Modern Crowd-Sourcing Validates Cleveland's 1984 Hierarchy of Graphical Elements

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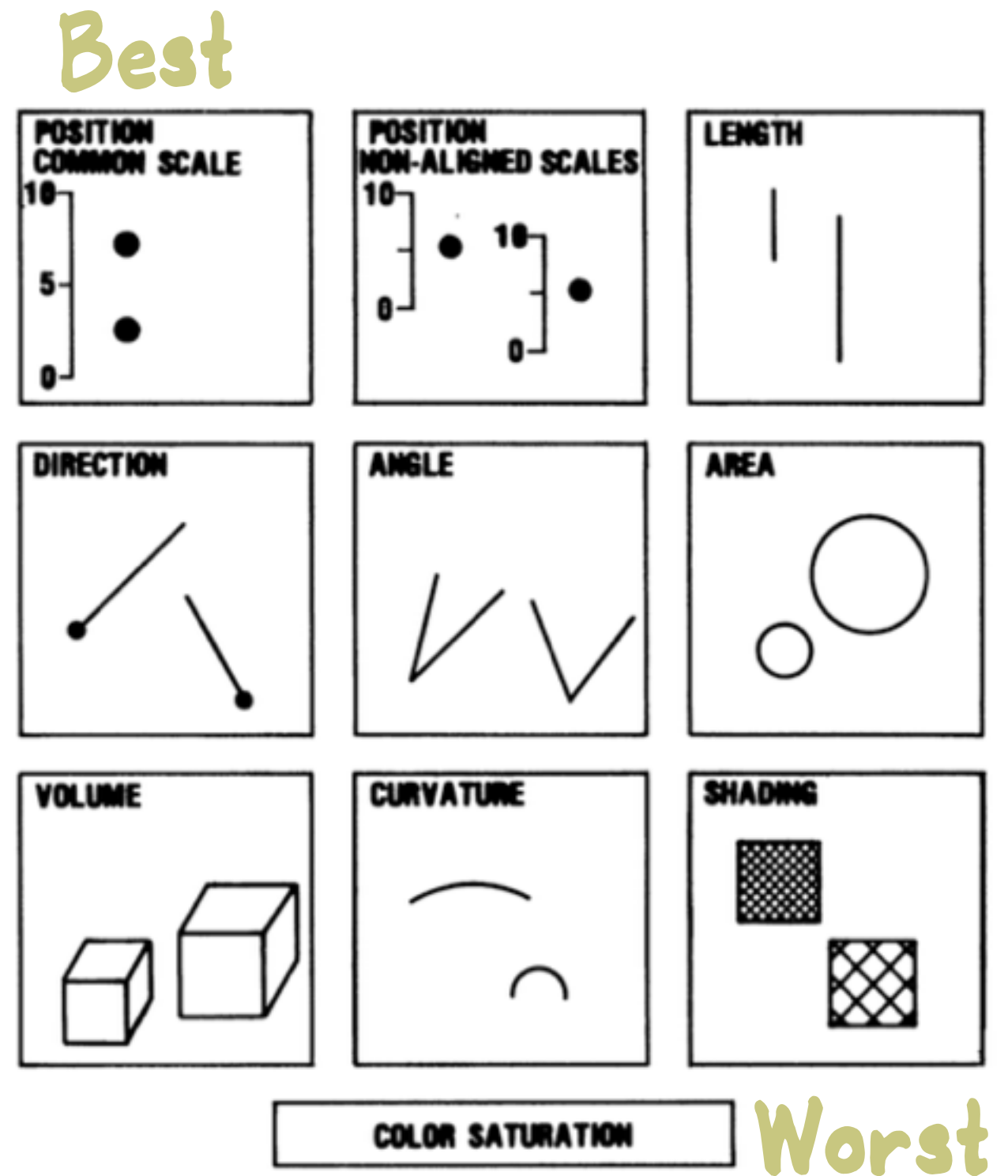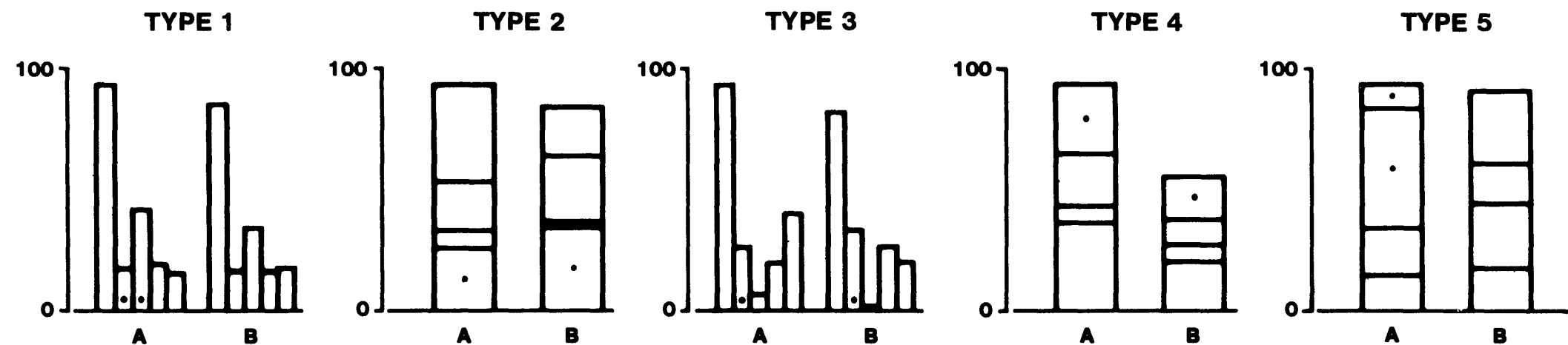

Figure 1. Elementary perceptual tasks.

Point your mobile device to do the experiment
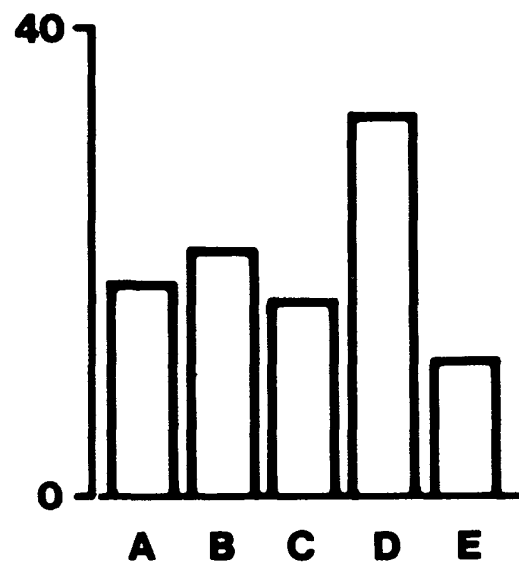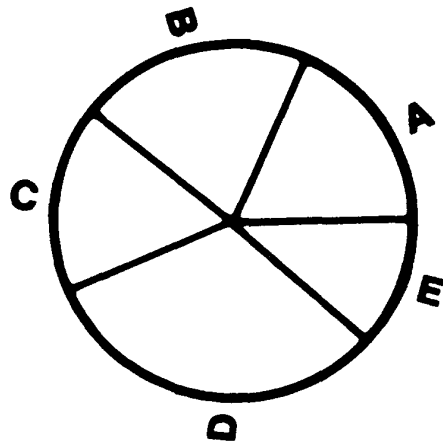
http://bit.ly/JSM-vis16

Experiment

- 51 subjects
- 50 graphs
- Packets 50 stapled pages
- Which is bigger? What % is the smaller bar of the larger?

Experiment

- 51 subjects
- 20 graphs
- Packets 20 stapled pages
- What % the largest bar/segment is each of the other bars/segments?

Bill's experimental style

- Take the experimental packets home and test your spouse, kids! Oh, and also run along the corridor and get your colleague to participate too.
- Subjects consisted of nontechnically focused females, mostly housewives, and a mix of technical staff, both males and females from the labs.

Guide deduced

1. Position along a common scale e.g. scatter plot, bar chart
2. Position on identical but nonaligned scales e.g. bars on spatial map in 3D, facetted plots, stacked bars
3. Length e.g. candlestick plots, boxplots
4. Angle, slope e.g. pie chart
5. Area e.g. bubble chart
6. Volume, curvature, shading e.g. glyphs
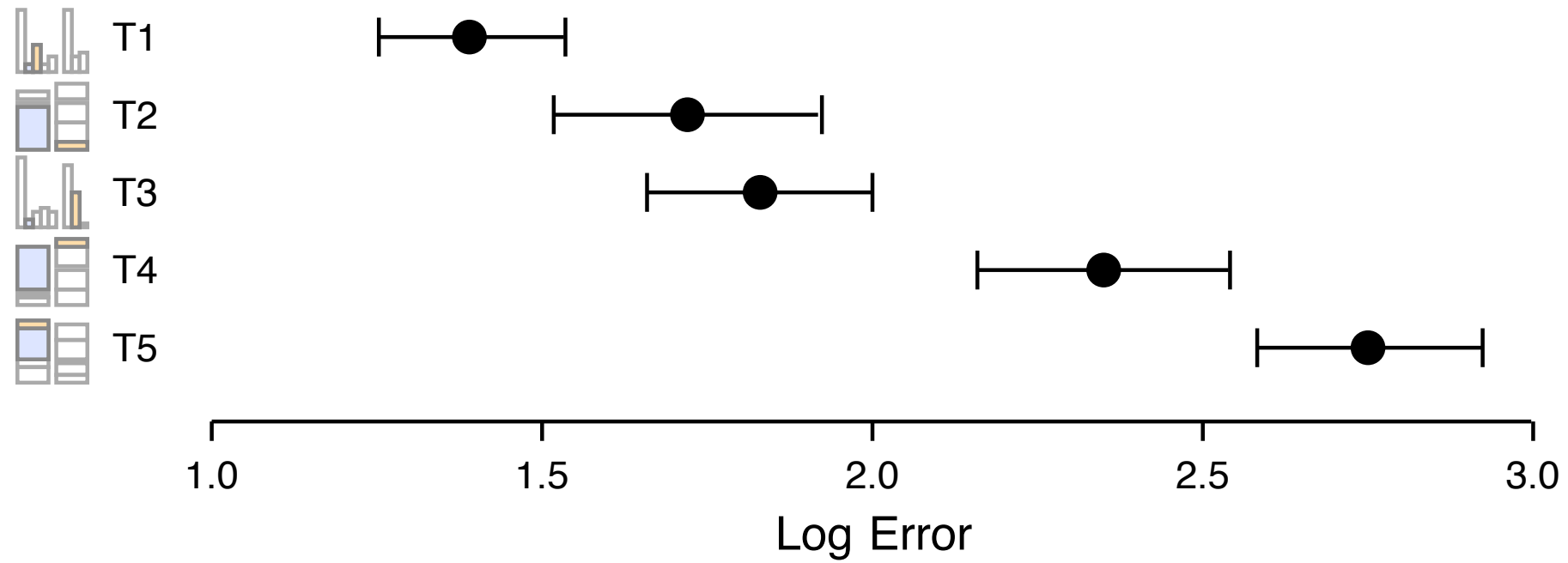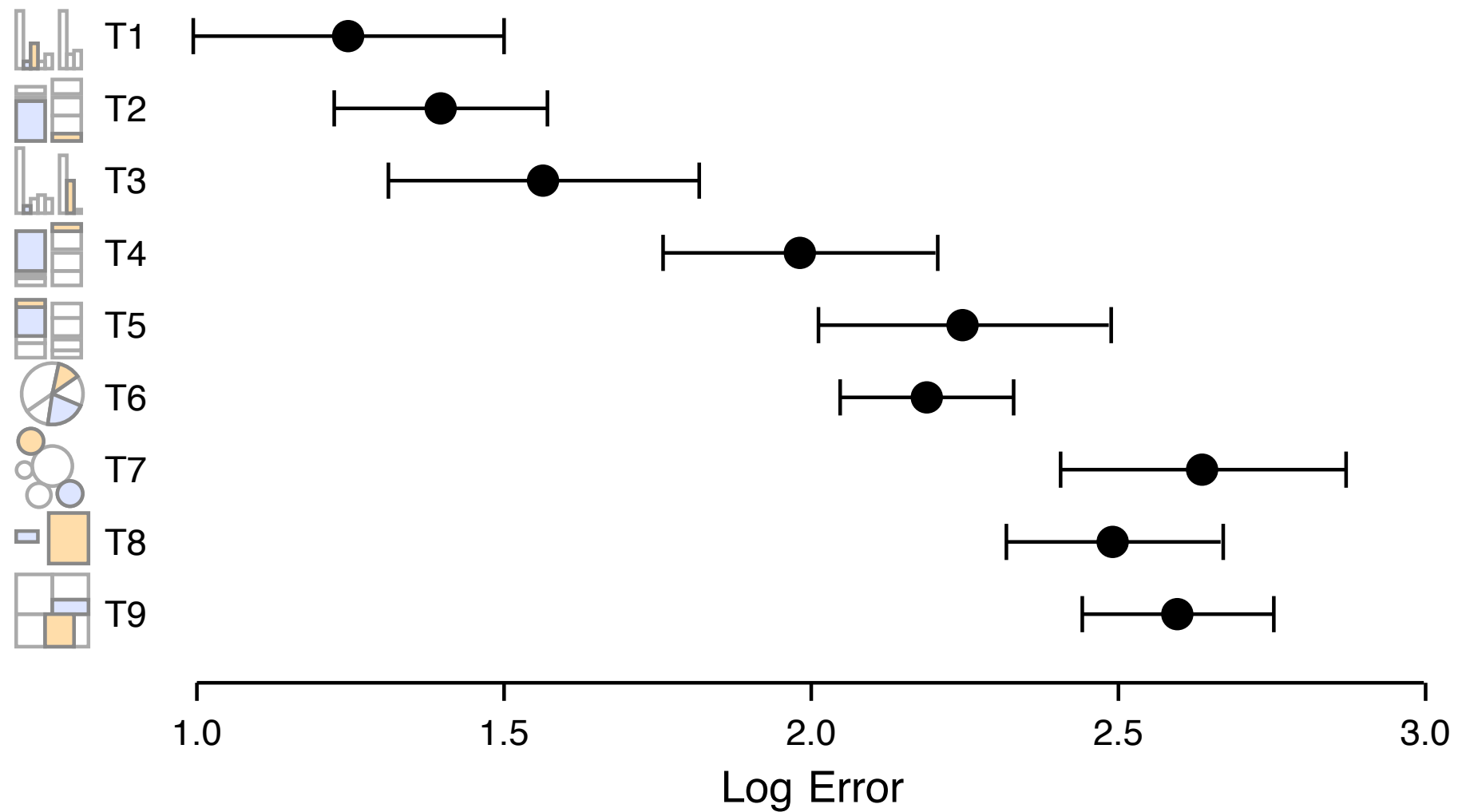7. Color hue e.g. heatmap, chloropleth map

Jeff's repeat
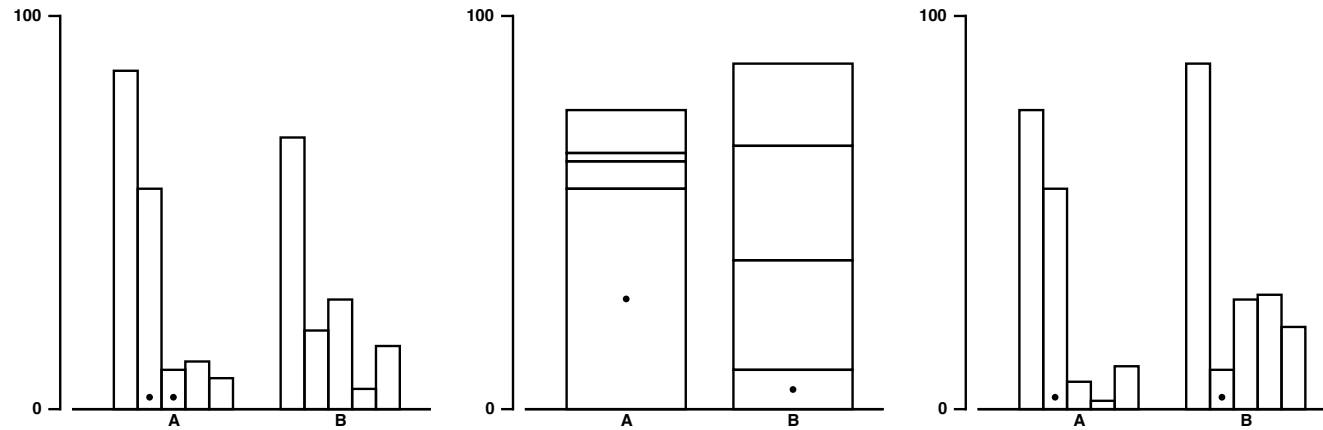
- Subjects recruited from Amazon MTurk
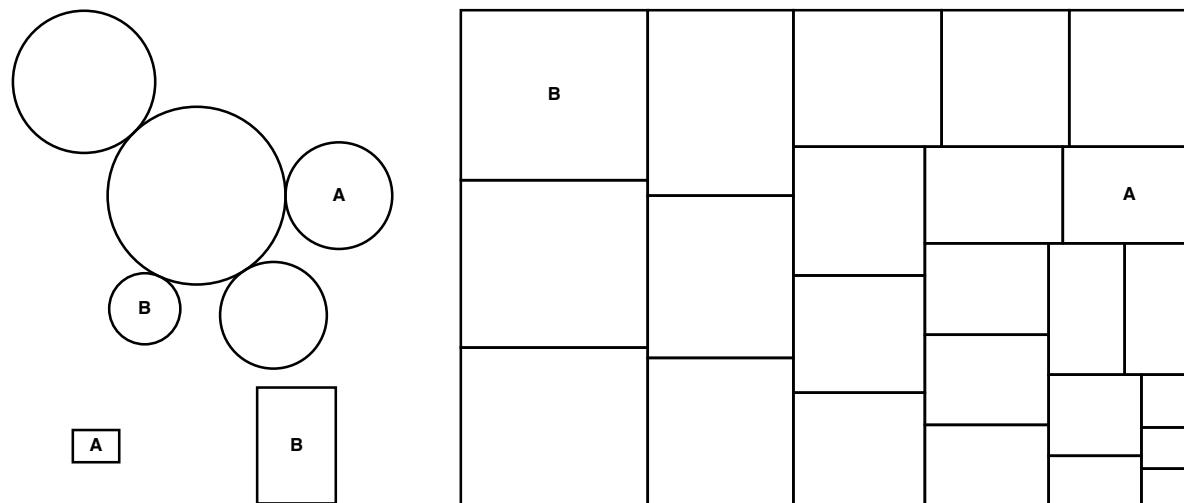
Cleveland & McGill's Results
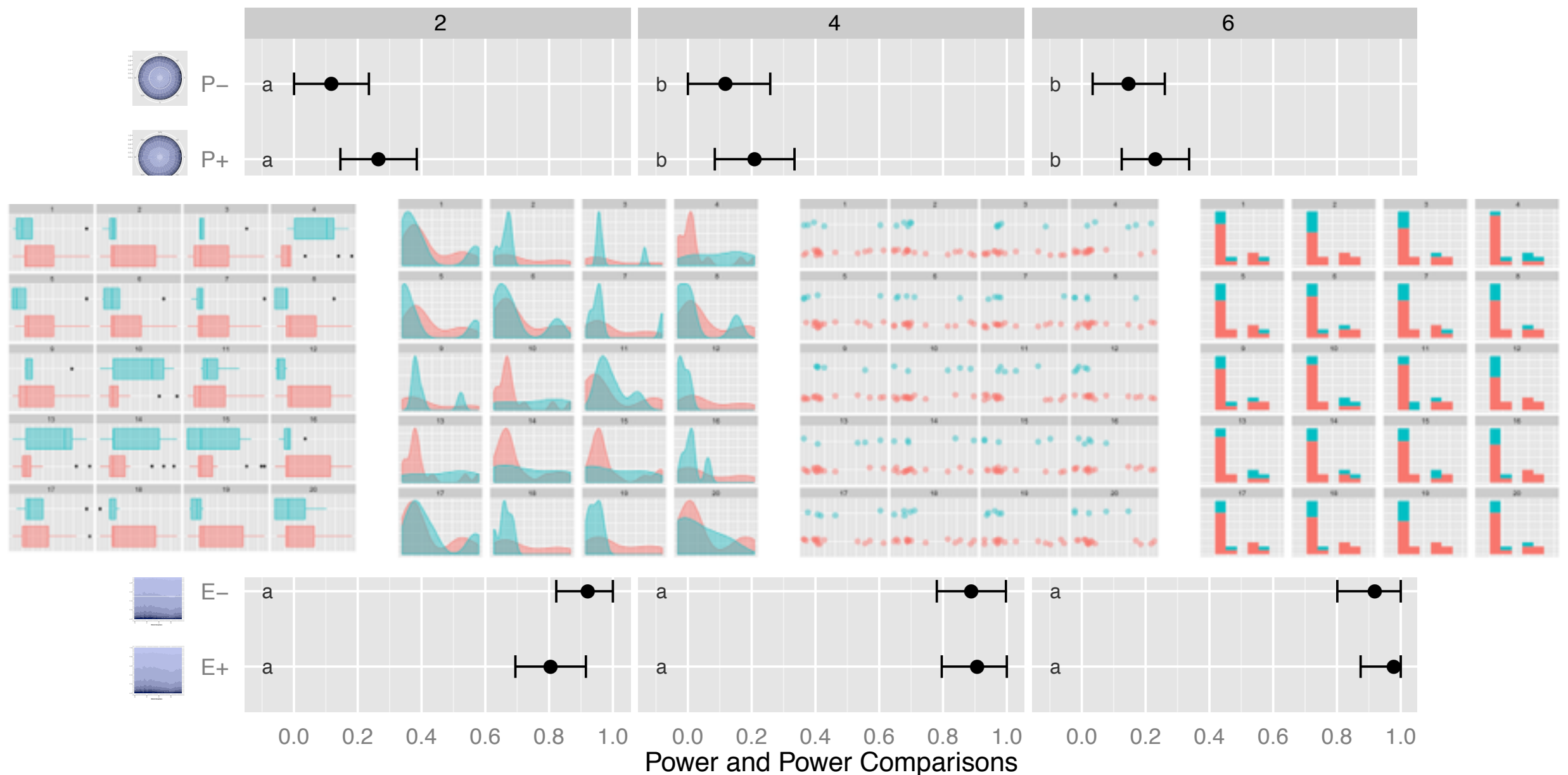
Crowdsourced Results

Major Advance

- "How William Cleveland Turned Data Visualization Into a Science" Priceonomics, Jan 2016
- Conducting experiments to test whether one design is better than another formalizes statistical graphics - today it is easy to do
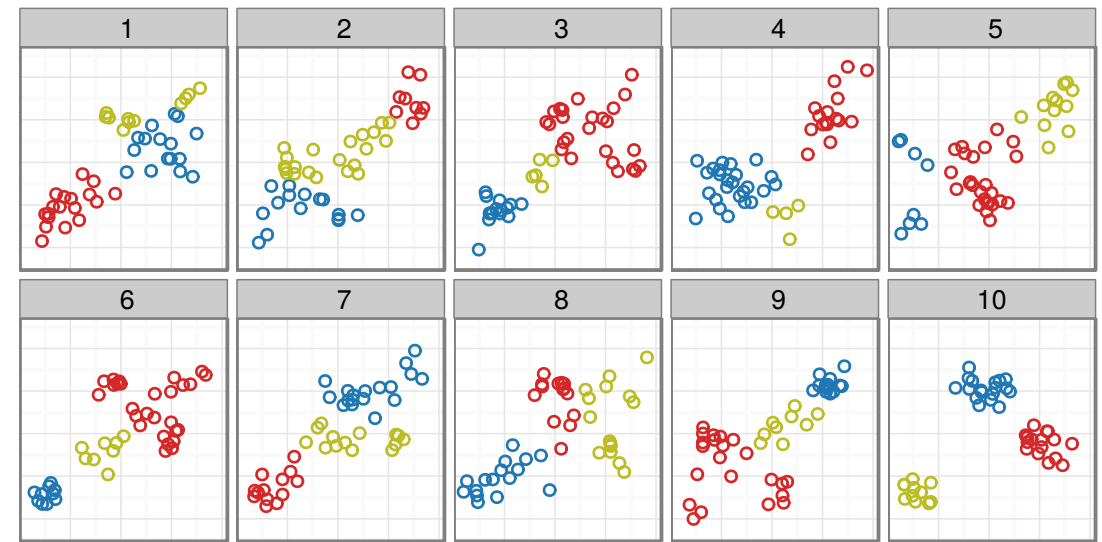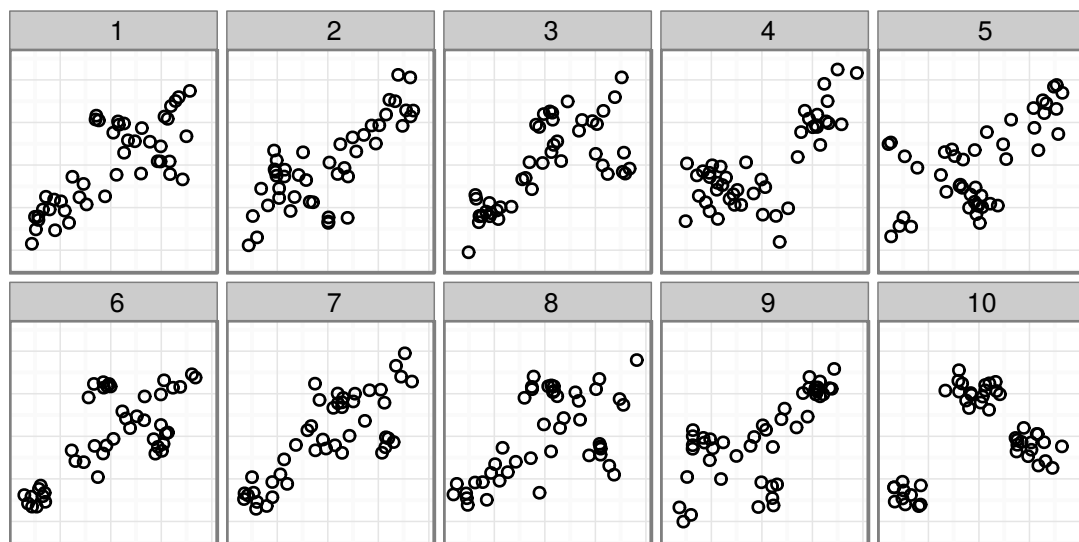
Derivatives

- Hofman et al (2012) in conjunction with visual inference protocols

Derivatives

- Vanderplas, S and Hofmann (2016) Clusters Beat Trend!? Testing Feature Hierarchy in Statistical Graphics, JCGS, To appear.

Crowd-sourcing

Our results:

https://github.com/dicook/JSM16