW YORK CITY / ATLANTA
SAN FRANCISCO / HOUSTON / WASHINGTON / SEATTLE

CHI   LA   NYC
ATL   SF   HOU
      DC   SEA

% who drive themselves
% who carpool to work
% who take public transport
% who walk to work
% who bike, work at home, etc.

Martha Kang McGill. Data source: Census Bureau's American Community Survey 2008

Walkthrough:
Improve a Visualization

Invitation:
Improve a Visualization

1. Form groups (3-4 people)

2. Pick a data visualization as a group to improve together
   (Your own or from Github)

3. Brainstorm improvements yourself

4. Share your brainstorm with your team
   (Hear from every person)

5. Vote on the 3-5 improvements your team wants to do

6. Prototype on paper

Activity from D. Huppenkothen