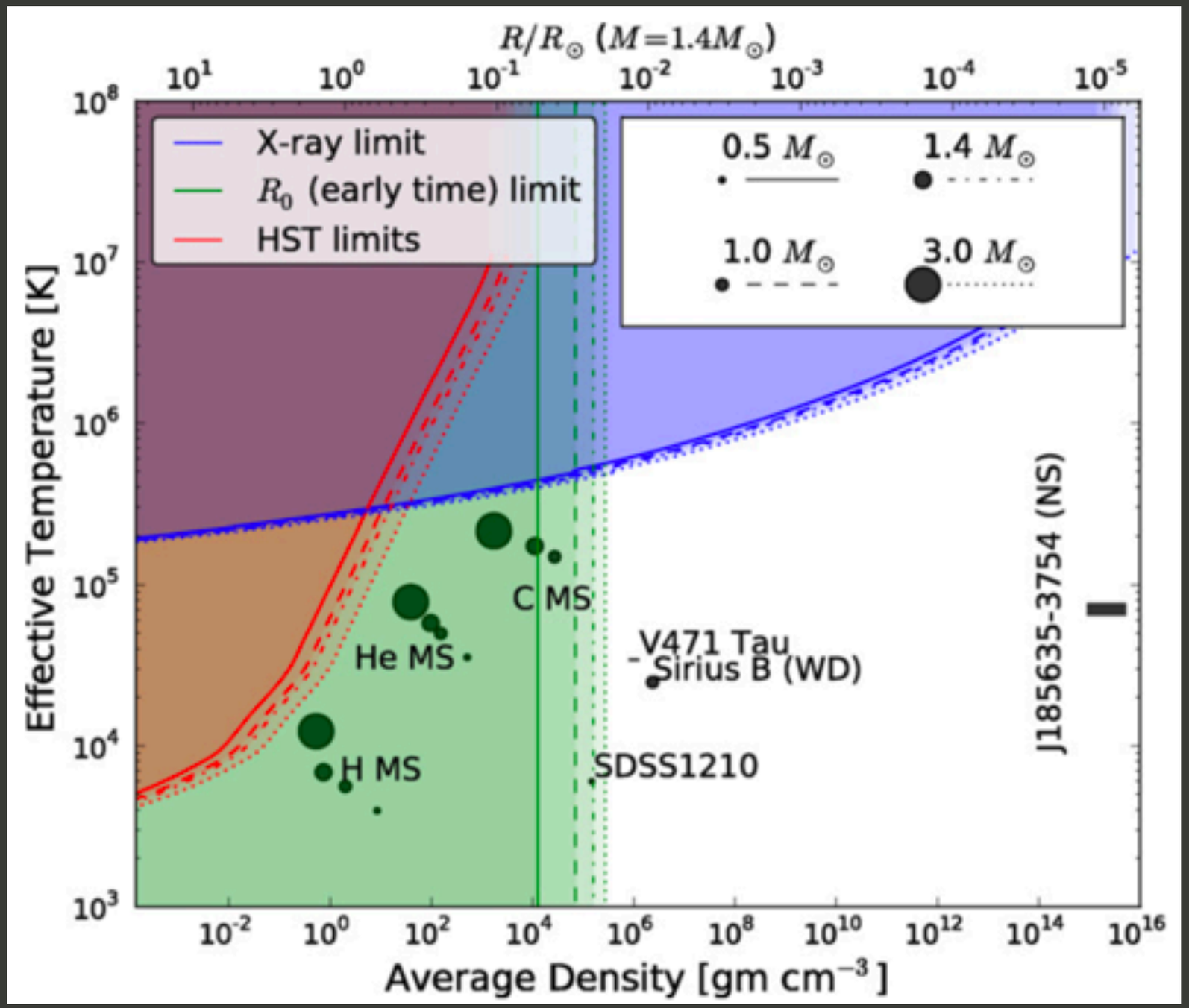


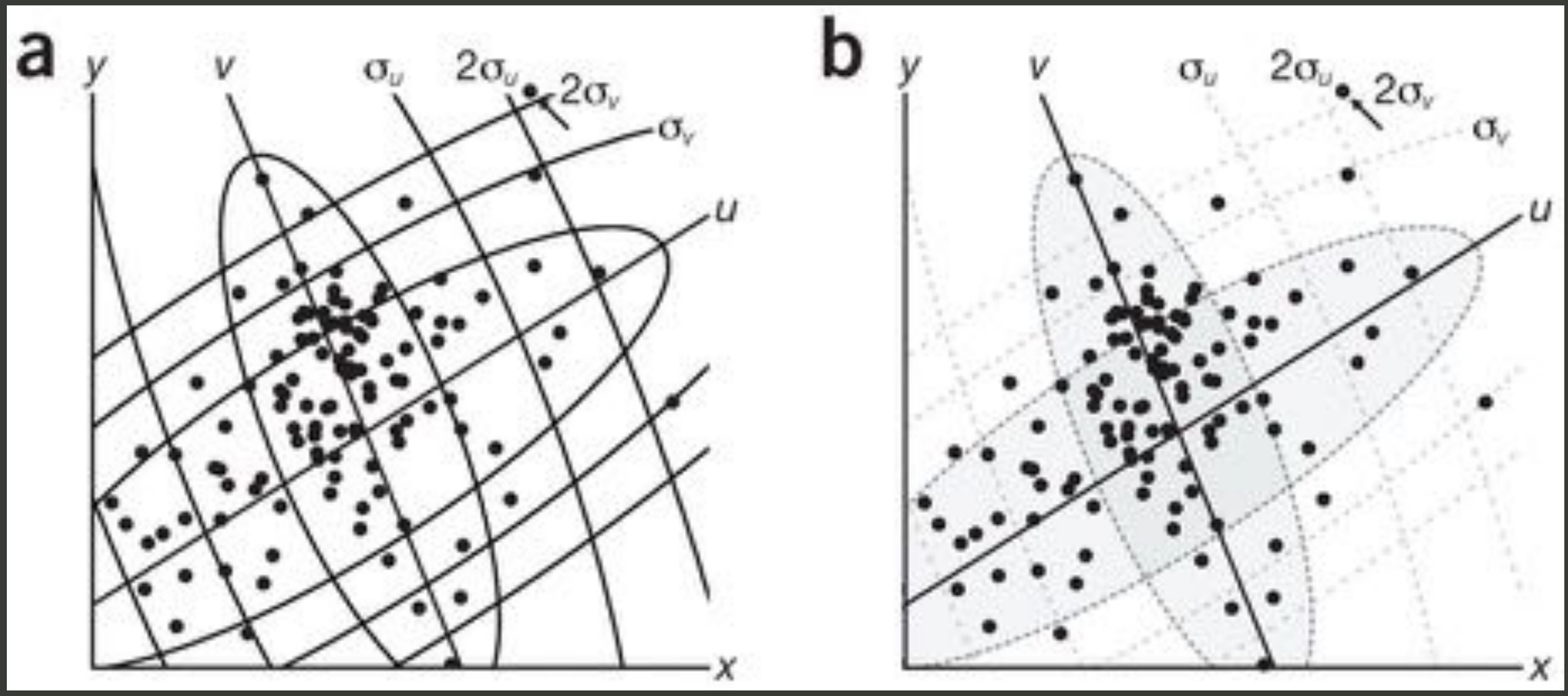

Upper limits obtained in the hours after explosion for SN 2011fe enable precise constraints on the radius of the progenitor star when compared to expectations from shock break-out models. Combined with pre-explosion limits on the temperature of the progenitor, it is possible to definitively conclude that a WD must have exploded for this type Ia SN.

Bloom+12

# Human brain is not a multiprocessor

Information transmission needs to be efficient
Impossible to simultaneously read *and* listen

# Building Visualizations via Principles of Design



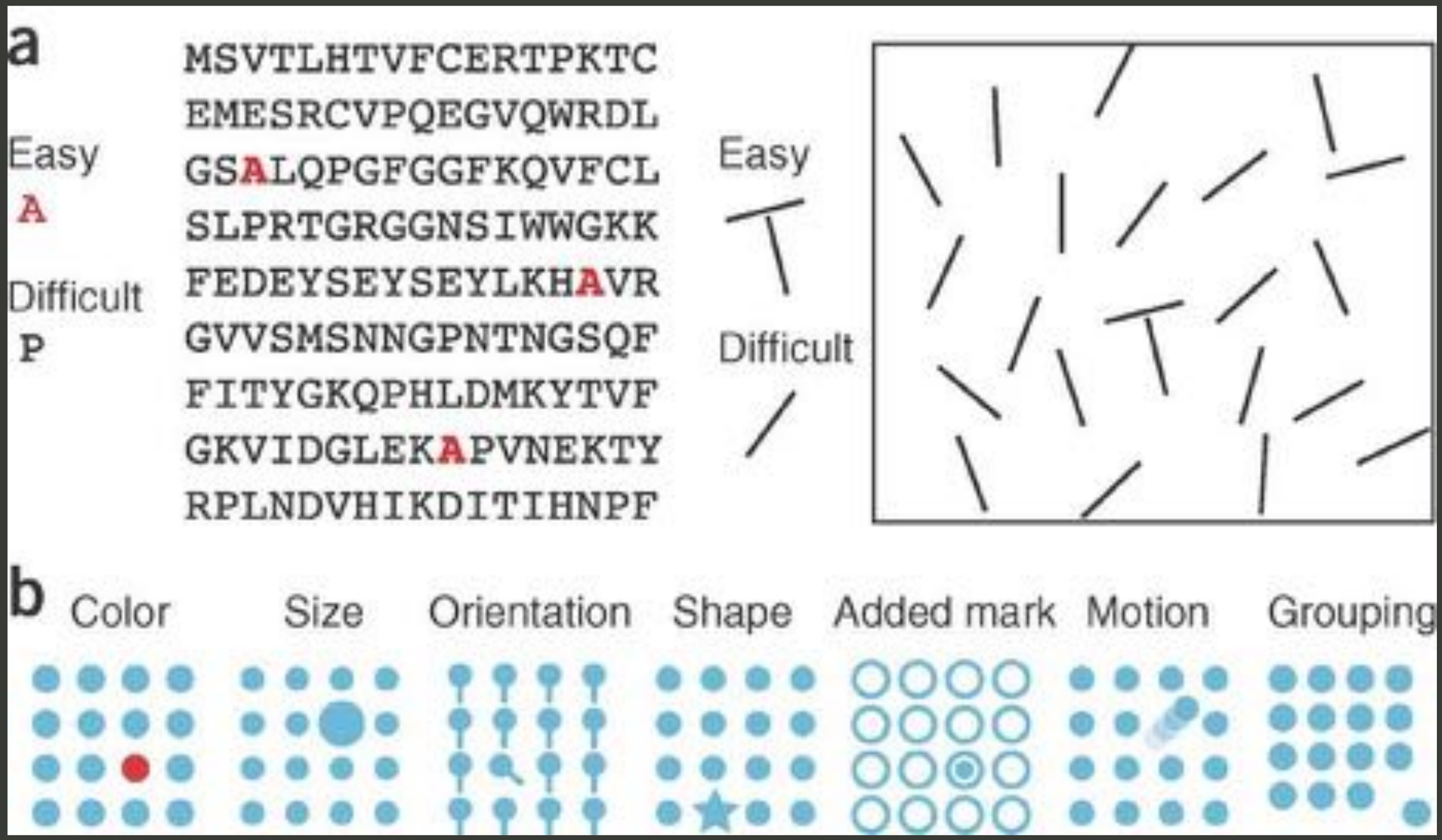

**Adam A Miller**
Northwestern/CIERA

LSSTC DSFP Session 13
29 Sep 2021

Krzywinski, Nature Methods, 2013

# Salience

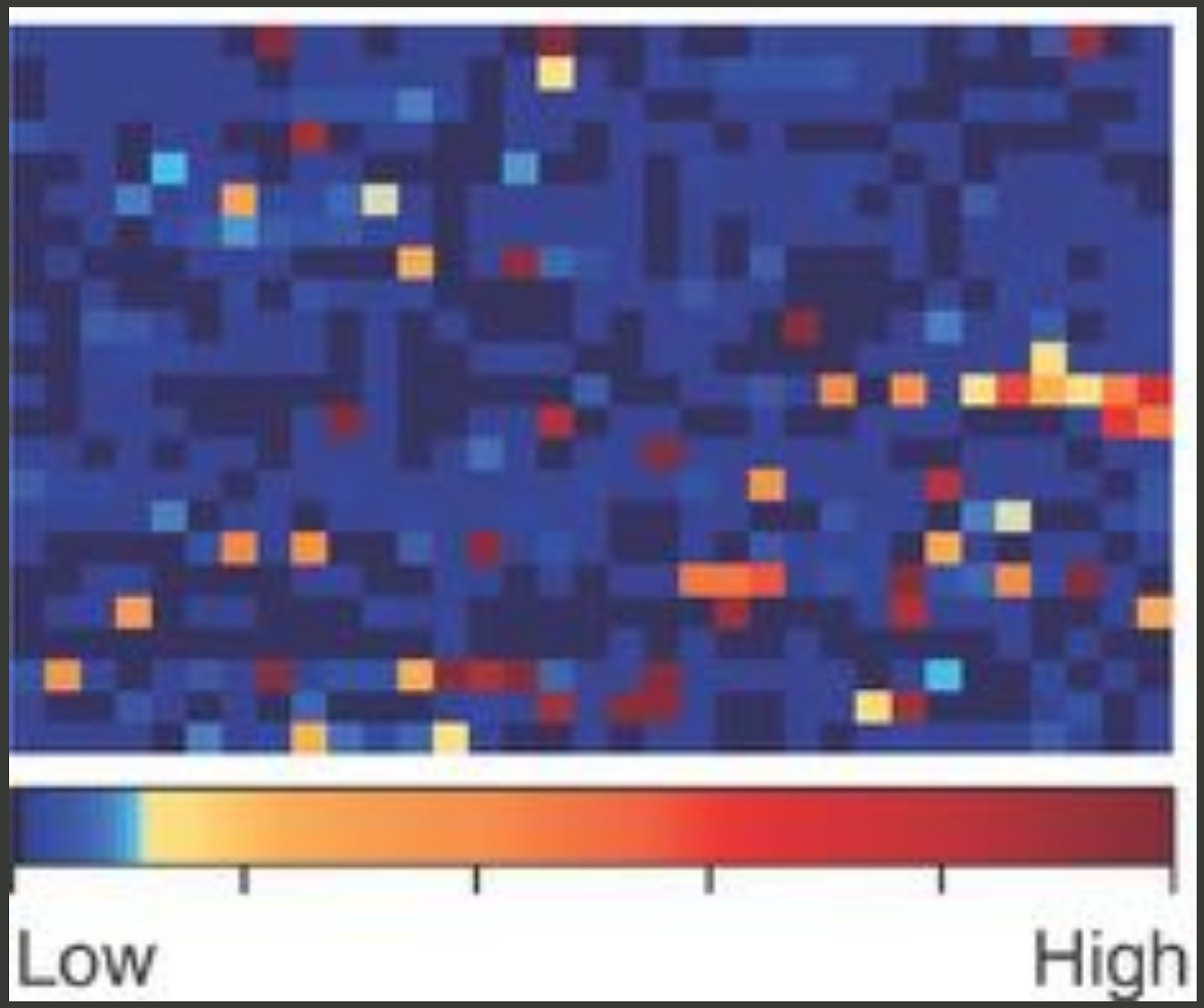
Things that stand out are easy to find




Wong, Nature Methods, 2010

# Salience

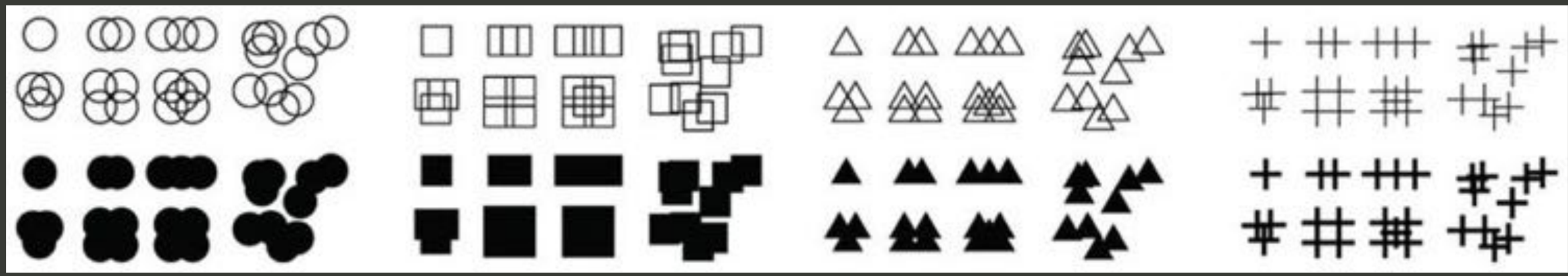
Salience must match relevance




Wong, Nature Methods, 2010

# Symbols

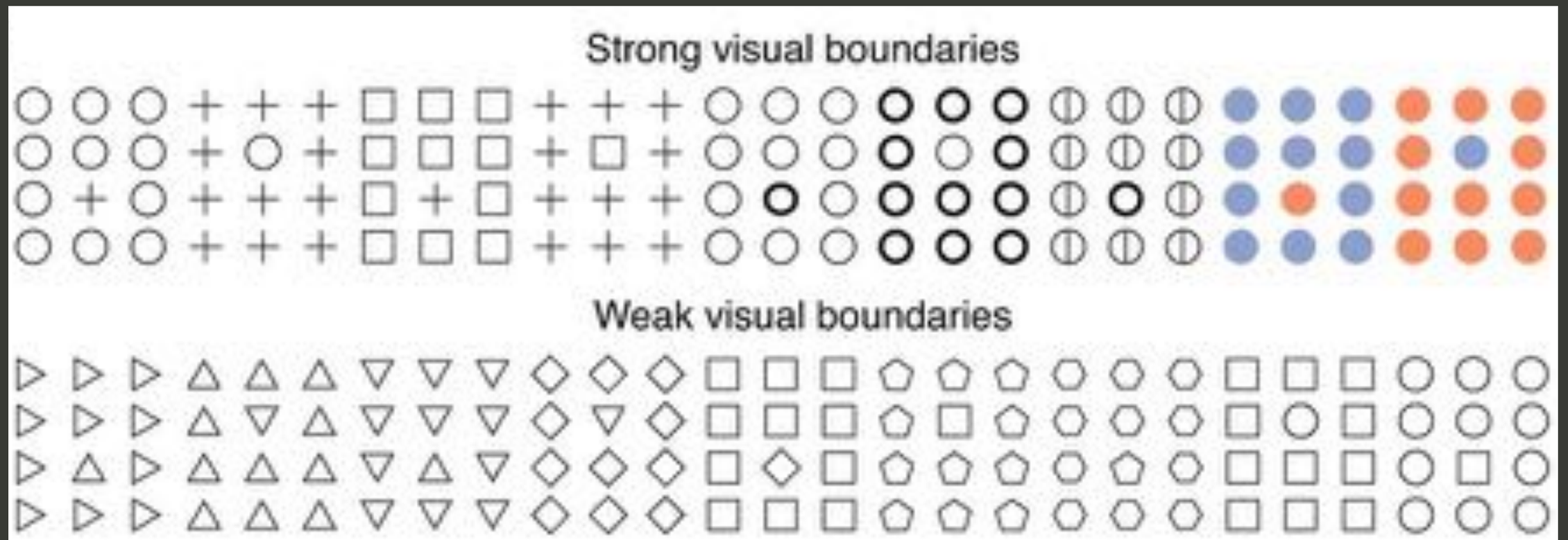
Hollow circle is the most flexible and robust



Krzywinski & Wong 13

# Symbols

Form strong visual boundaries



# Figure Design

Use easy-to-estimate visual representations

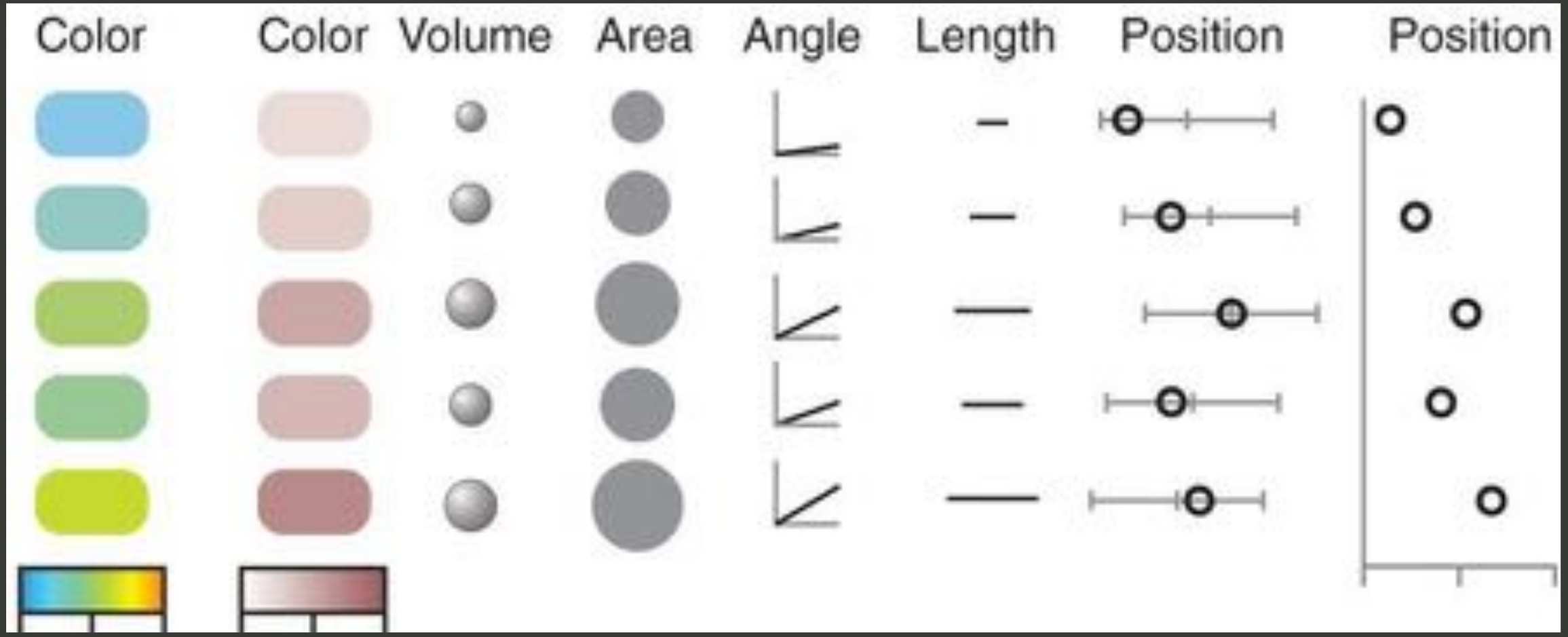
| Rank | Aspect to Compare |
|---|---|
| 1 | Positions on a common scale |
| 2 | Positions on the same but nonaligned scales |
| 3 | Lengths |
| 4 | Angles, slopes |
| 5 | Area |
| 6 | Volume, color saturation |
| 7 | Hue |

Cleveland & McGill 1985

# Figure Design

## Use easy-to-estimate visual representations

positions = easy
colors = hard

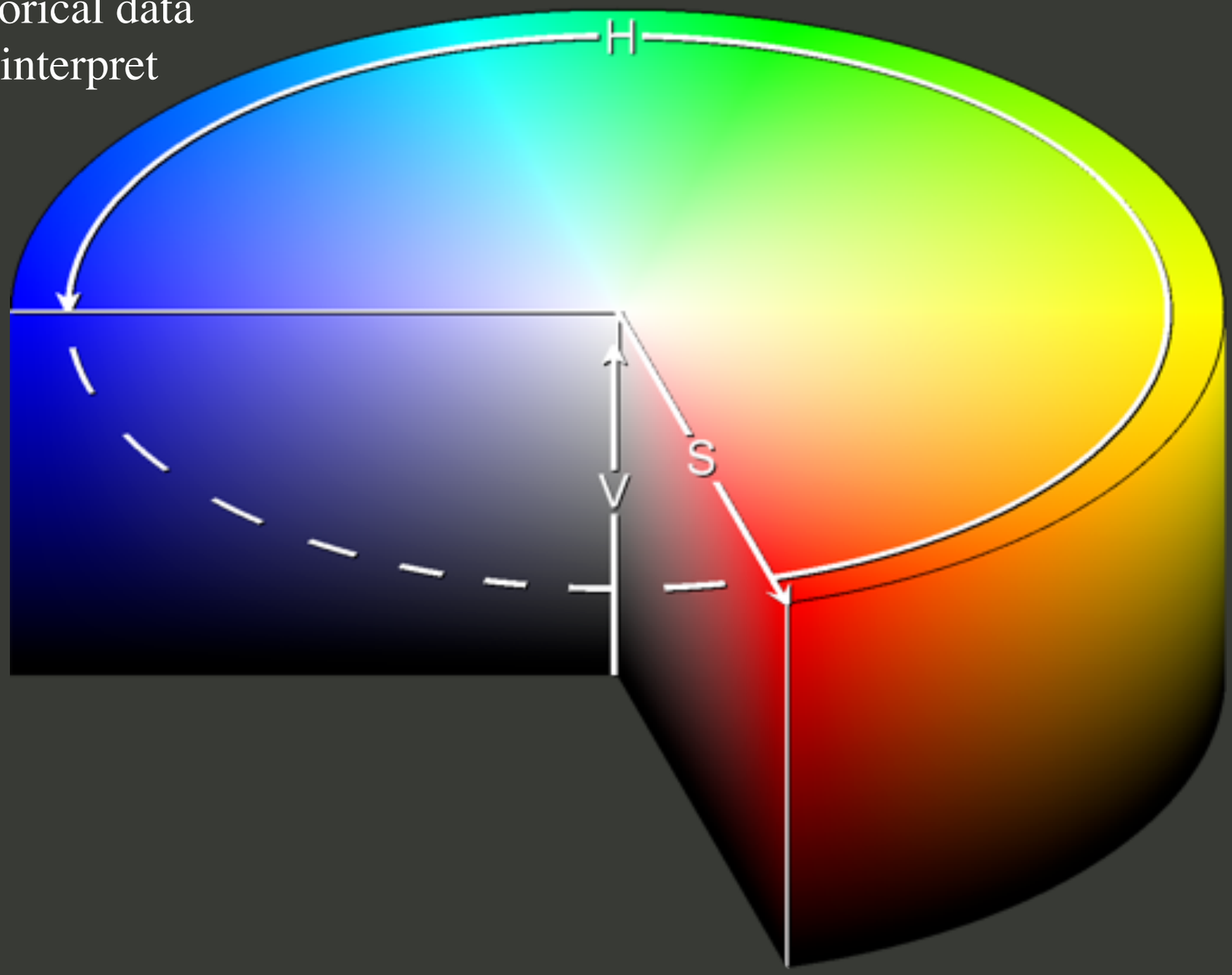



Wong, Nature Methods, 2010

# Color

Color defined by hue, saturation, lightness

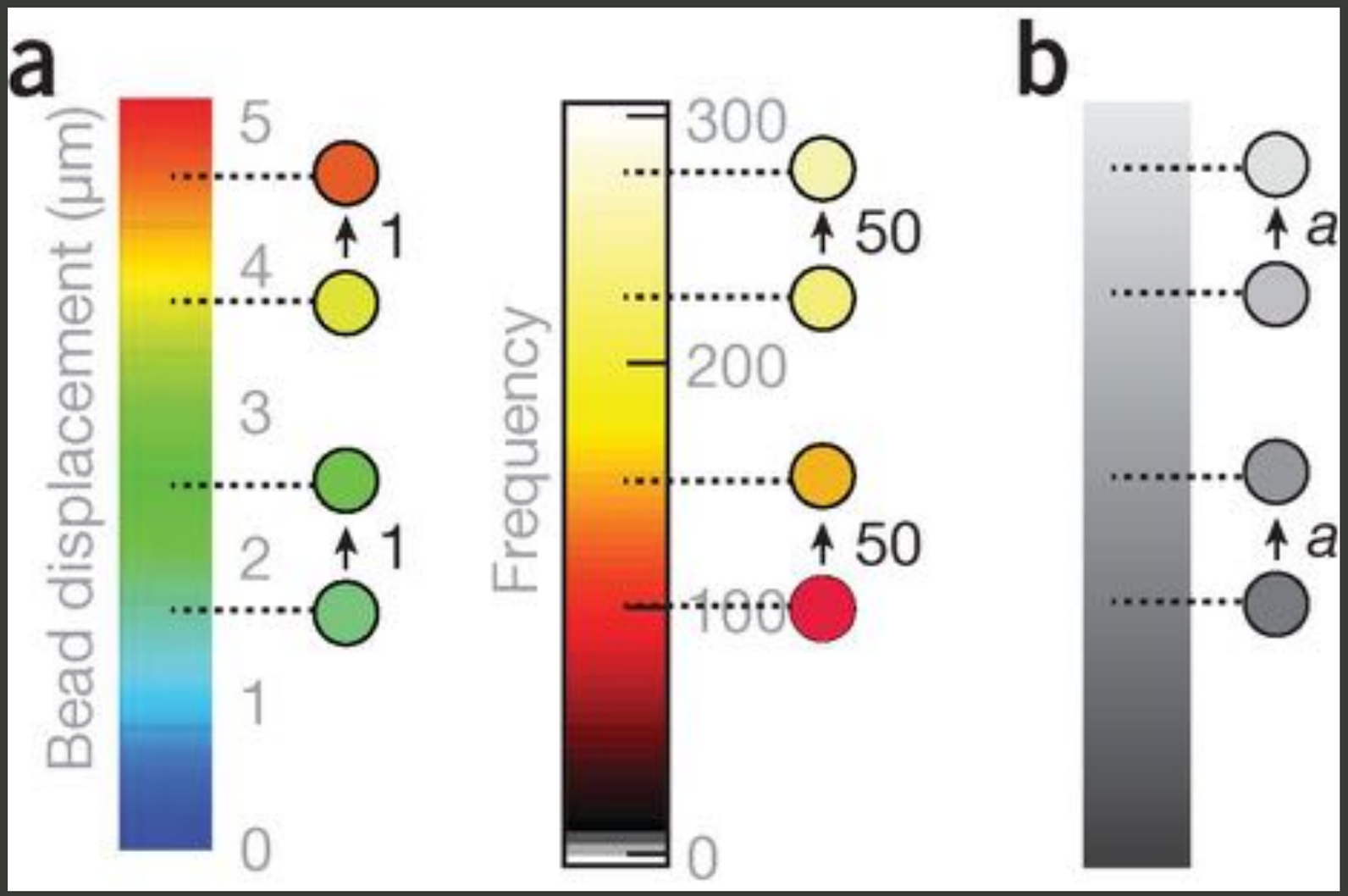
best for categorical data
>6 = hard  to interpret




wiki commons

# Color

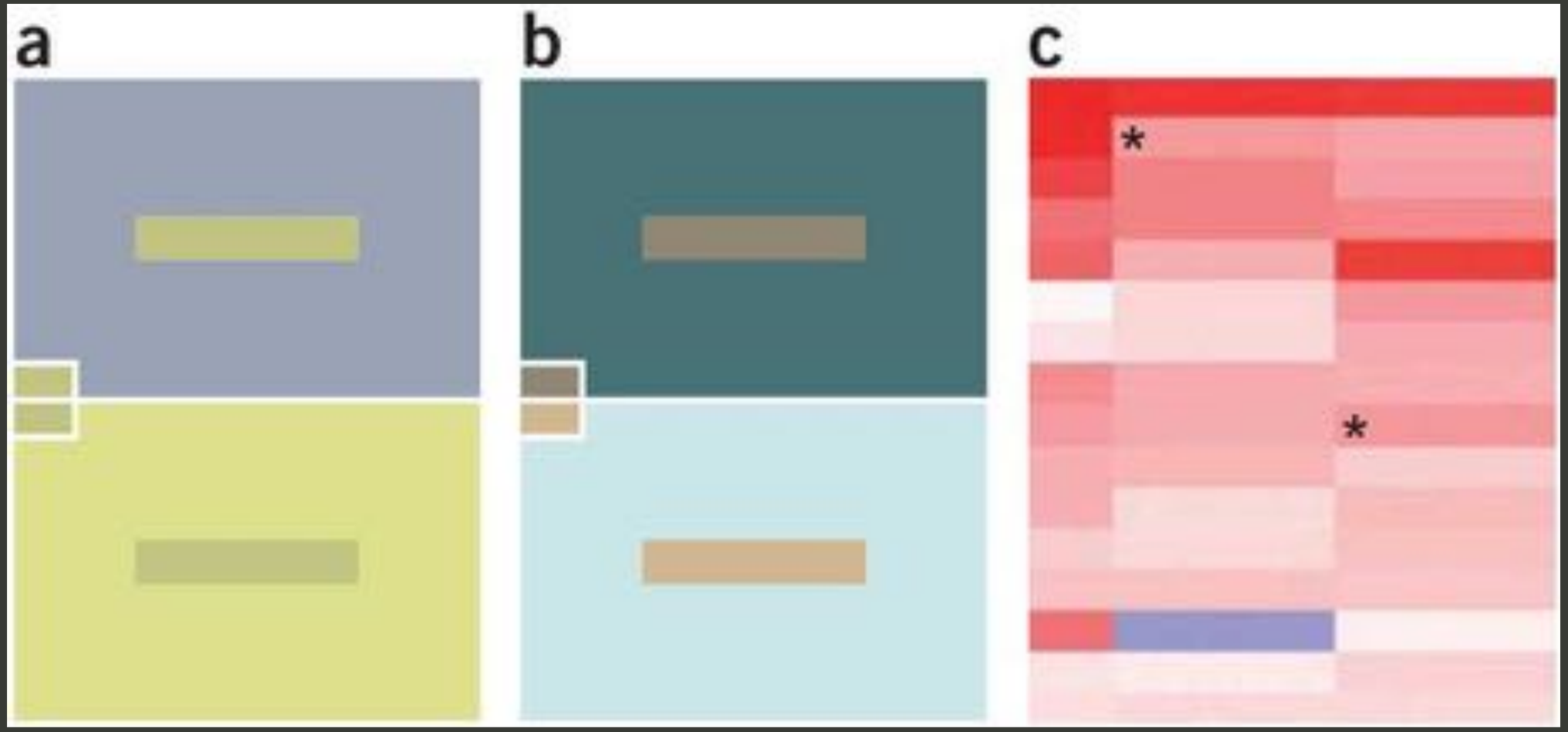
Hue does a poor job encoding relative numerical values




Wong, Nature Methods, 2010

# Color

Color perception depends on context




Wong, Nature Methods, 2010

# Color

Select semantically resonant colors

banana

anger

money

sky

Lin+13

# Color

Select semantically resonant colors

**banana**

**anger**

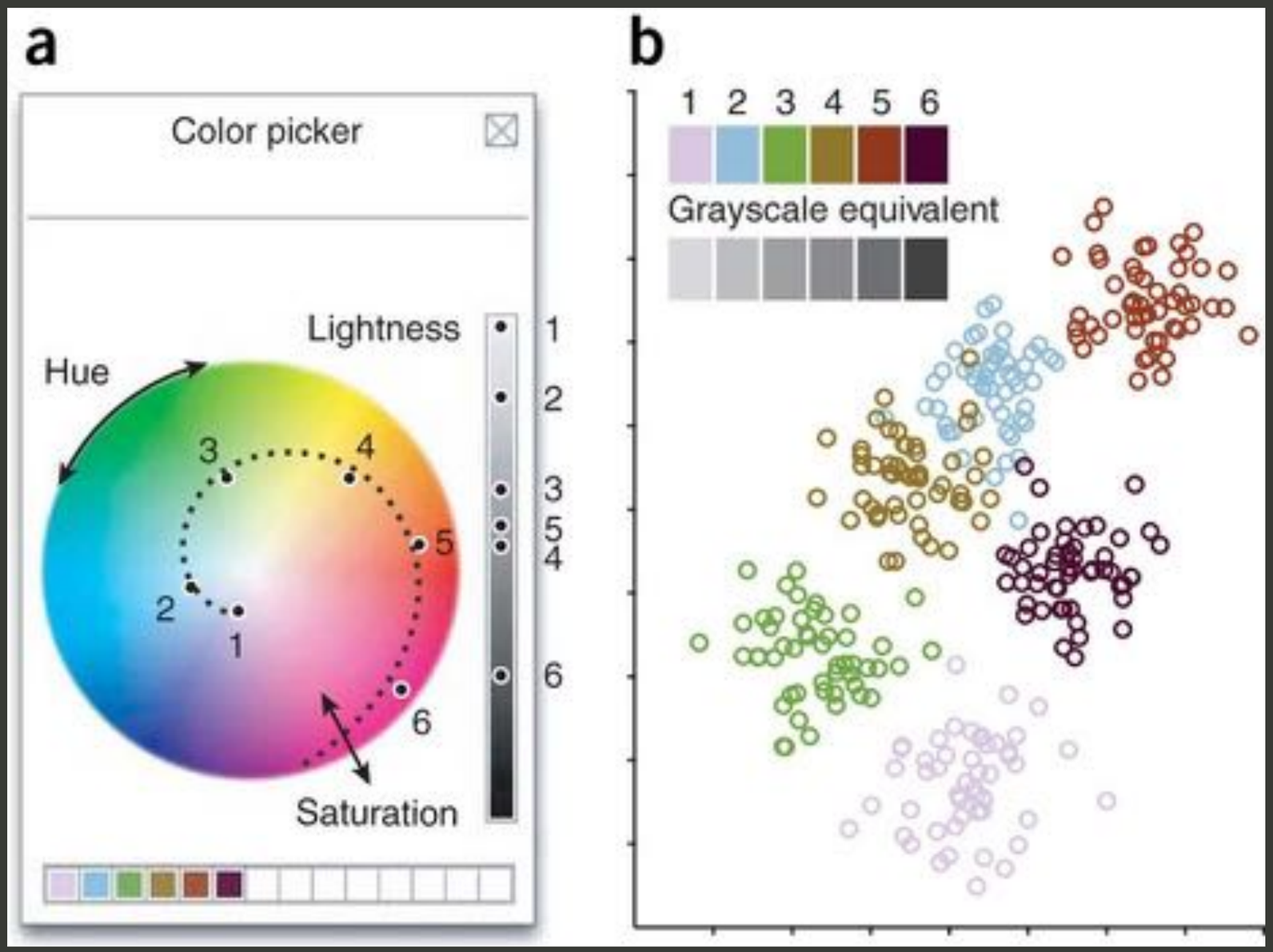
**money**

**sky**

Lin+13

# Color

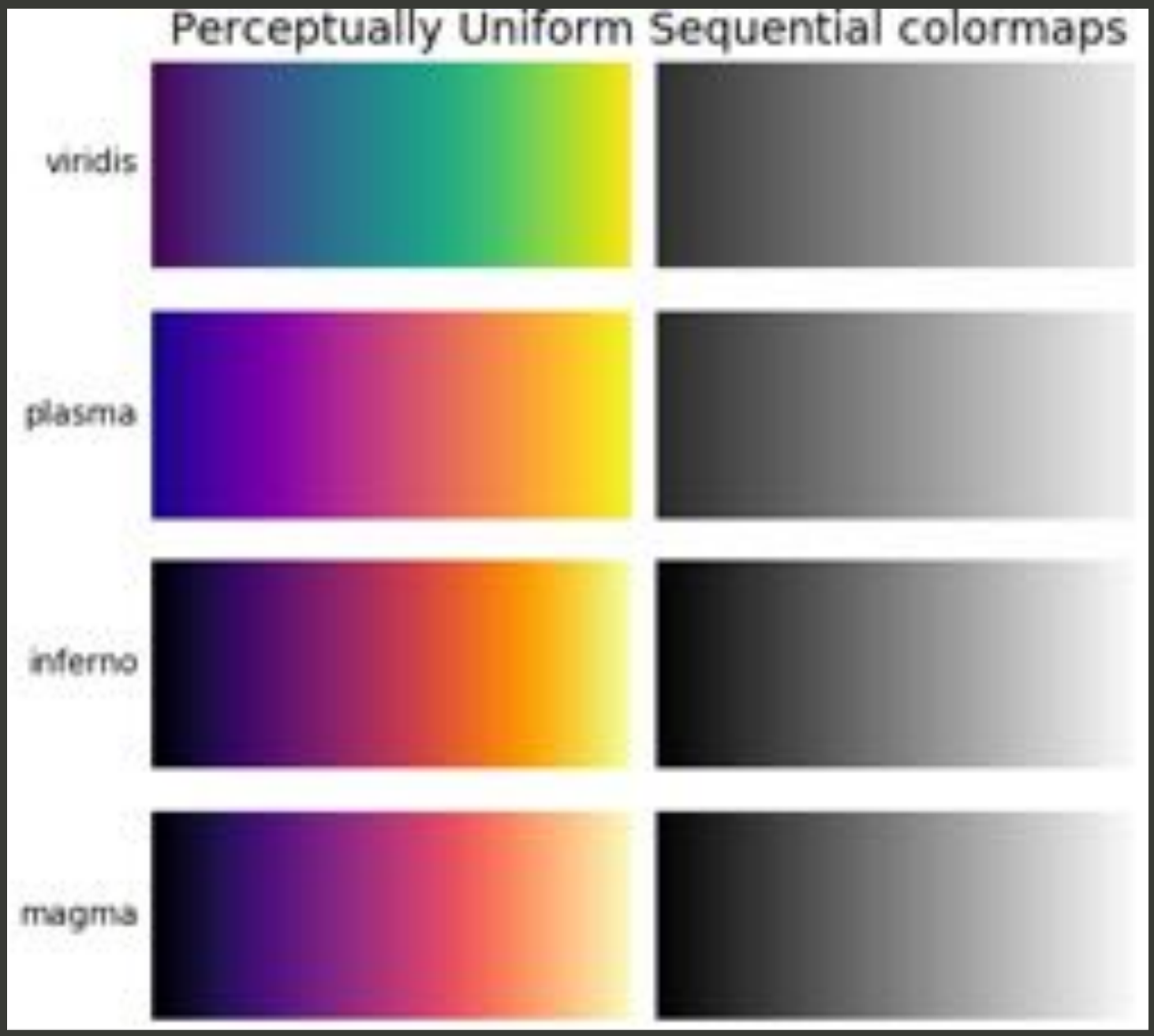
Rotate through color wheel for categorical selection




Wong, Nature Methods, 2010

# Color

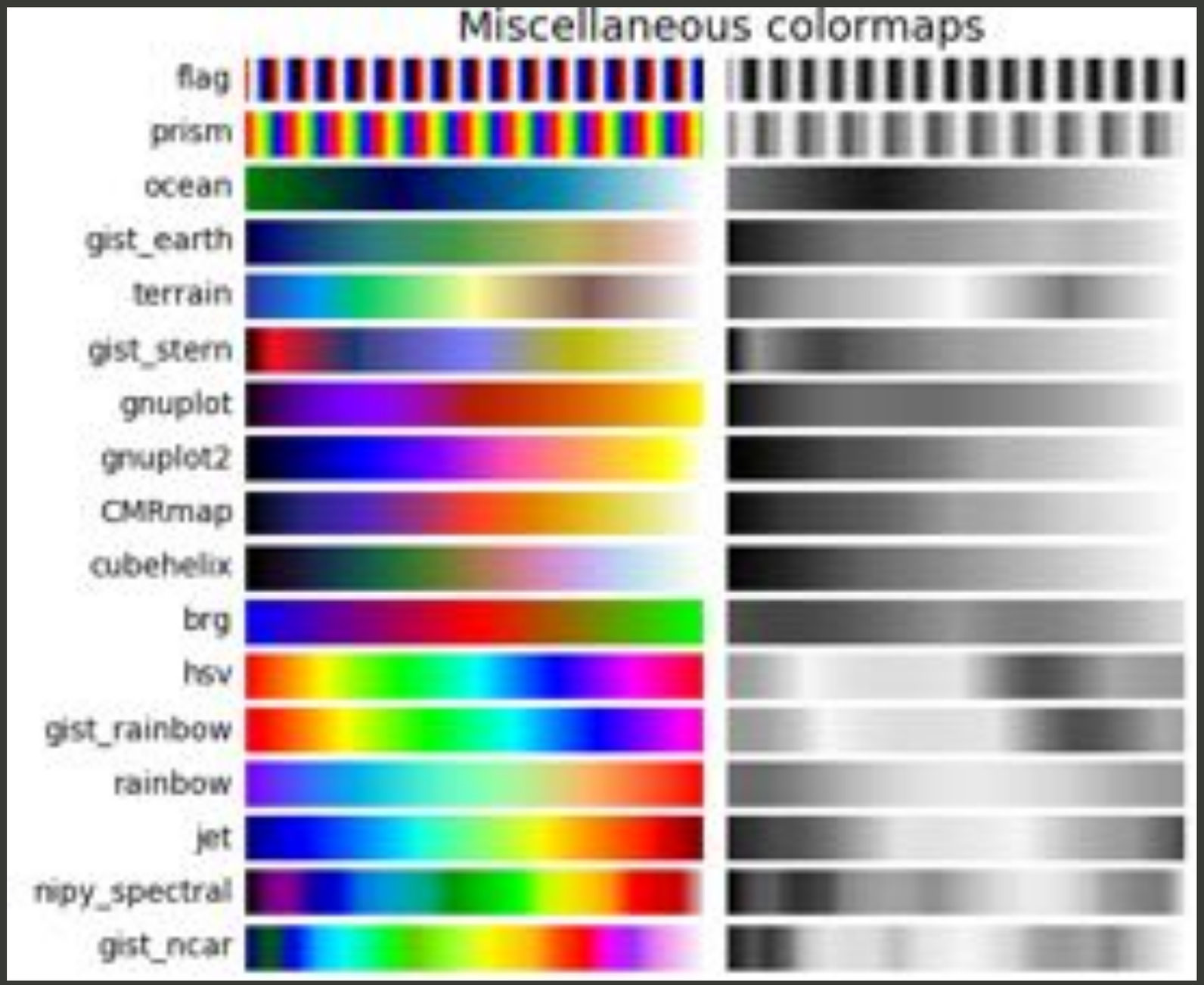
What does it look like in greyscale?




matplotlib

# Color

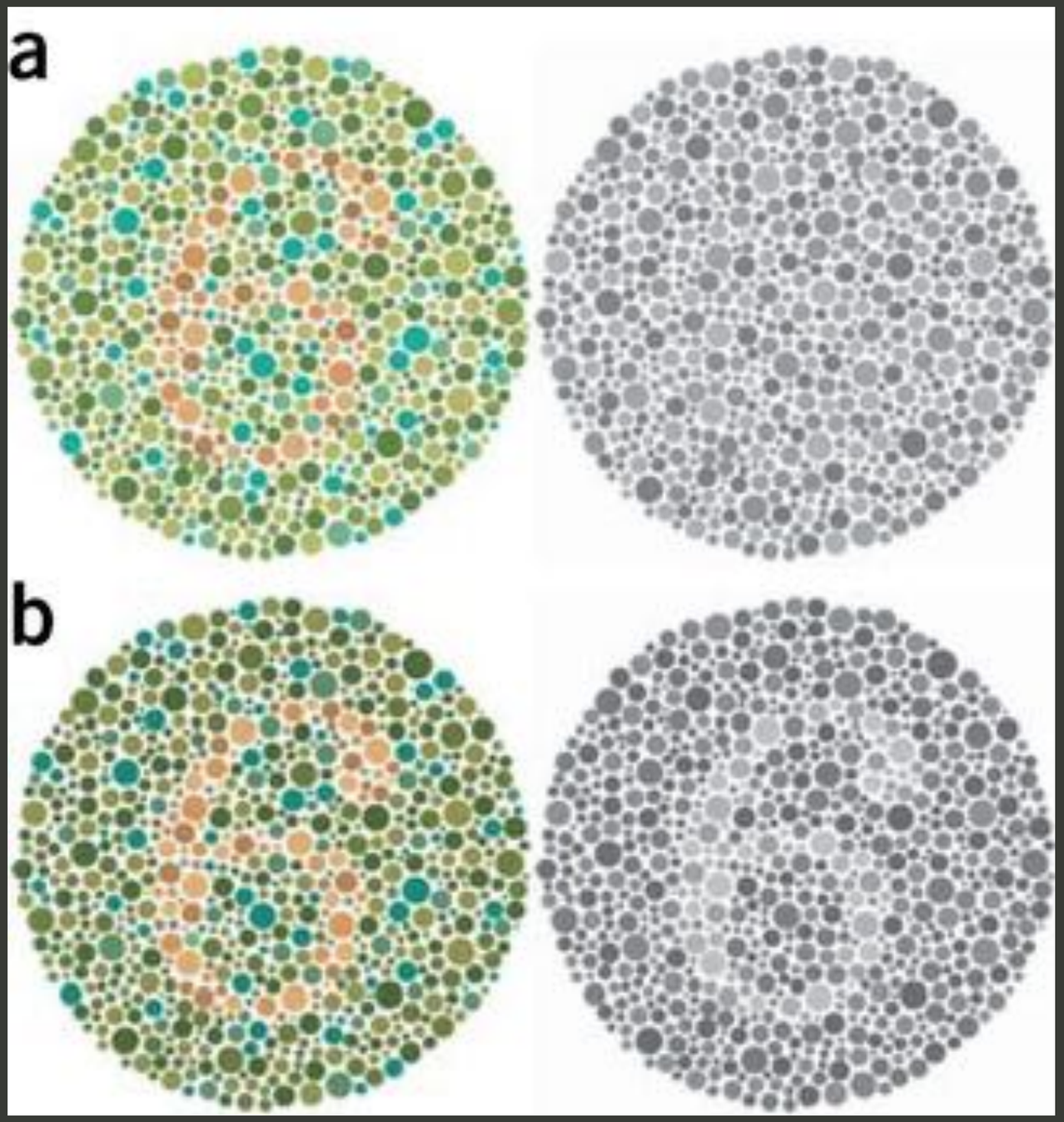
What does it look like in greyscale?




matplotlib

# Color

How does it look to the color blind?




Wong, Nature Methods, 2010

# Color

## If you must…

use colorbrewer2.org to select colorblind friendly palettes

use shapes to better highlight salience

select semantically resonant colors

consider background colors and how this affects final appearance