

Data Visualization - 1.

Looking at Data (part 1)

Kieran Healy
Code Horizons

December 10, 2023

Data Visualization with R and ggplot2

Housekeeping

10:00am to 12:30pm US EST

Break from 12:30pm to 1:30pm

1:30pm to 3:30pm

Use the Zoom chat to ask questions, or raise a hand with 

In between class sessions



My Setup and Yours

Talking, Slides, and Live-Coding in RStudio

Follow along and take notes in RStudio yourself

The course packet is also an RStudio project

Get up and Running



R version 4.1.1 (2021-08-10) -- "Kick Things"
Copyright (C) 2021 The R Foundation for Statistical Computing
Platform: aarch64-apple-darwin20 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

Natural language support but running in an English locale

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

knitr hook "anchor" is now available
Loading required package: testthat

Attaching package: 'testthat'

The following object is masked from 'package:devtools':

 test_file

> |

The screenshot shows the RStudio interface with the following panes:

- Console:** Displays the R startup message and the loading of the 'testthat' package.
- Environment:** Shows the 'Global Environment' tab with the 'set' function defined.
- Files:** Shows the file structure of the 'dataviz_xaringan' directory:

Name	Size	Modified
..		
.gitignore	129 B	Feb 18, 2022, 5:01 PM
code		
course_notes.Rmd	988 B	Feb 18, 2022, 5:01 PM
data		
data_visualization.Rproj	276 B	Feb 18, 2022, 5:01 PM
LICENSE	50 B	Feb 18, 2022, 5:01 PM
pdf_slides		
README.md	1.7 KB	Feb 18, 2022, 5:01 PM
README.Rmd	2.2 KB	Feb 18, 2022, 5:01 PM
slides		

dataviz_xaringan - main - RStudio

course_notes.Rmd 01-looking-at-data.Rmd

Knit on Save Knit Run

Source Visual Outline

```
1 ---  
2 title: "Data Visualization Notes"  
3 author: "<YOUR NAME HERE>"  
4 date: "April 2022"  
5 output: html_document  
6 ---  
7  
8 ```{r setup, include=FALSE}  
9 knitr::opts_chunk$set(echo = TRUE)  
10 ```  
11  
12 ## Welcome  
13  
14 This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see  
http://rmarkdown.rstudio.com.
```

11:1 (Top Level) R Markdown

Console Terminal Render Jobs

R 4.1.1 · ~/Documents/courses/dataviz_xaringan/

```
ls.  
  
Natural language support but running in an English locale  
  
R is a collaborative project with many contributors.  
Type 'contributors()' for more information and  
'citation()' on how to cite R or R packages in publications.  
  
Type 'demo()' for some demos, 'help()' for on-line help,  
or  
'help.start()' for an HTML browser interface to help.  
Type 'q()' to quit R.
```

Environment History Connections Git Tutorial

Import Dataset 271 MiB

Global Environment

Functions set function (name, value)

Files Plots Packages Help Viewer Presentation

New Folder New Blank File Delete Rename More

Home Documents courses dataviz_xaringan

Name	Size	Modified
.gitignore	129 B	Feb 18, 2022, 5:01 PM
code		
course_notes.Rmd	990 B	Feb 19, 2022, 8:07 AM
data		
data_visualization.Rproj	276 B	Feb 18, 2022, 5:01 PM
LICENSE	50 B	Feb 18, 2022, 5:01 PM
pdf_slides		
README.md	1.7 KB	Feb 18, 2022, 5:01 PM
README.Rmd	2.2 KB	Feb 18, 2022, 5:01 PM
slides		

Try rendering your notes



The screenshot shows the RStudio interface with the following details:

- Title Bar:** The file name "course_notes.Rmd" is displayed in the title bar.
- Toolbar:** Includes icons for back, forward, save, knit on save (unchecked), ABC (with a green checkmark), search, knit (with a blue knitting icon), and settings.
- Source/Visual Tabs:** The "Source" tab is selected, while the "Visual" tab is visible below it.
- Code Editor:** The code is displayed in two-line mode:

```
1 ---  
2 title: "Data Wrangling Notes"
```

Don't worry if it's not clear what's happening at this point.

Now write the following code

Write this out inside the “code chunk” in your notes.

```
library(tidyverse)
library(gapminder)

p ← ggplot(data = gapminder,
            mapping = aes(x = gdpPercap,
                           y = lifeExp))

p + geom_point()
```

... And knit your document again.

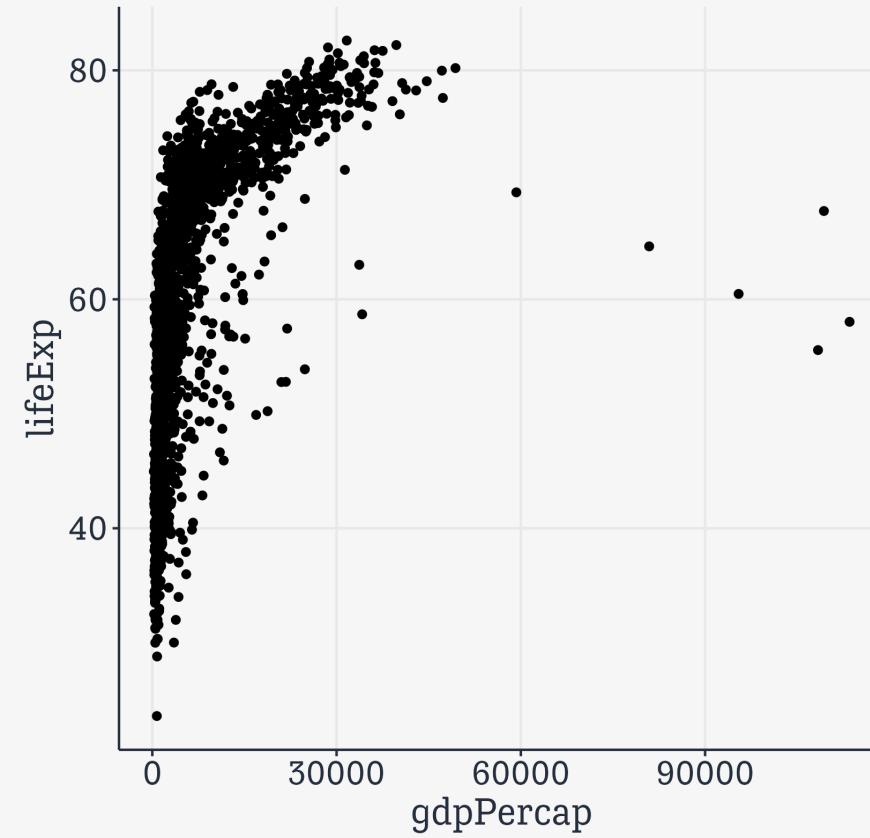
Now write the following code

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```
library(tidyverse)
library(gapminder)

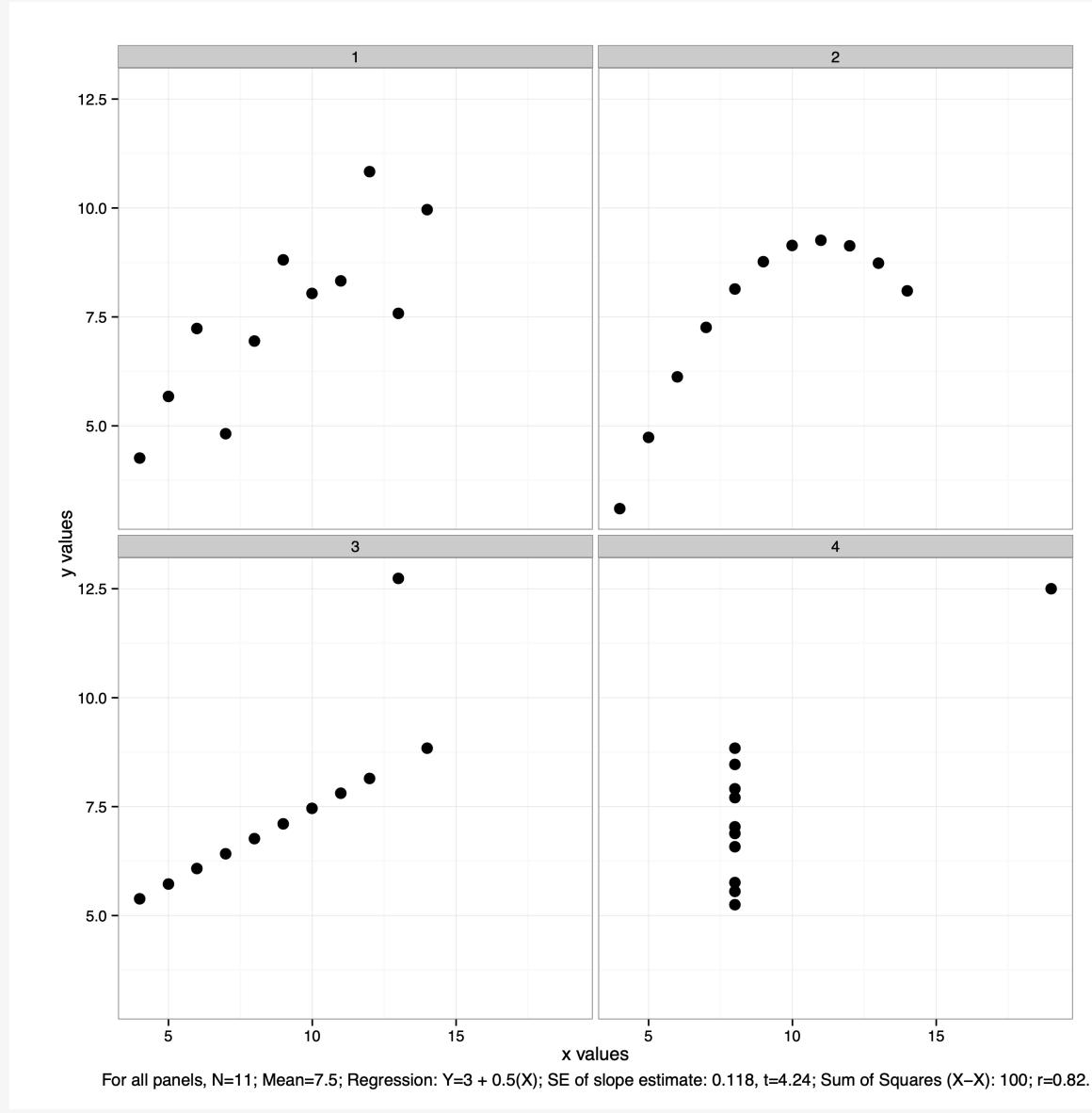
p ← ggplot(data = gapminder,
            mapping = aes(x = gdpPercap,
                           y = lifeExp))

p + geom_point()
```

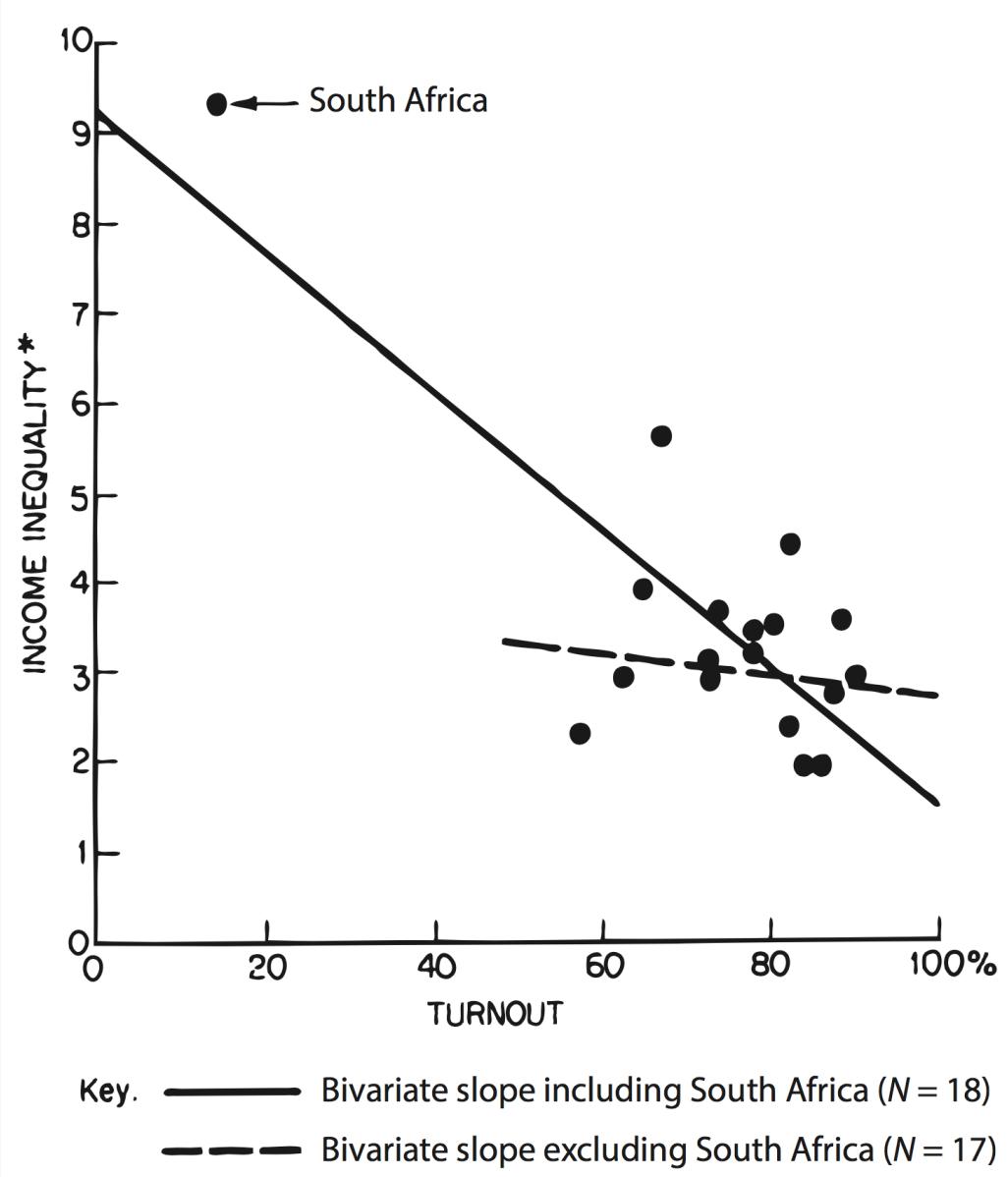


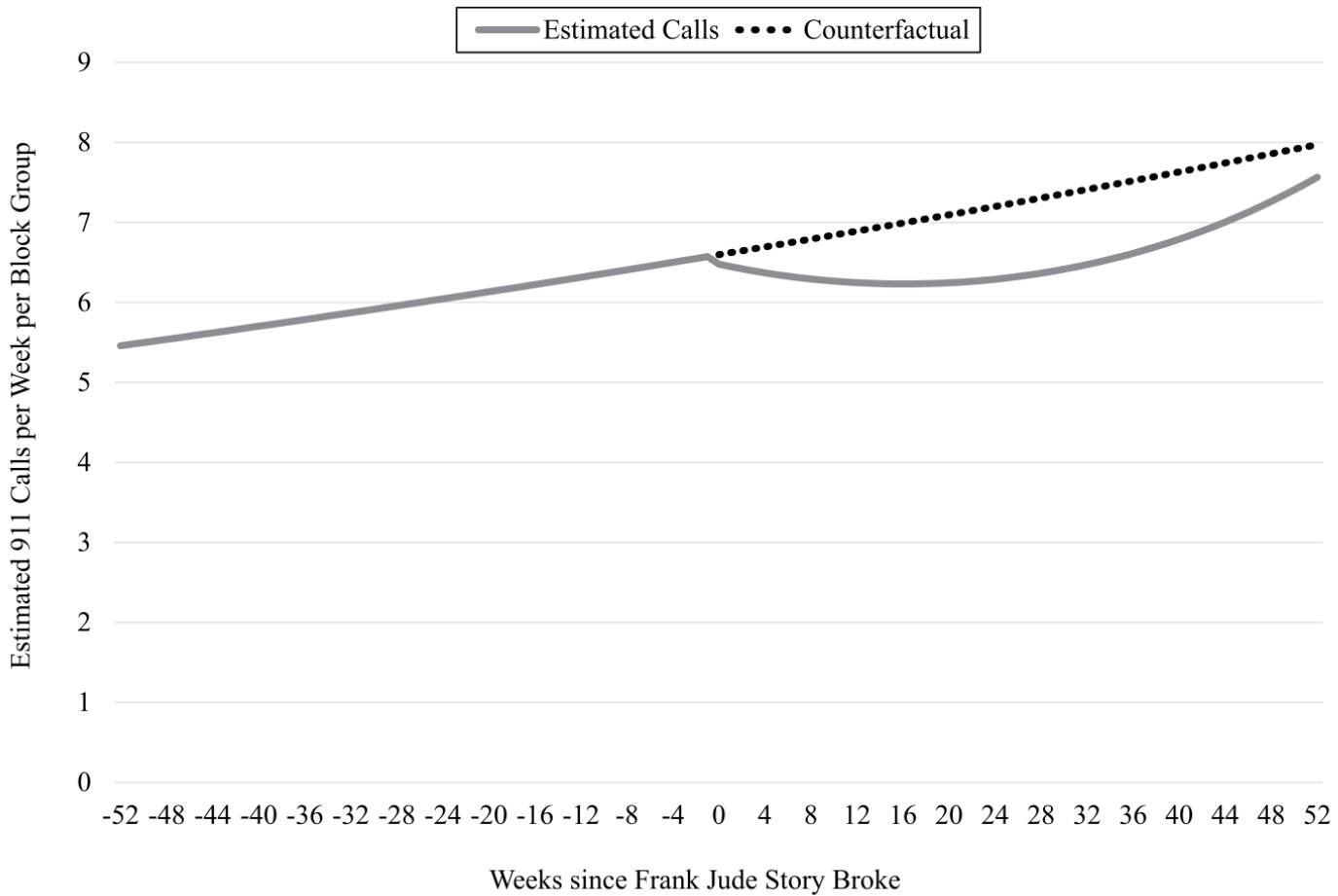
You should
.kjh-yellowlook at
your data

Seeing things

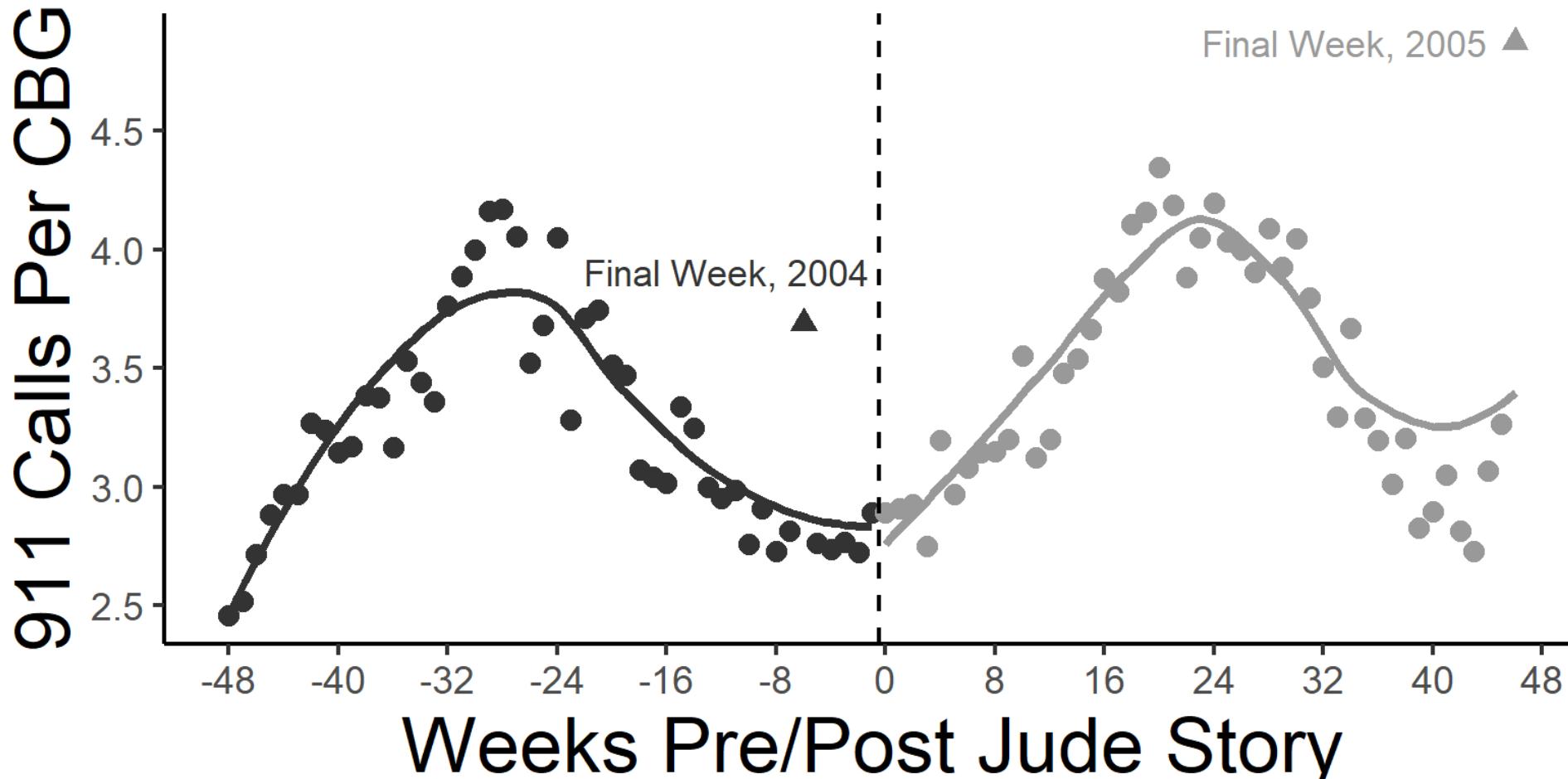


Anscombe's Quartet

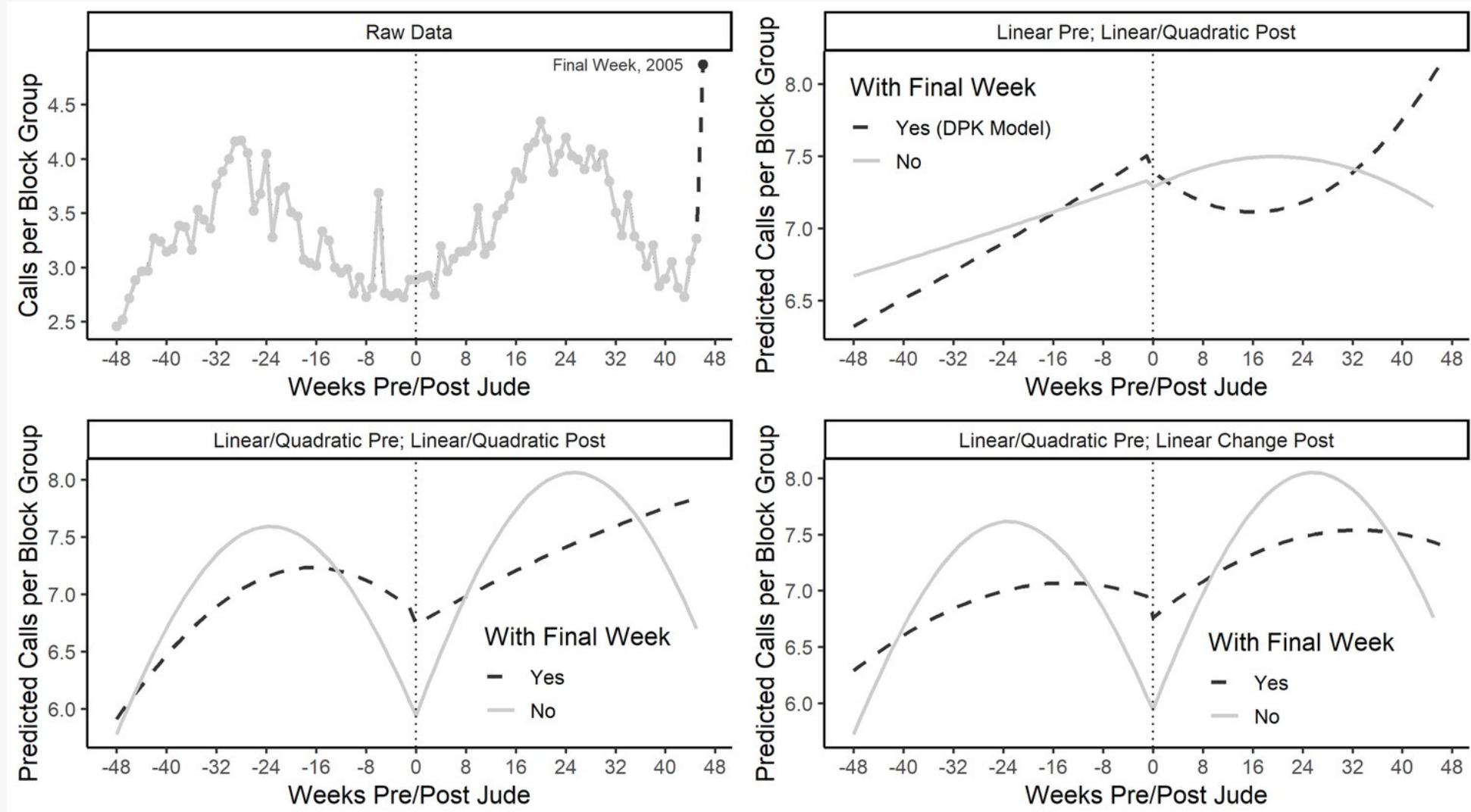




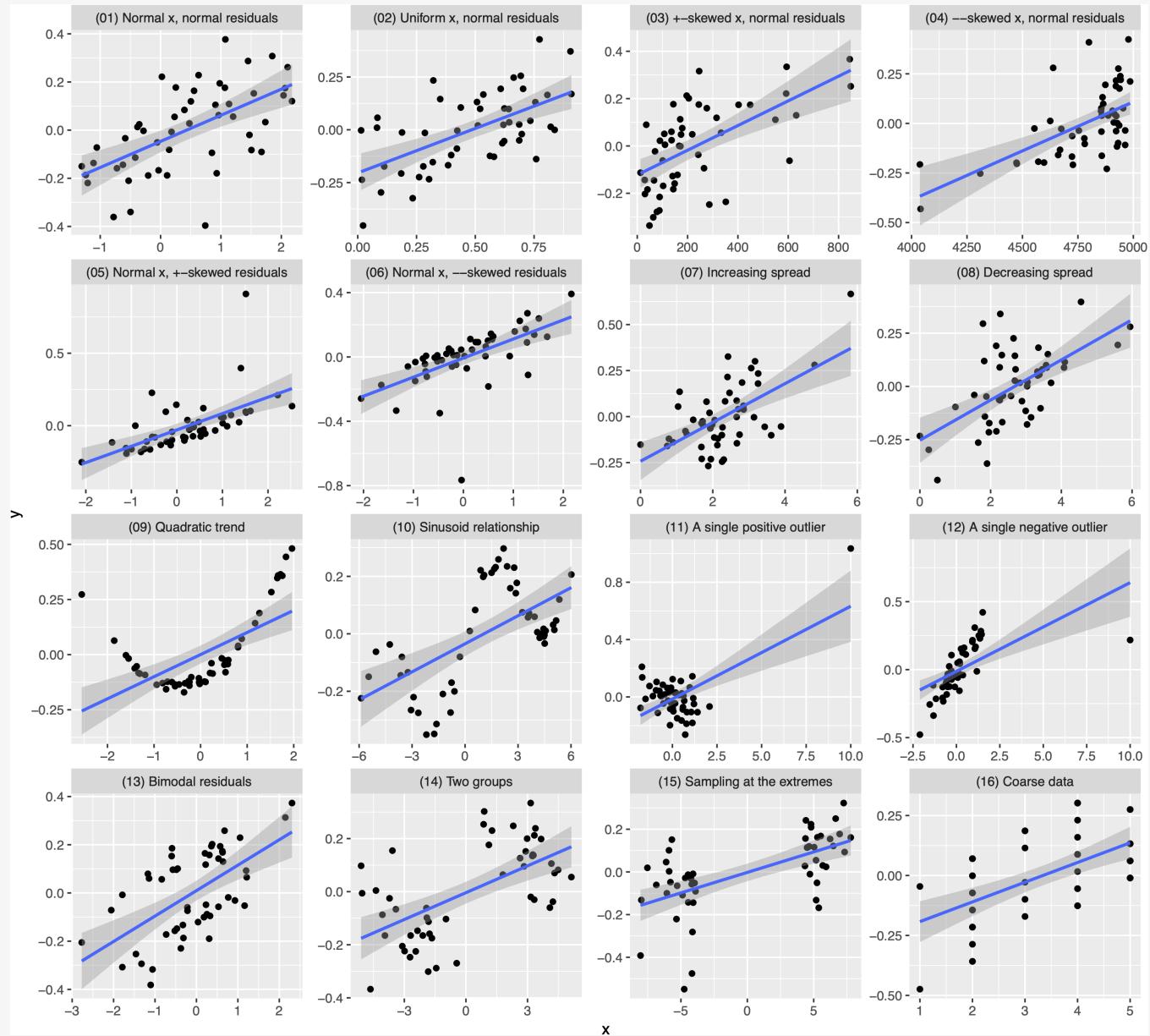
All Neighborhoods

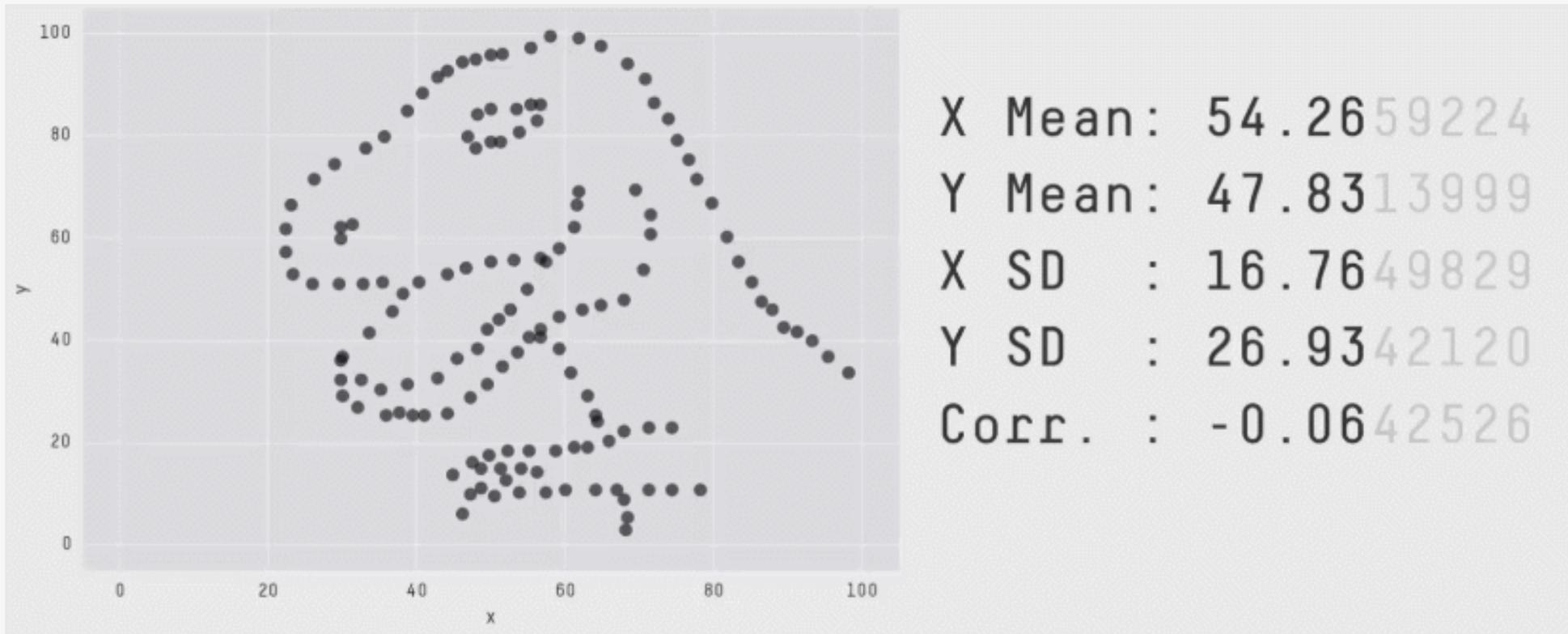


Zoorob (2020)



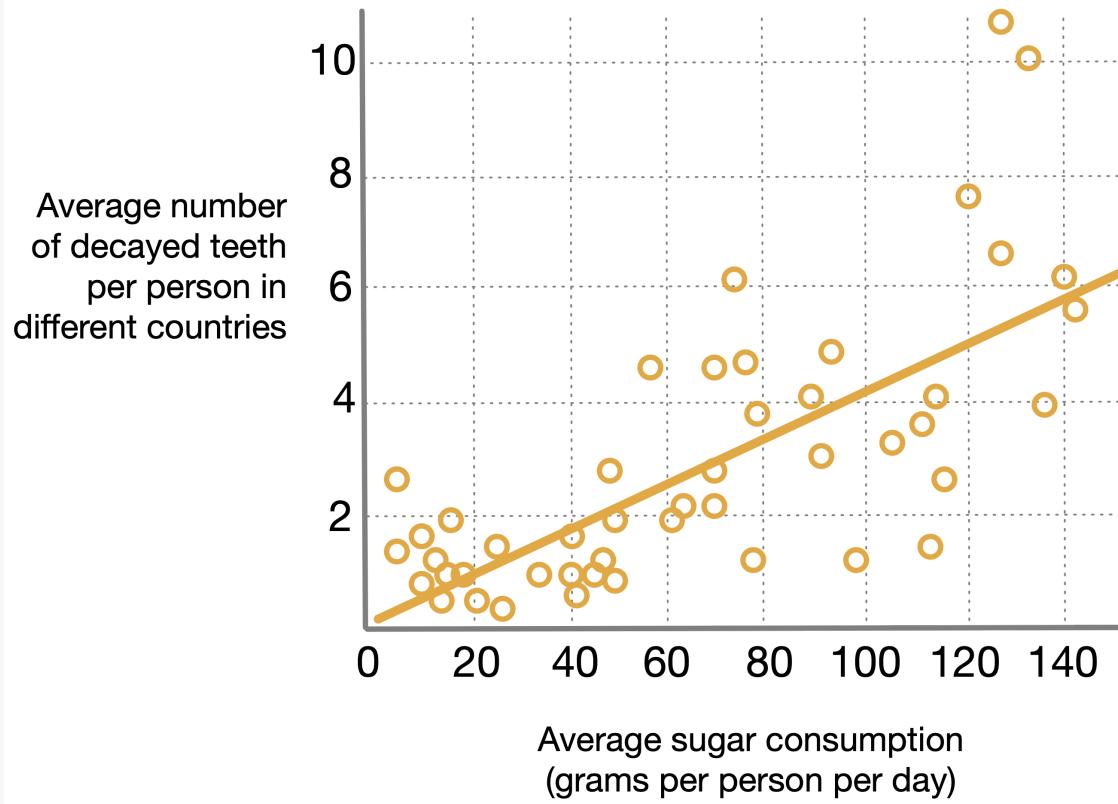
Zoorob (2020)





Cairo; Matejka & Fitzmaurice

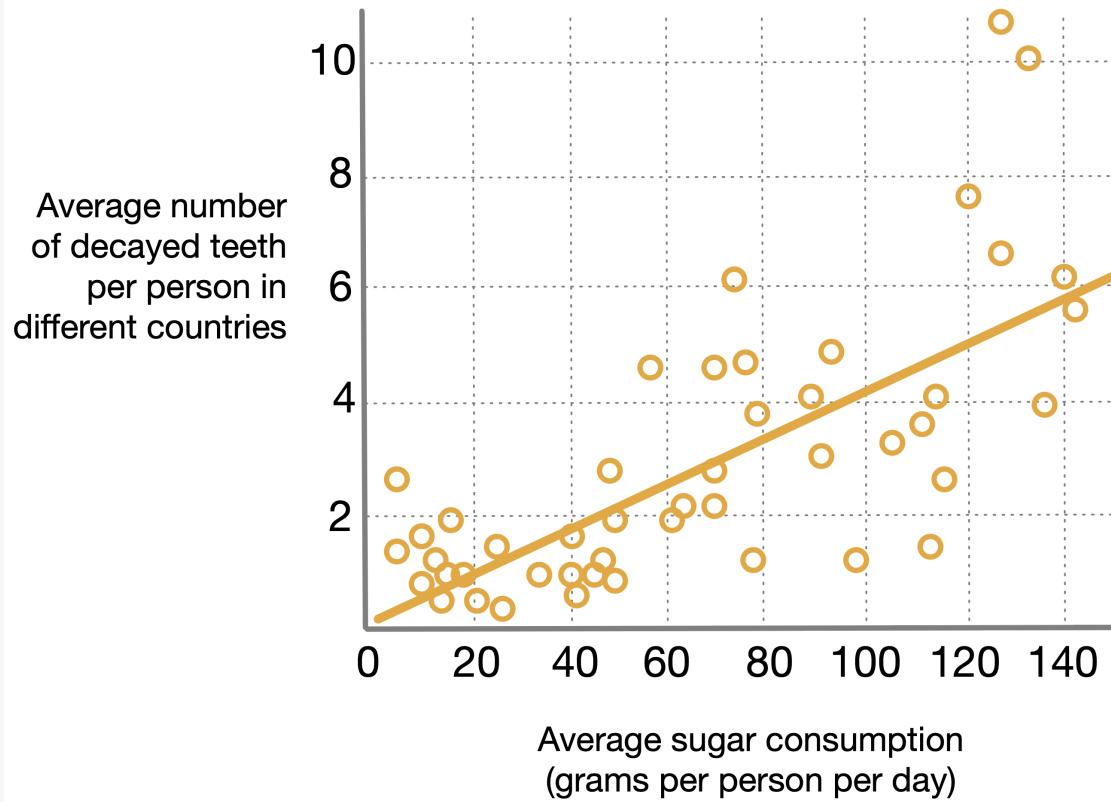
Which of the following statements best describes the data in the graph below?



Pew Research

- A. In recent years, the rate of cavities has increased in many countries
- B. In some countries, people brush their teeth more frequently than in other countries
- C. The more sugar people eat, the more likely they are to get cavities
- D. In recent years, the consumption of sugar has increased in many countries

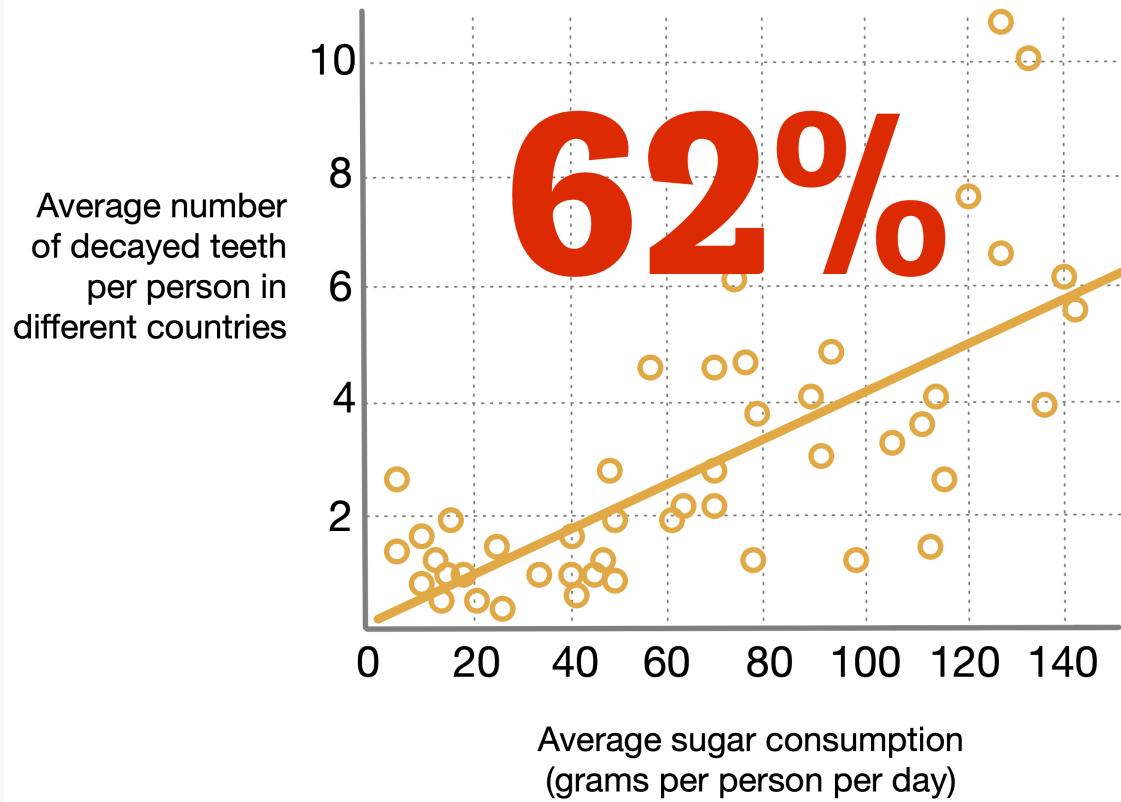
Which of the following statements best describes the data in the graph below?



Pew Research

- A. In recent years, the rate of cavities has increased in many countries
- B. In some countries, people brush their teeth more frequently than in other countries
- C. **The more sugar people eat, the more likely they are to get cavities**
- D. In recent years, the consumption of sugar has increased in many countries

Which of the following statements best describes the data in the graph below?

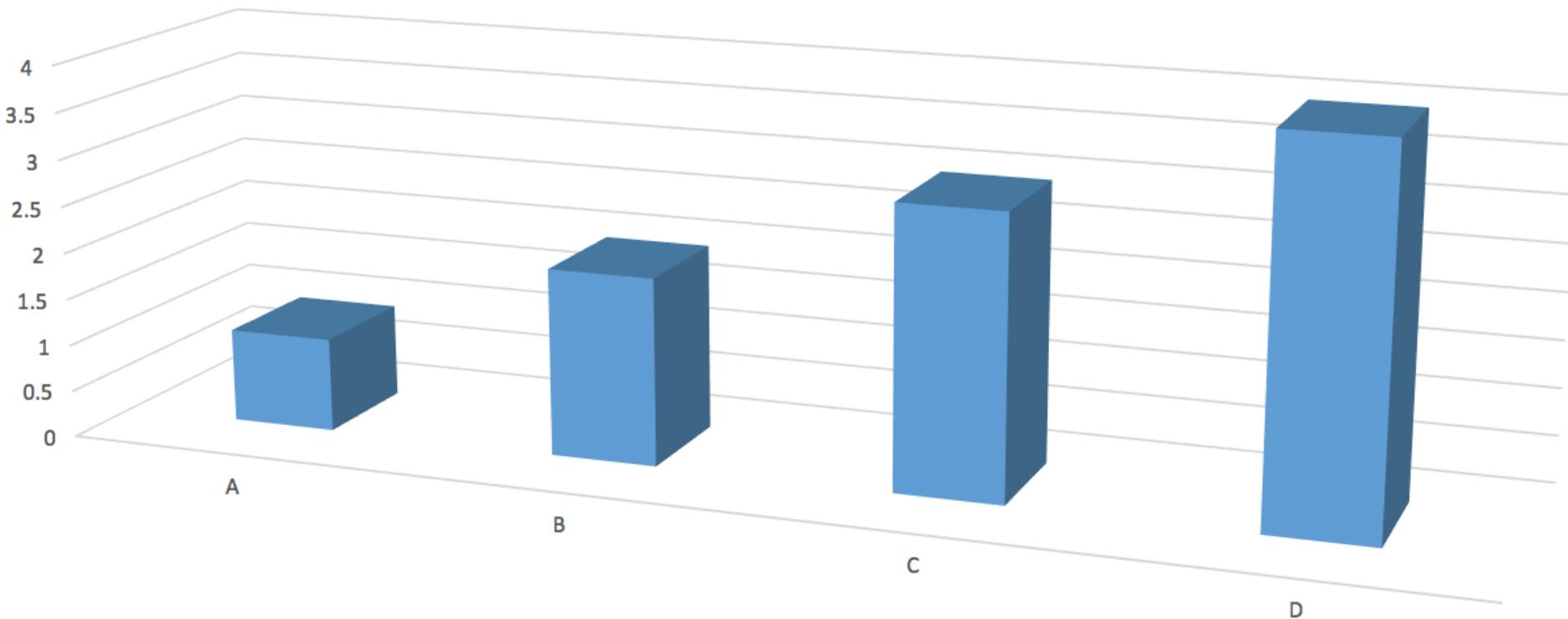


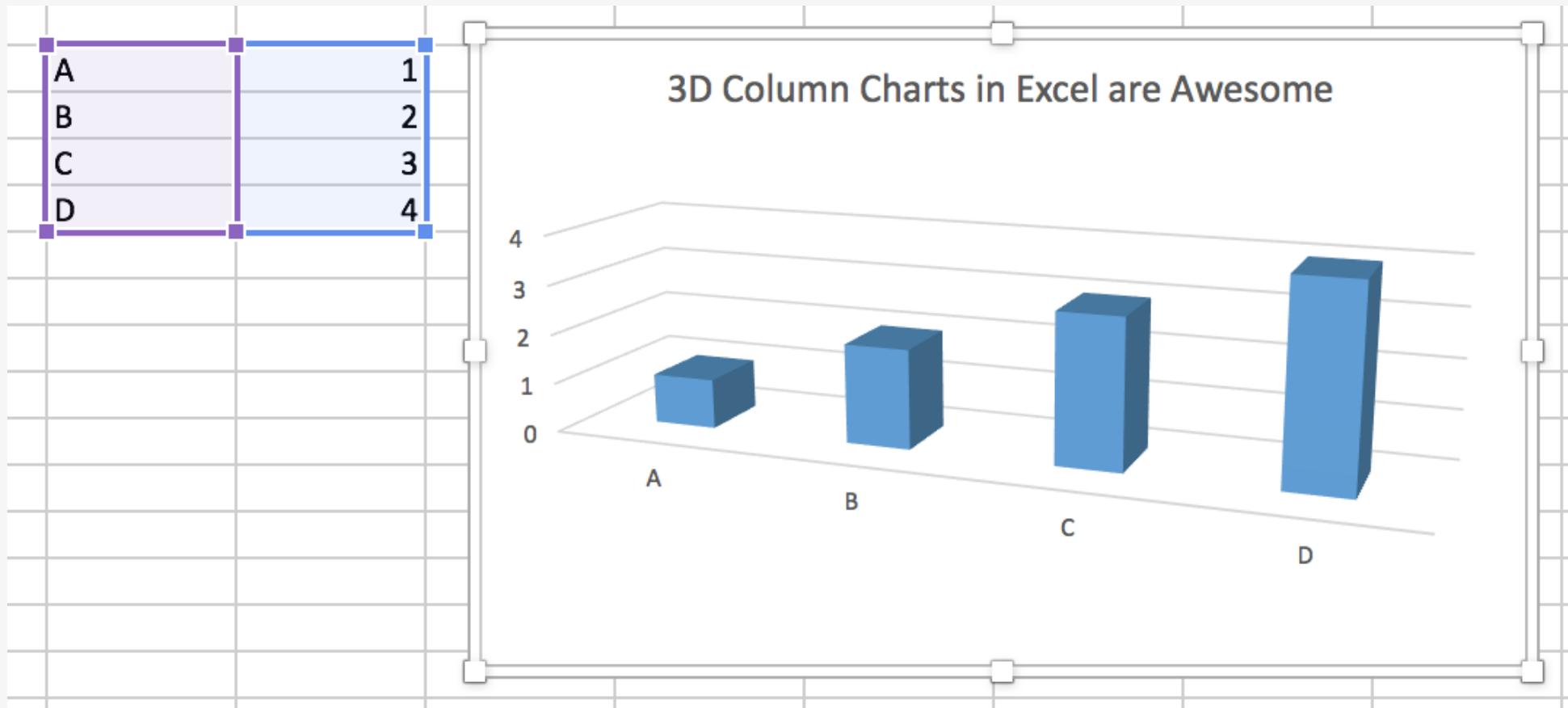
Pew Research

- A. In recent years, the rate of cavities has increased in many countries
- B. In some countries, people brush their teeth more frequently than in other countries
- C. **The more sugar people eat, the more likely they are to get cavities**
- D. In recent years, the consumption of sugar has increased in many countries

Not Seeing Things

3D Column Charts in Excel are Awesome





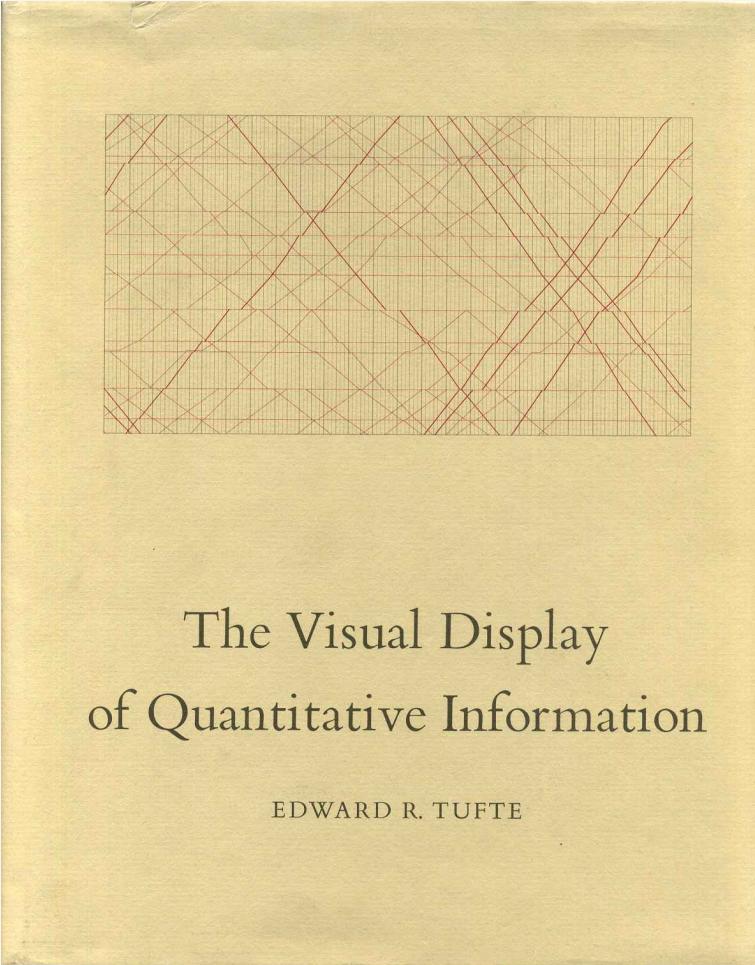
Bad Taste

Bad Data

Bad Perception

Bad Taste: Simplify, Simplify?

Tufte's “Data to Ink Ratio”





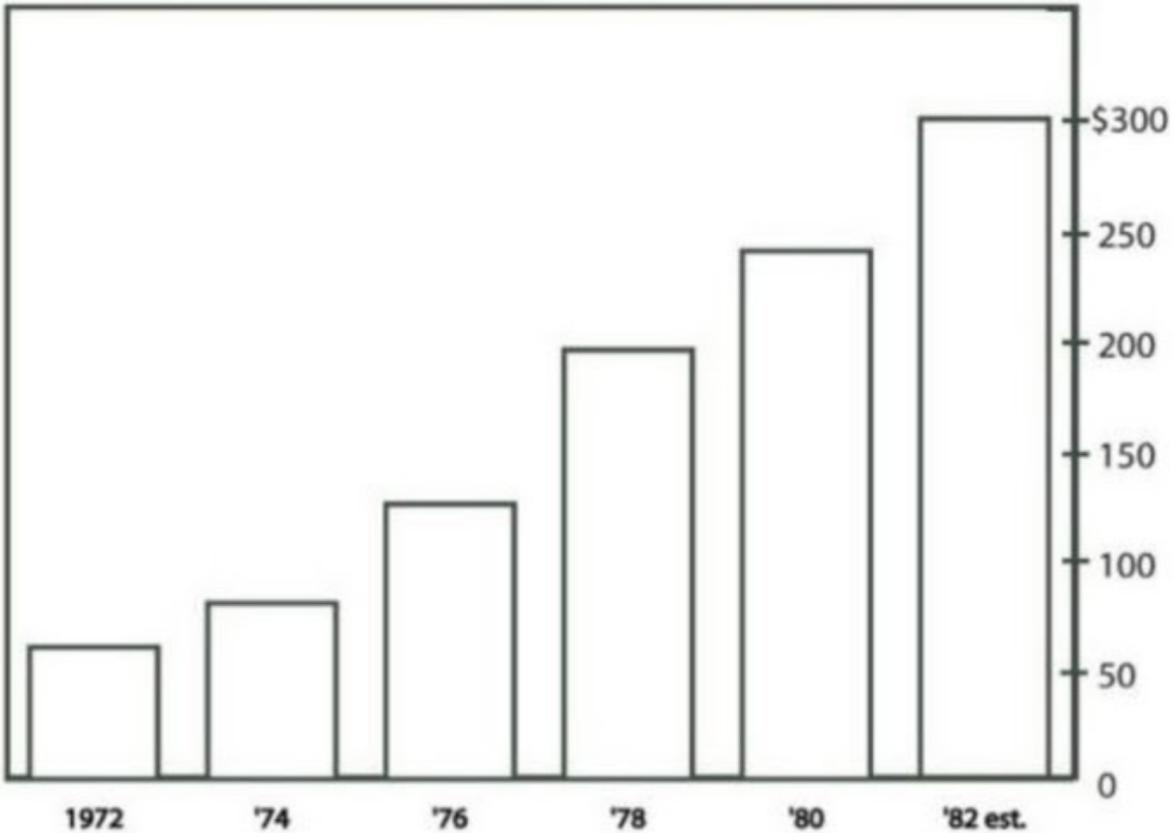
MONSTROUS COSTS

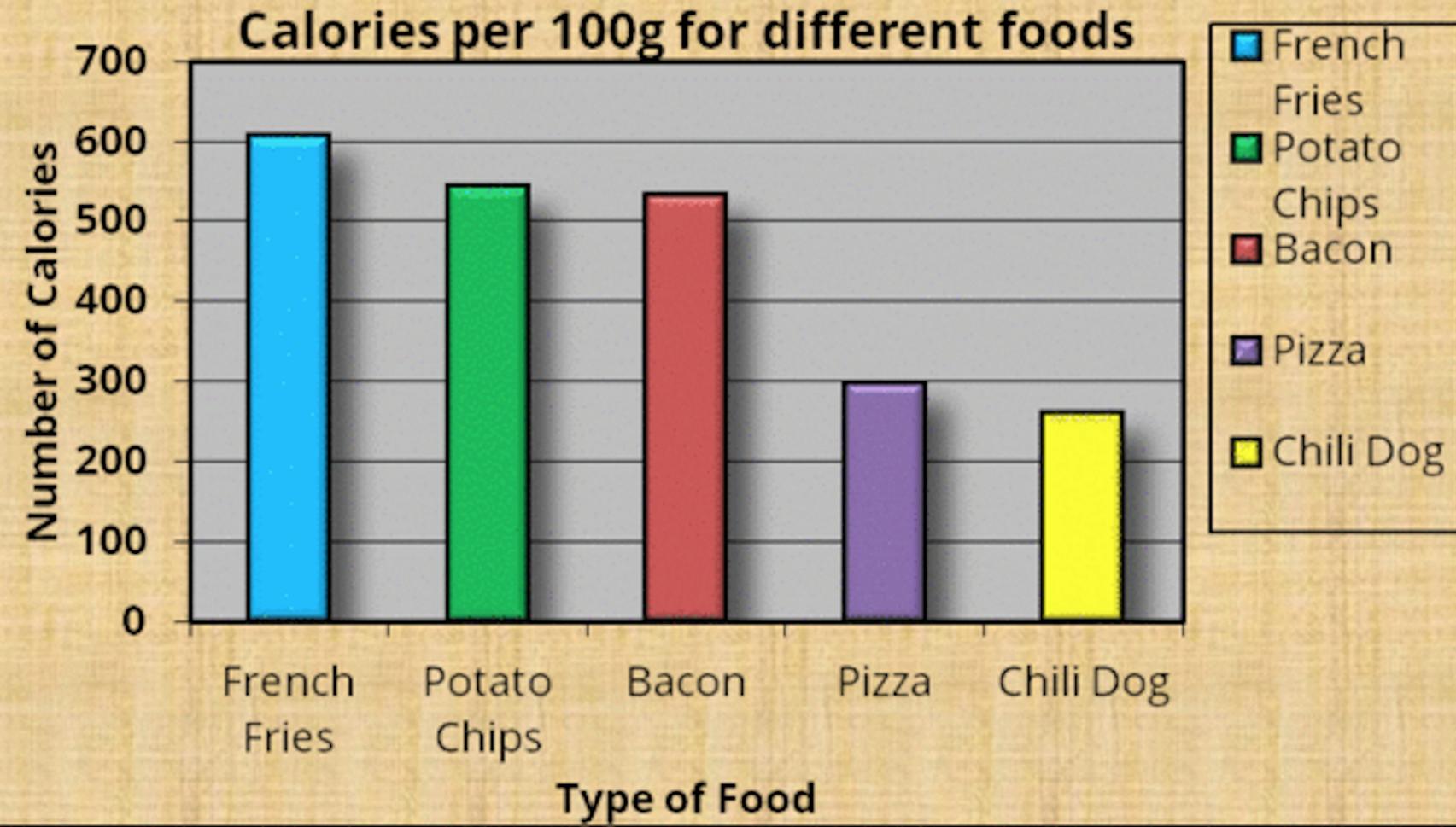
Total House and Senate campaign expenditures,
in millions



Nigel Holmes

MONSTROUS COSTS
Total House and Senate campaign expenditures, in millions

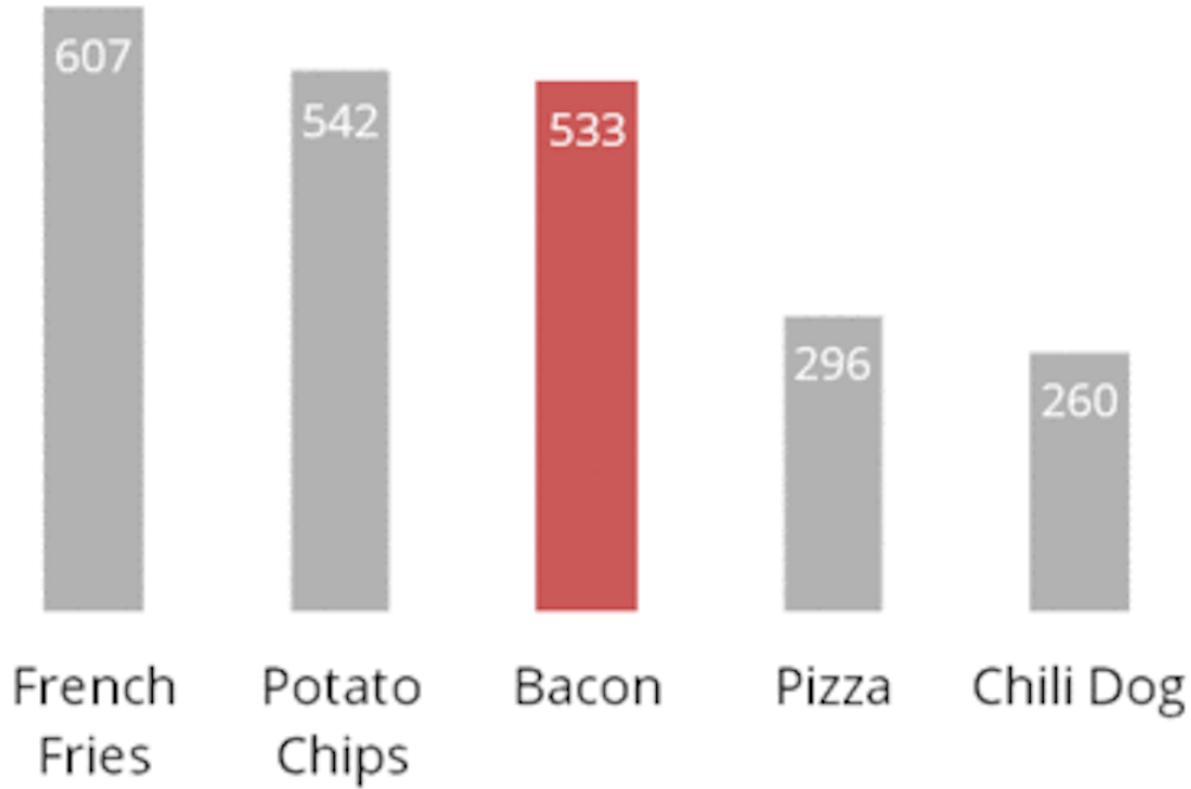




Created by Darkhorse Analytics

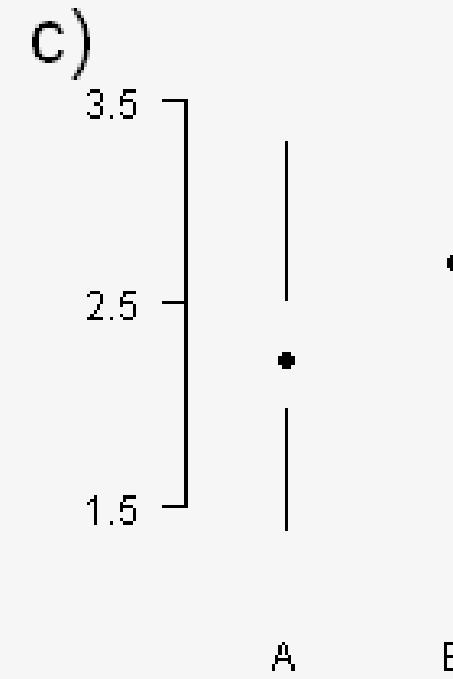
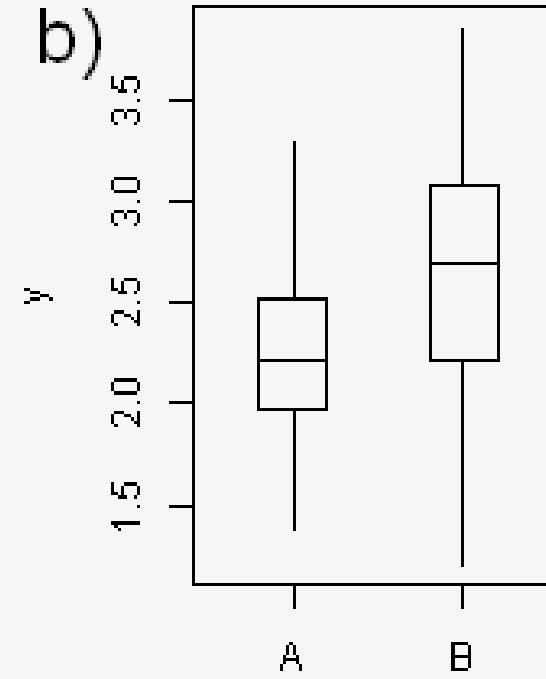
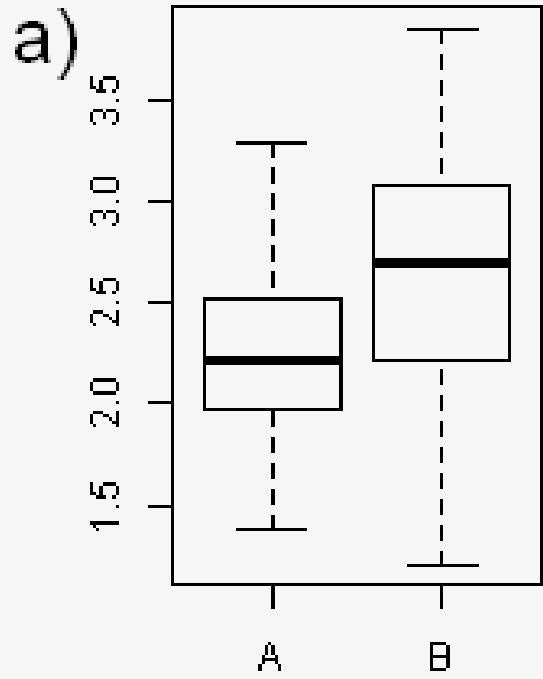
www.darkhorseanalytics.com

Calories per 100g



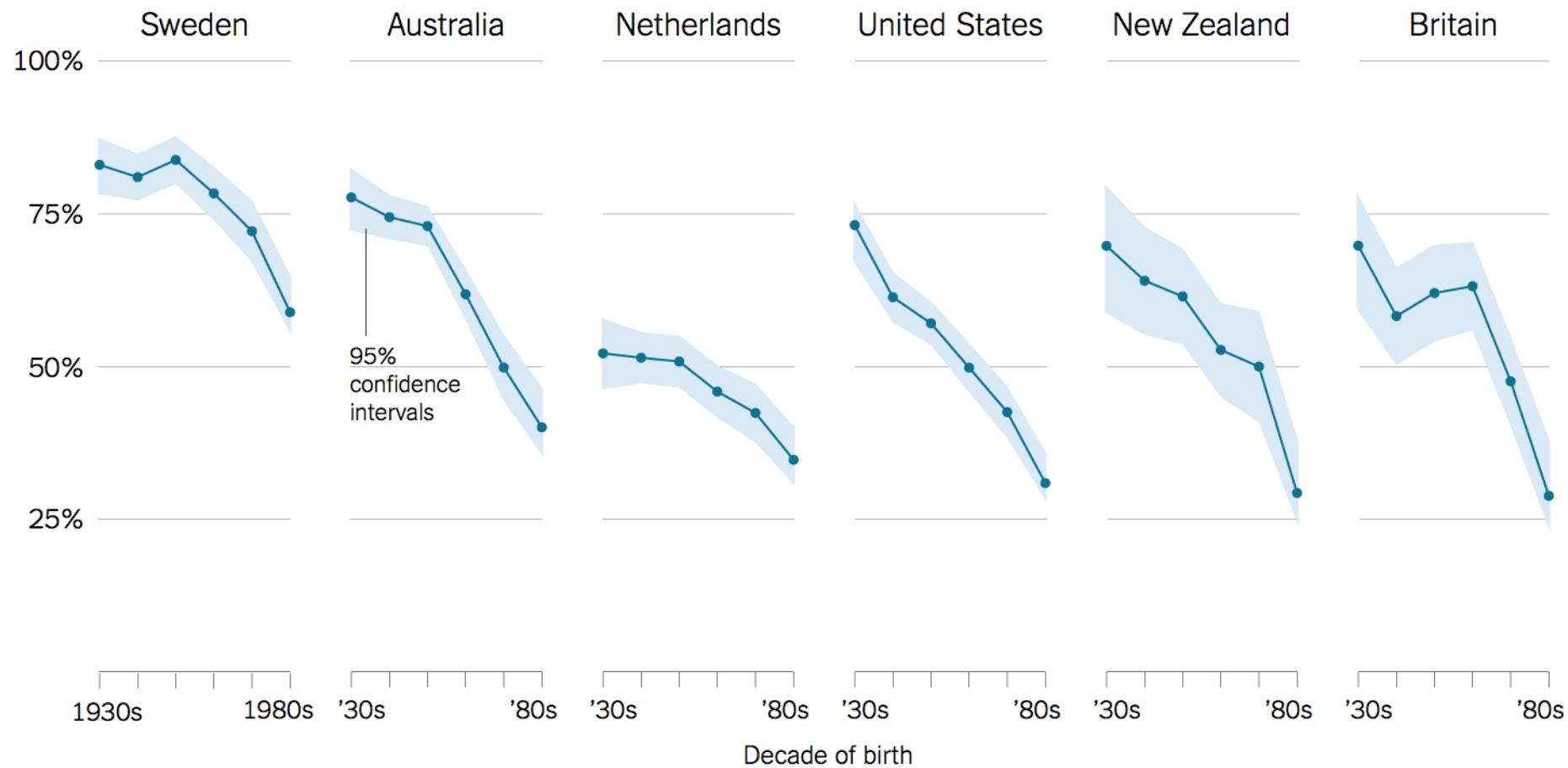
Created by Darkhorse Analytics

www.darkhorseanalytics.com

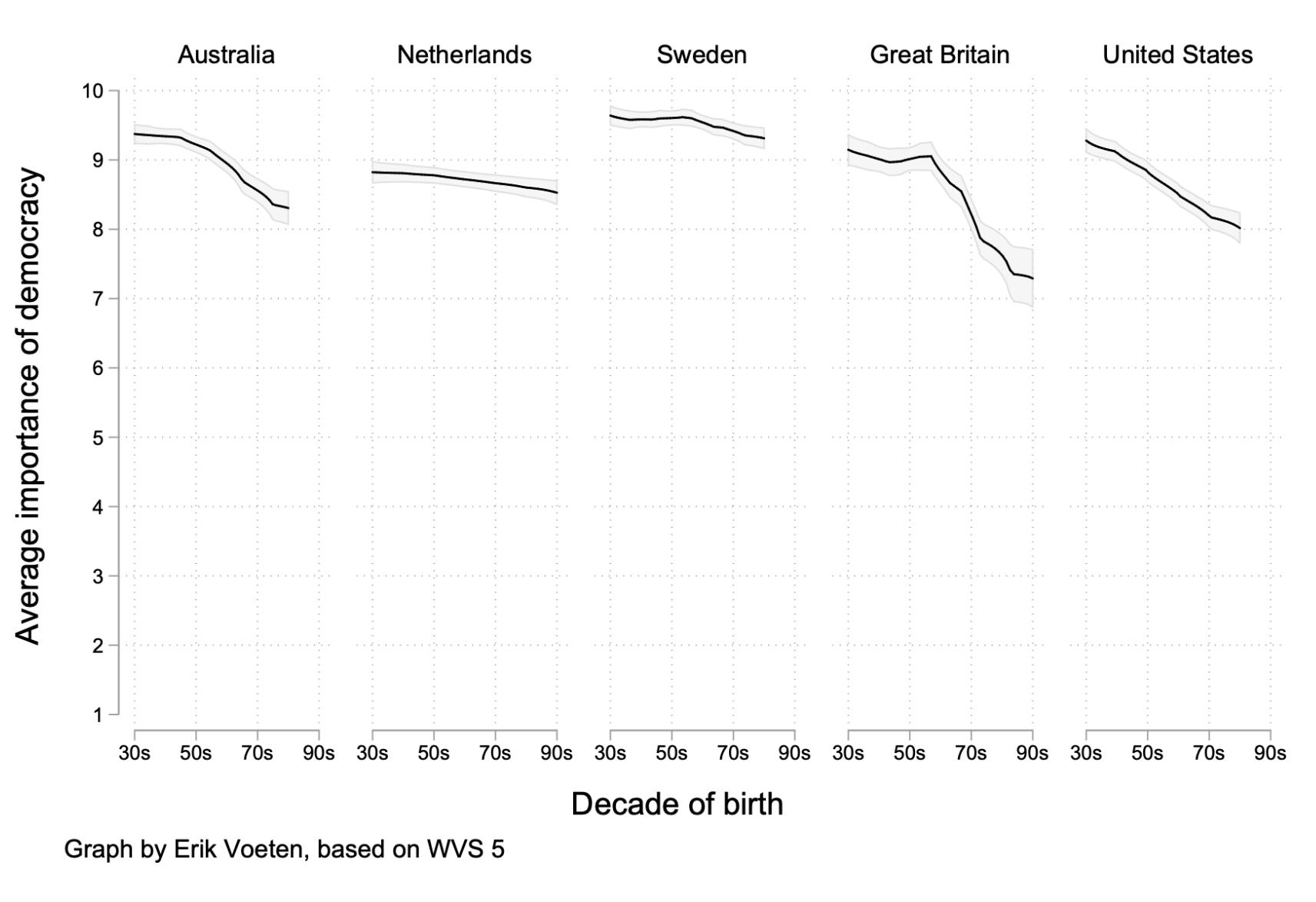


Bad Data: Junk-Free Junk Charts

Percentage of people who say it is “essential” to live in a democracy



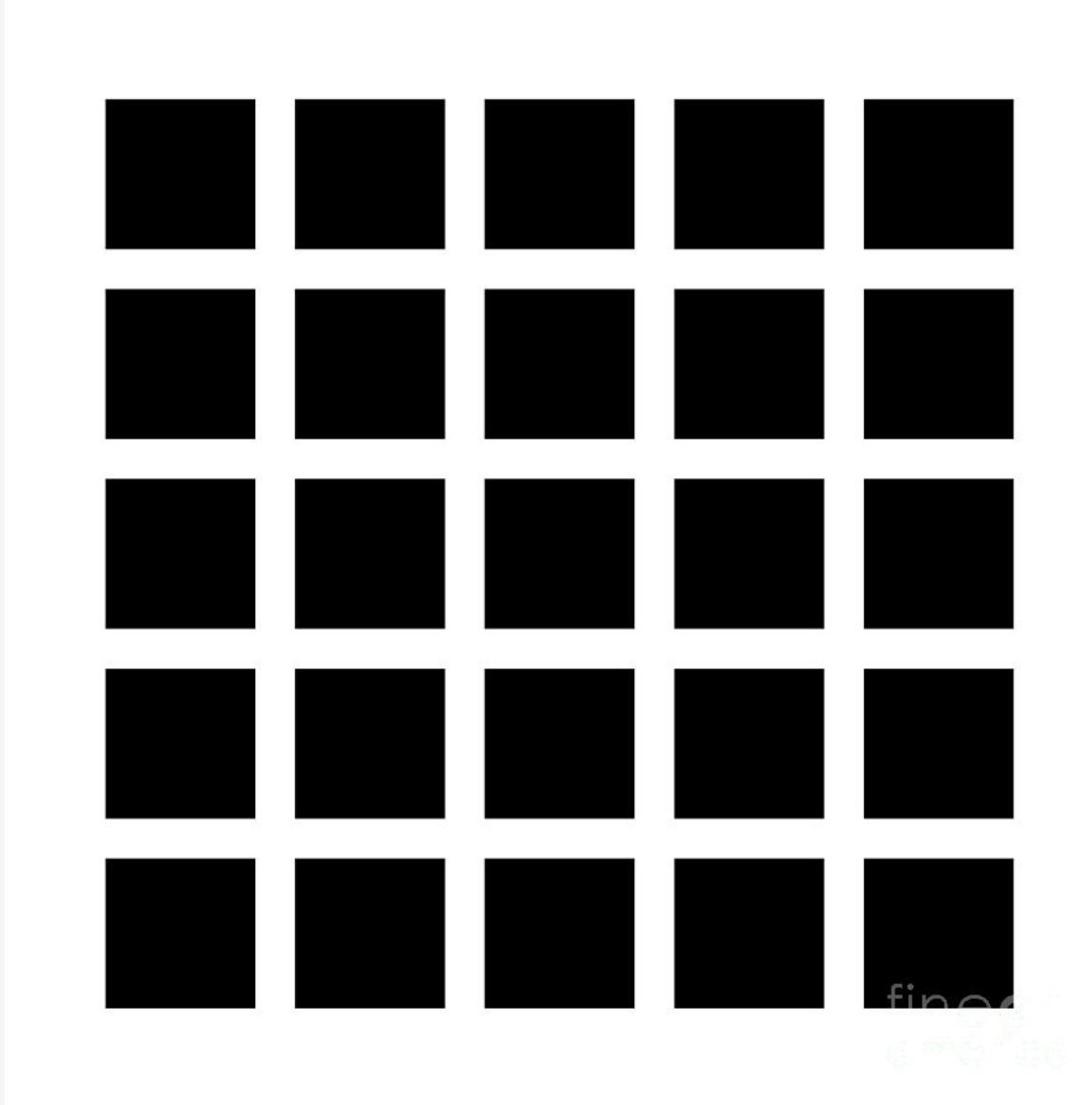
Source: Yascha Mounk and Roberto Stefan Foa, “The Signs of Democratic Deconsolidation,” Journal of Democracy | By The New York Times



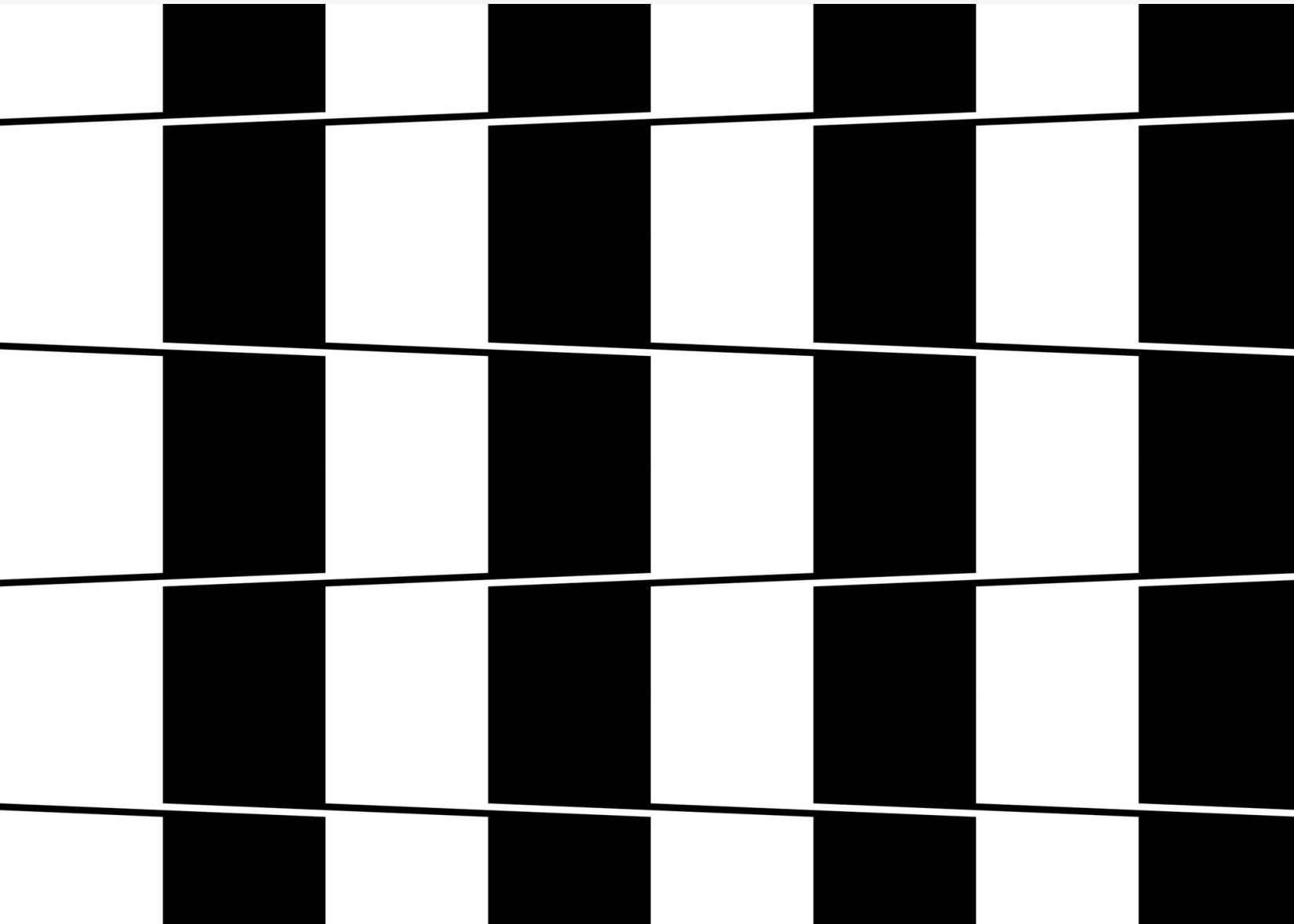
Erik Voeten

Bad Perception: Seeing and Not Seeing

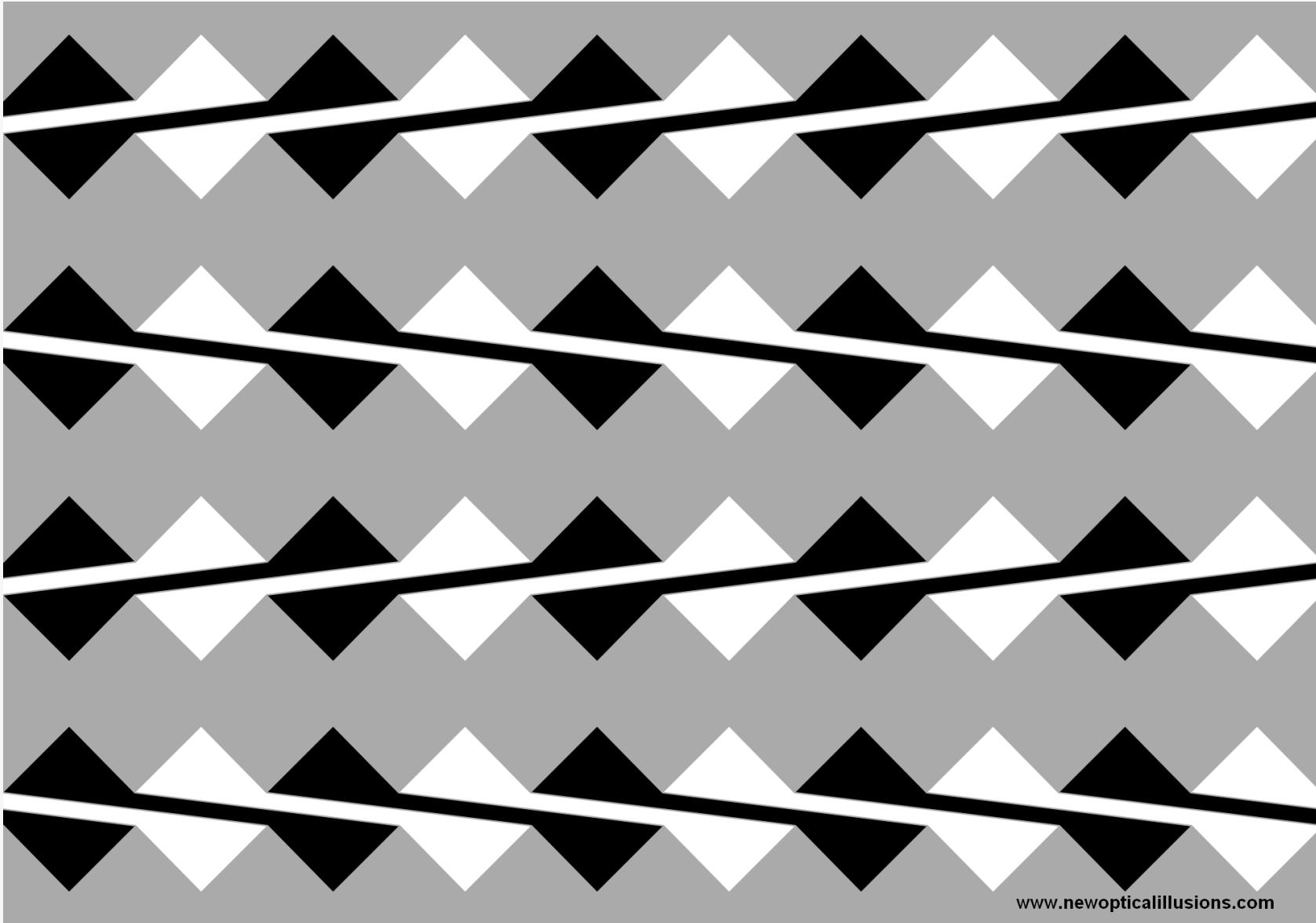
Edges & Contrasts



Hermann Grid Effect



Fraser Columns



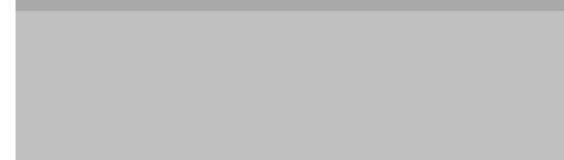
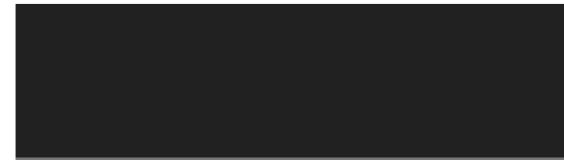
Fraser Diamonds



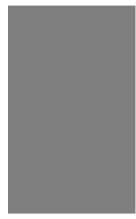
These are two perfectly
geometrical circles

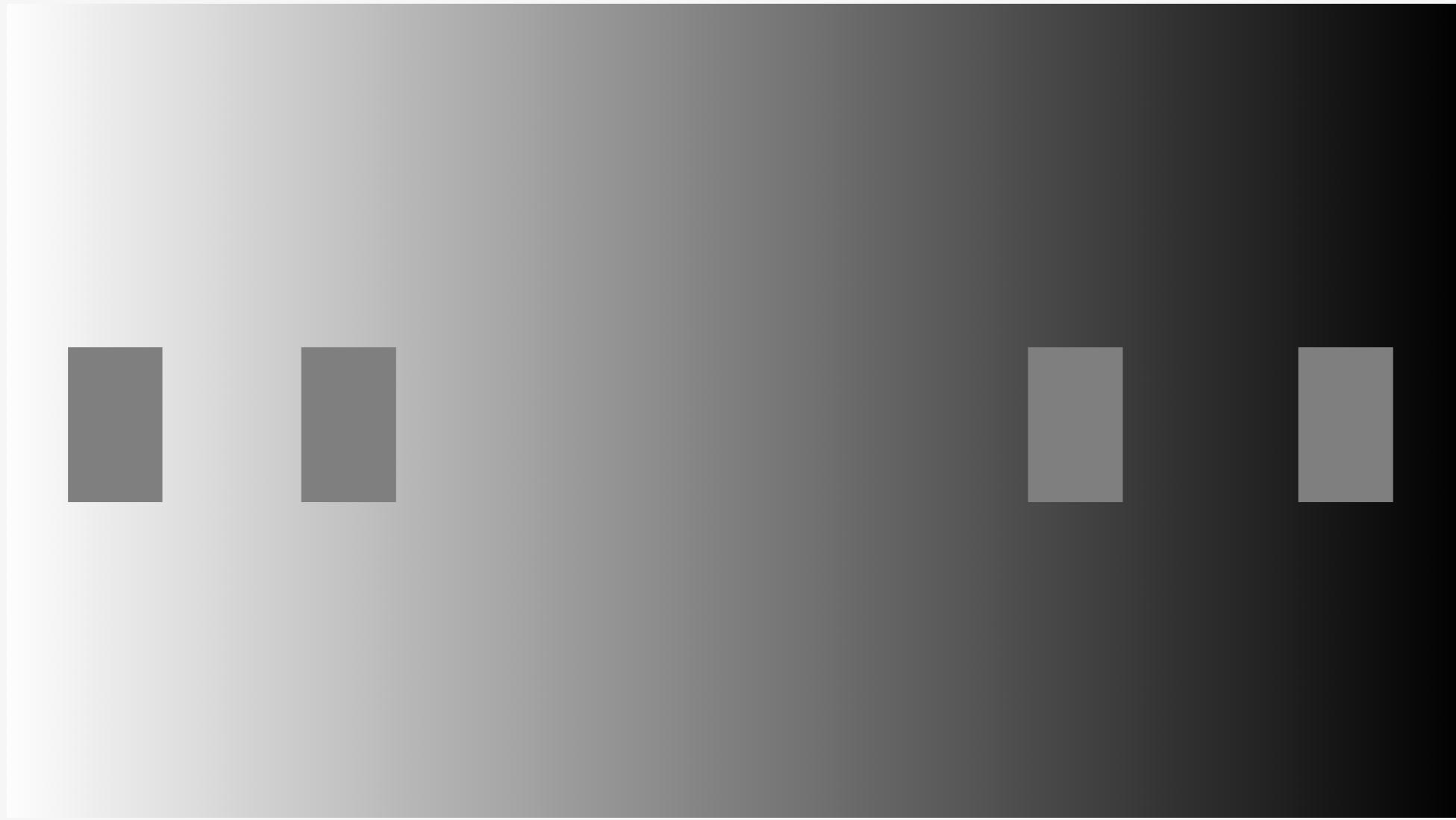


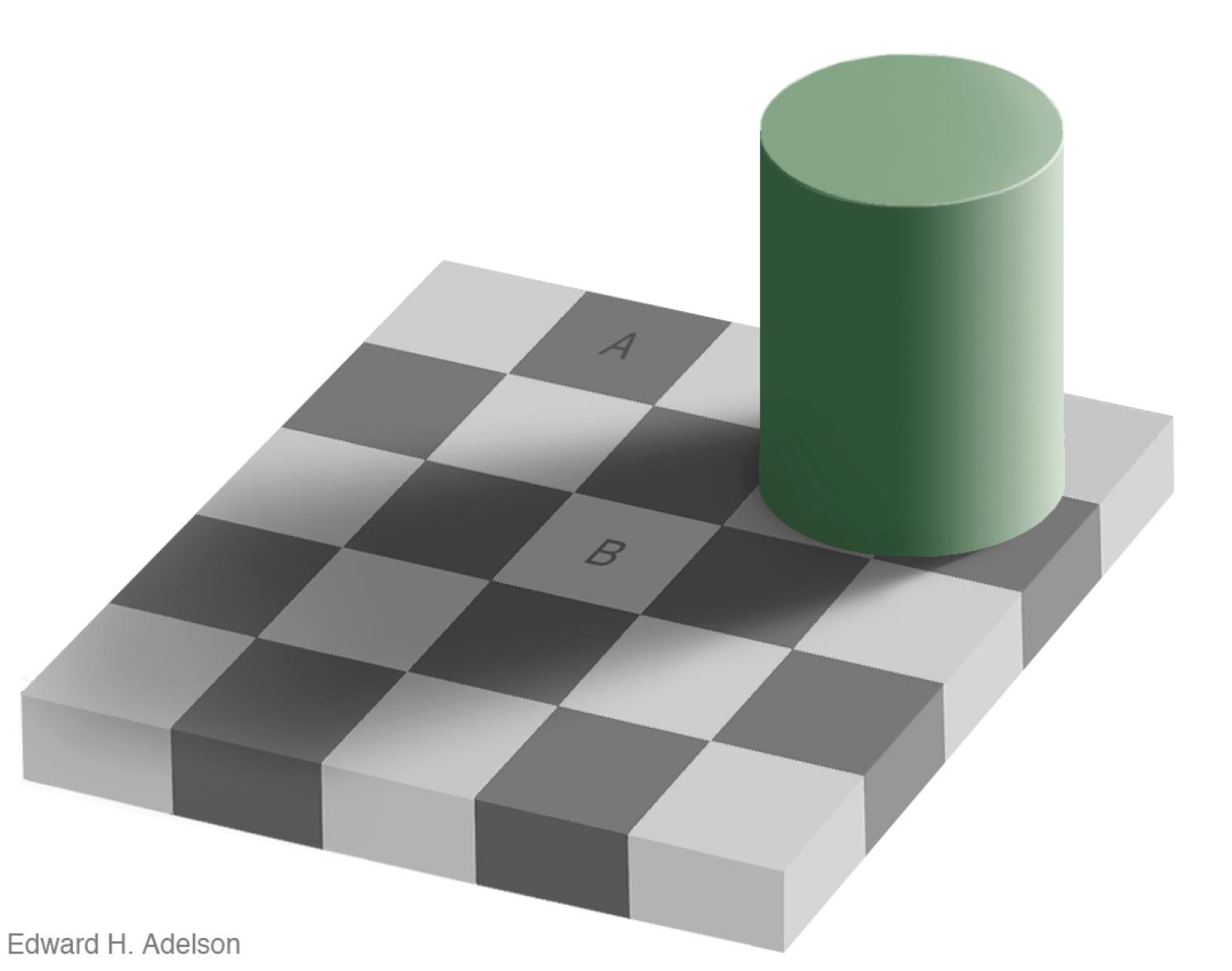
Mach Bands



Mach Bands

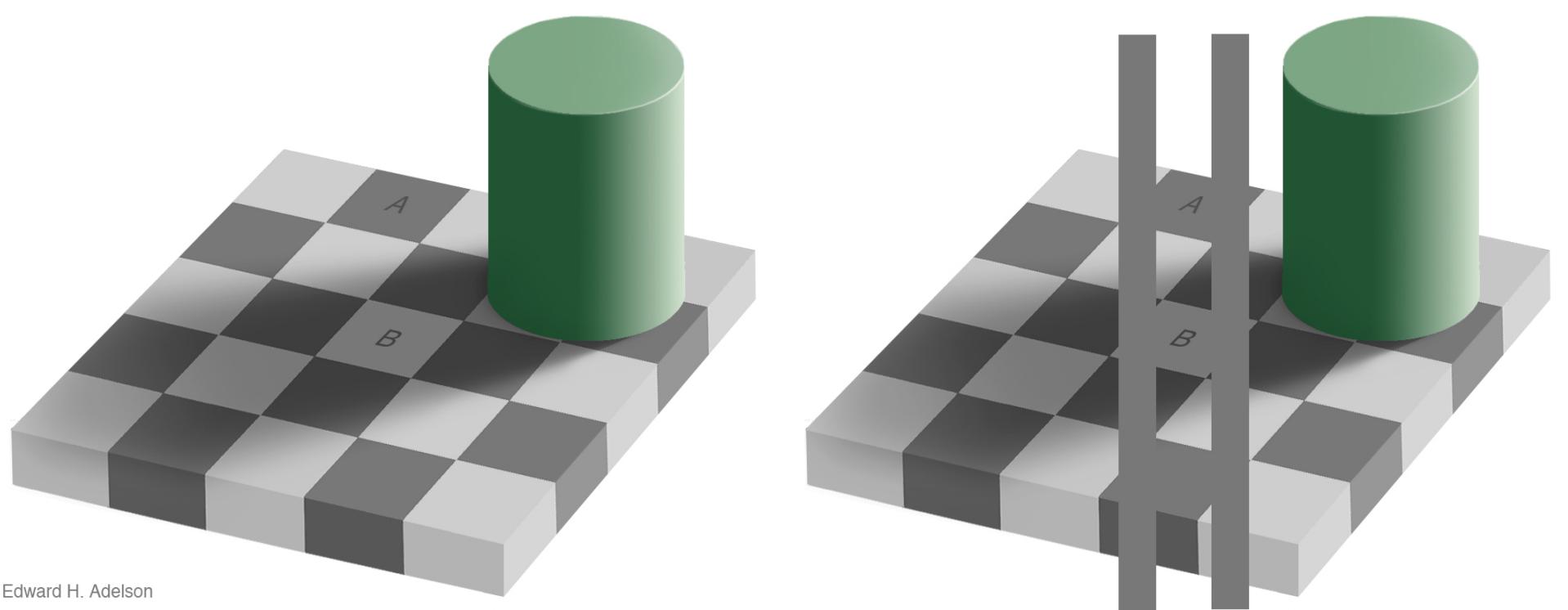






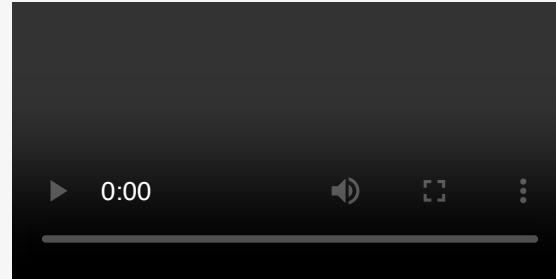
Edward H. Adelson

Edward Adelson



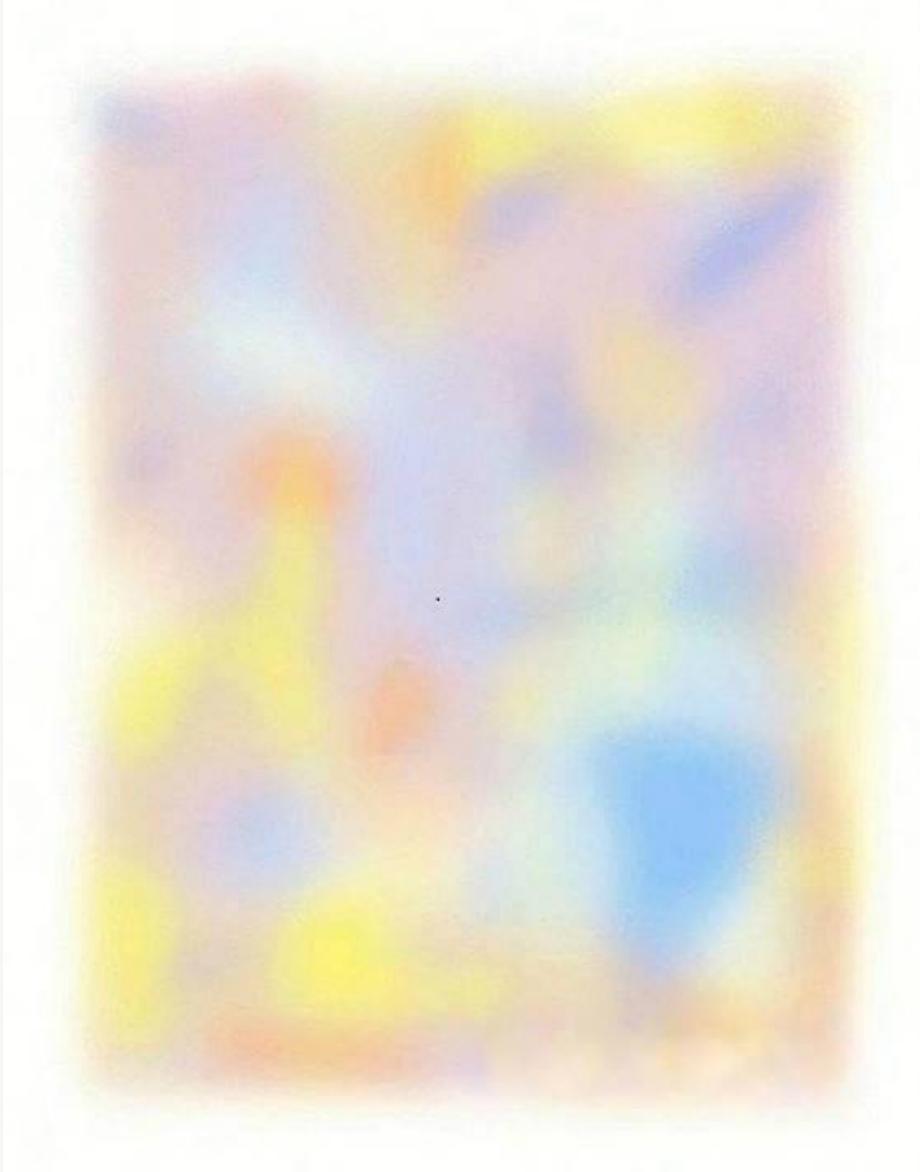
Edward H. Adelson

Edward Adelson

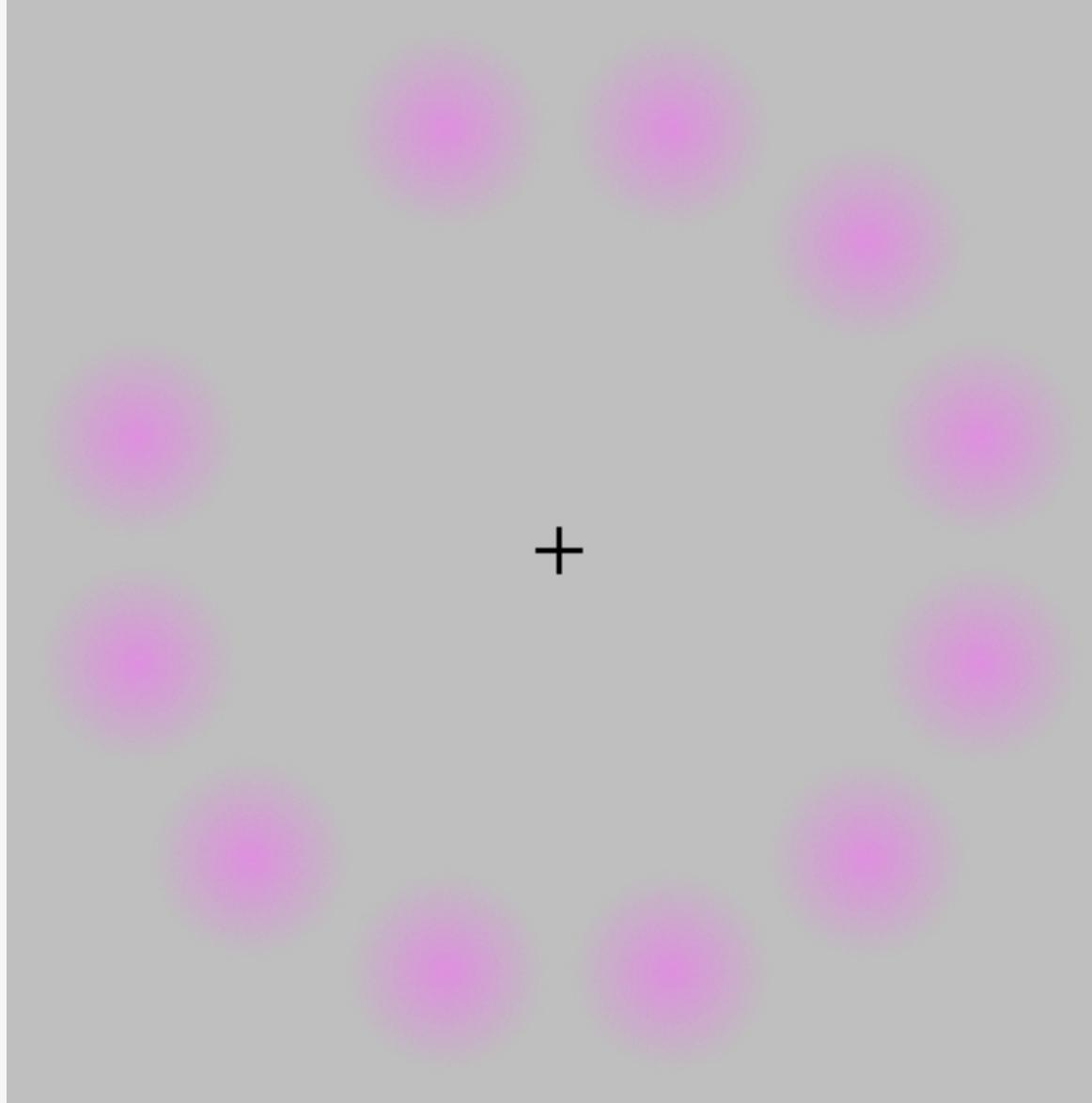


Edward Adelson

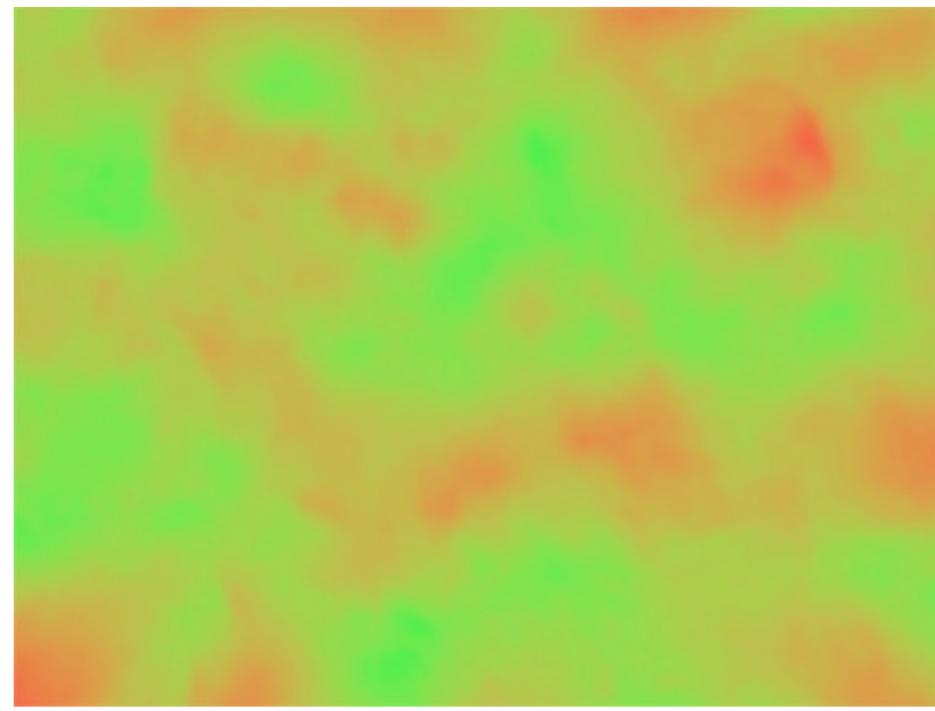
Luminance and Color



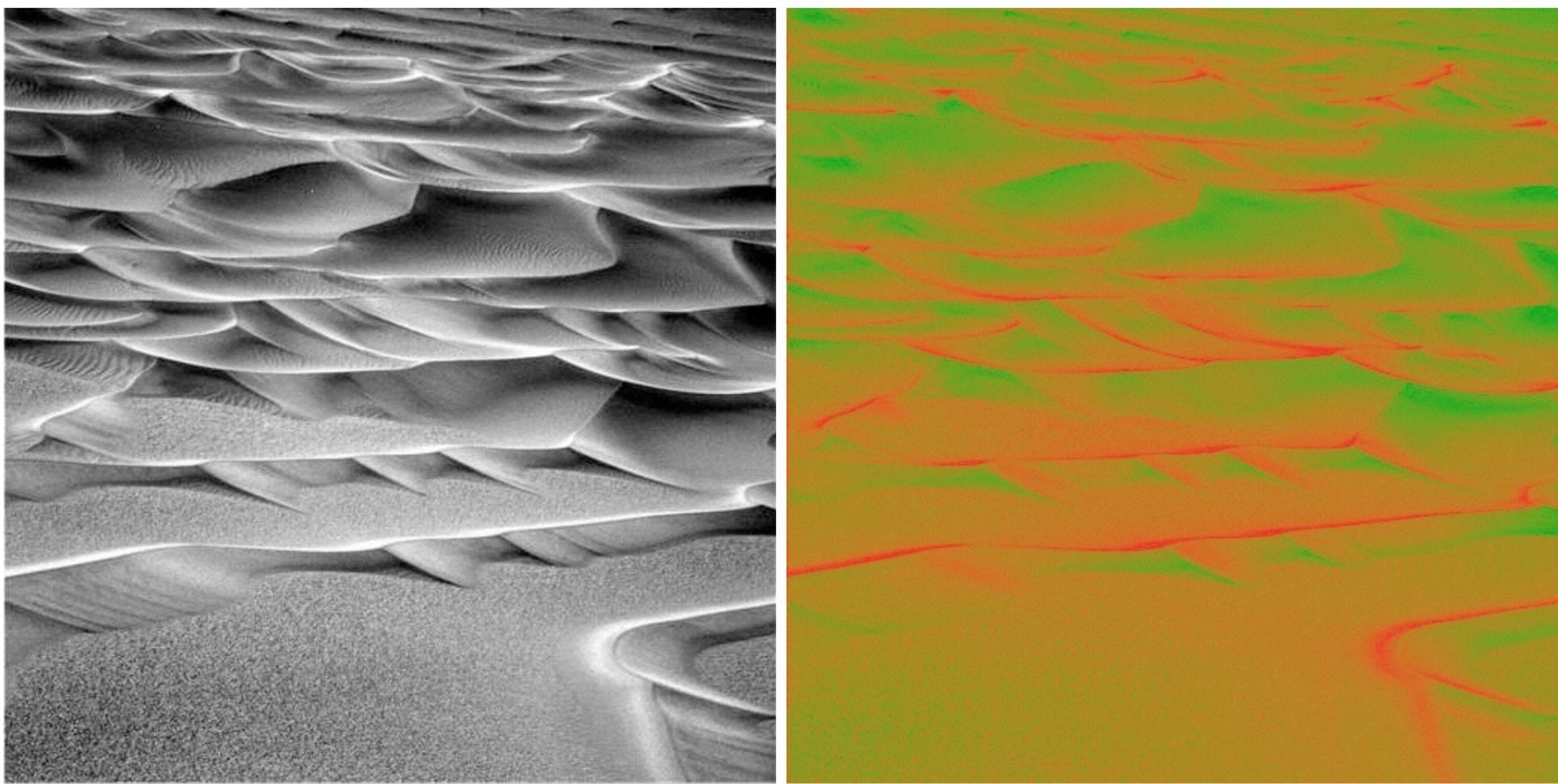
Troxler effect



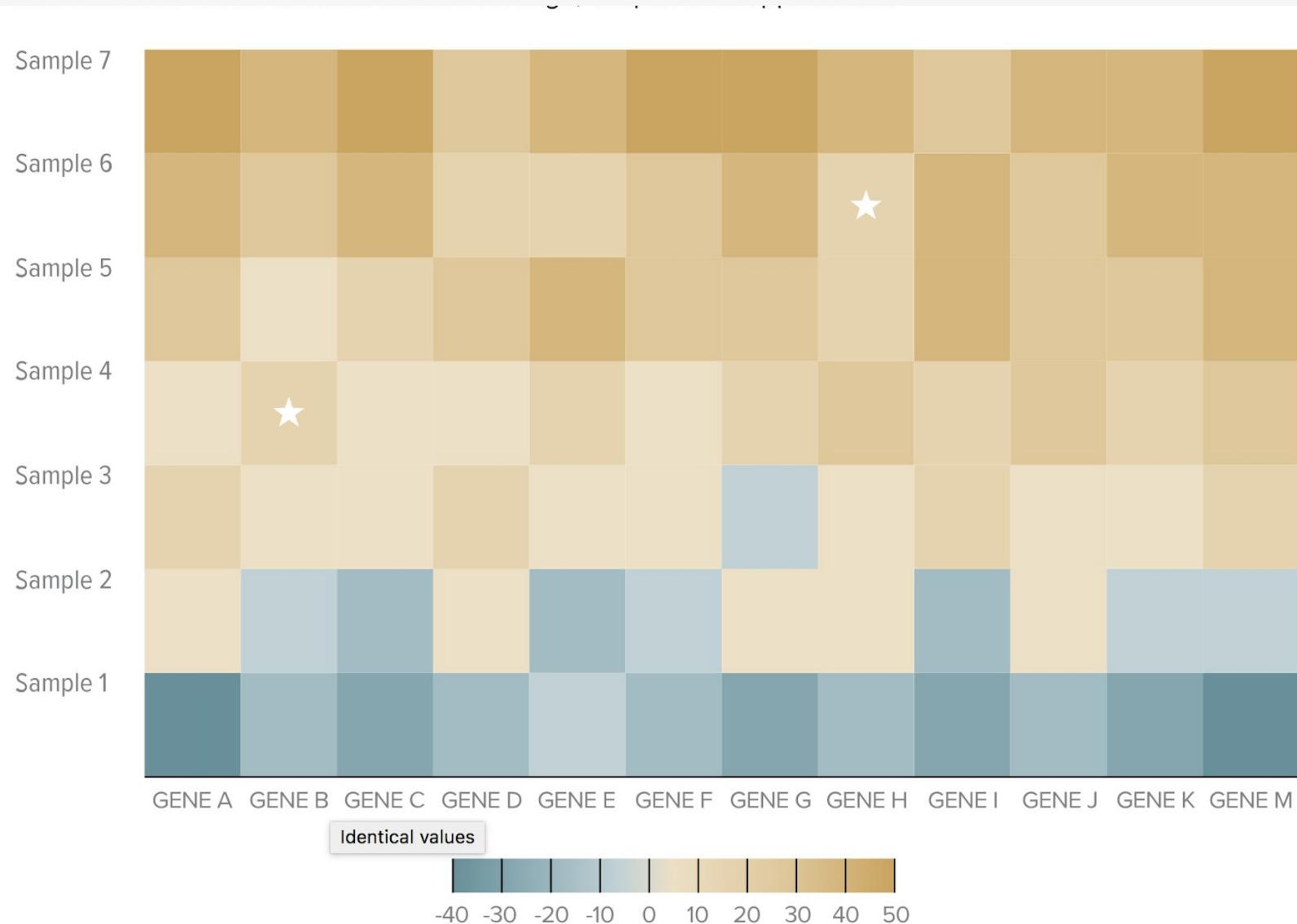
Lilac Chaser



Colin Ware

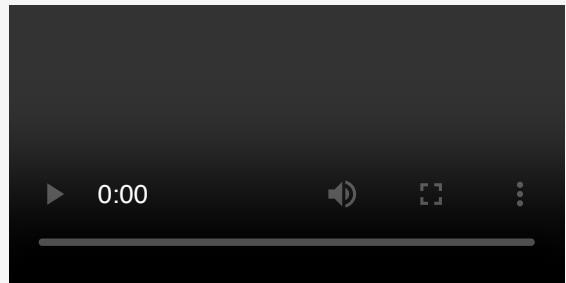


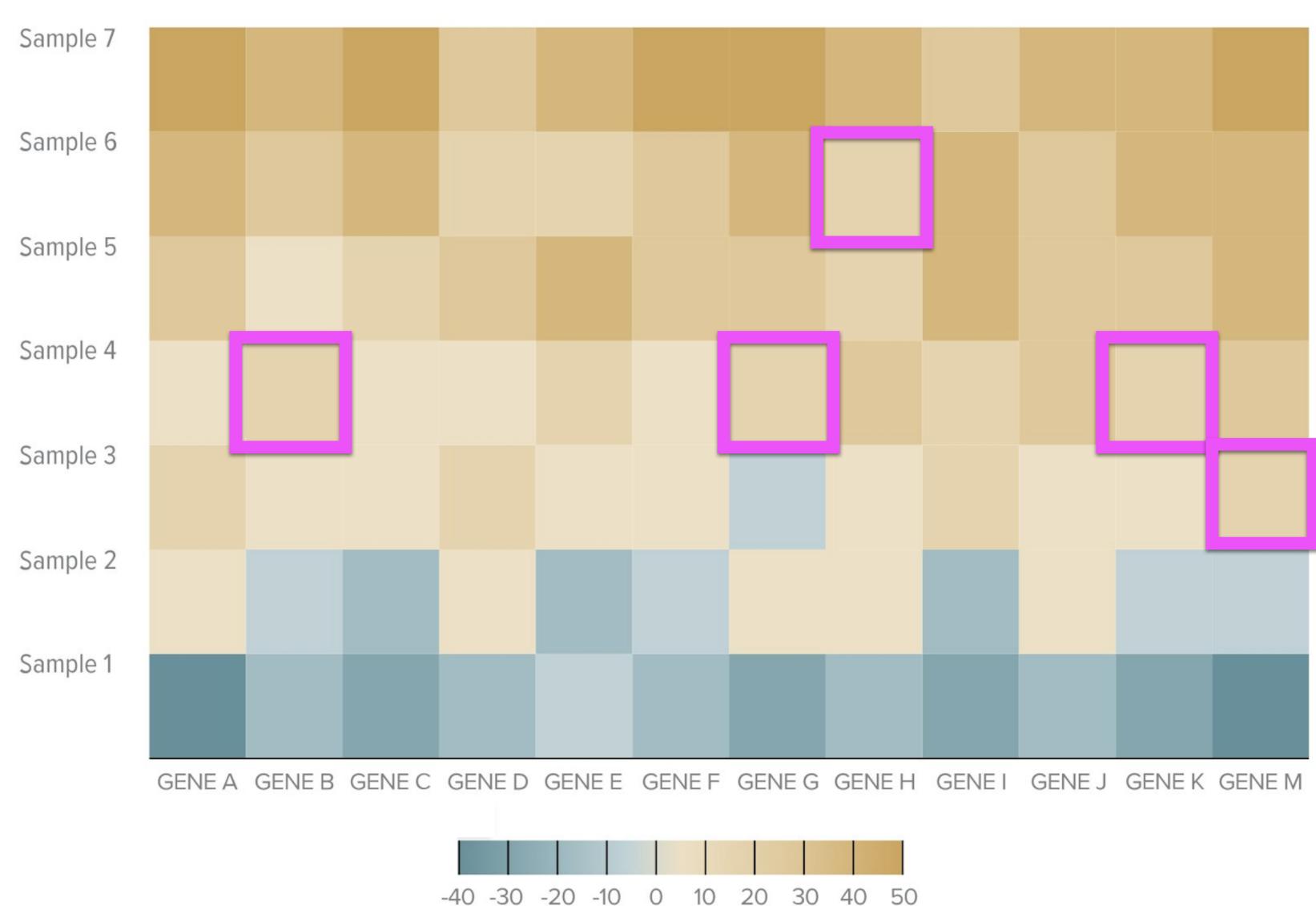
Colin Ware



SOURCE: H.E. GRECCO ET AL / NATURE METHODS 2010

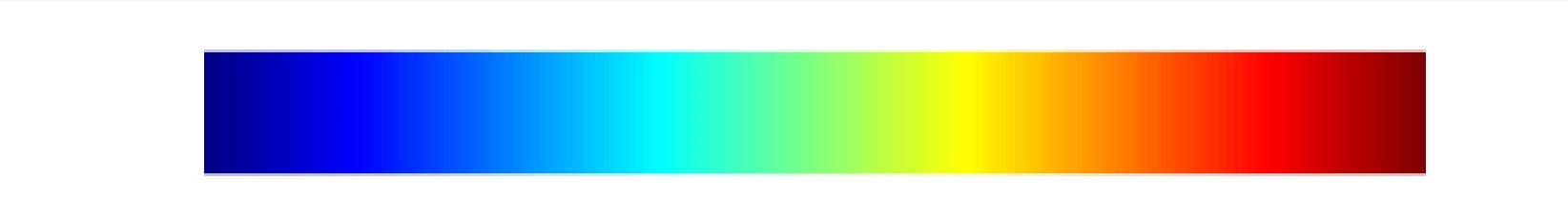
5W INFOGRAPHIC / KNOWABLE

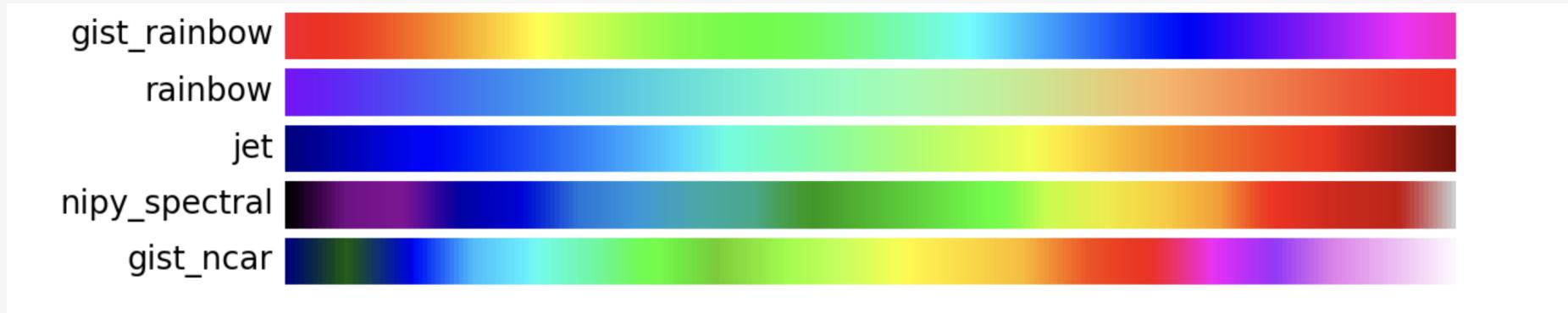


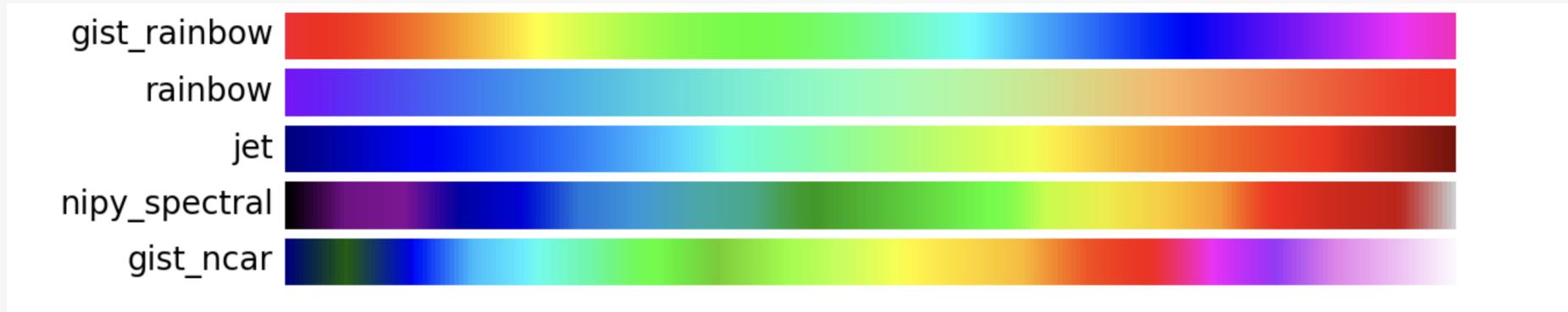


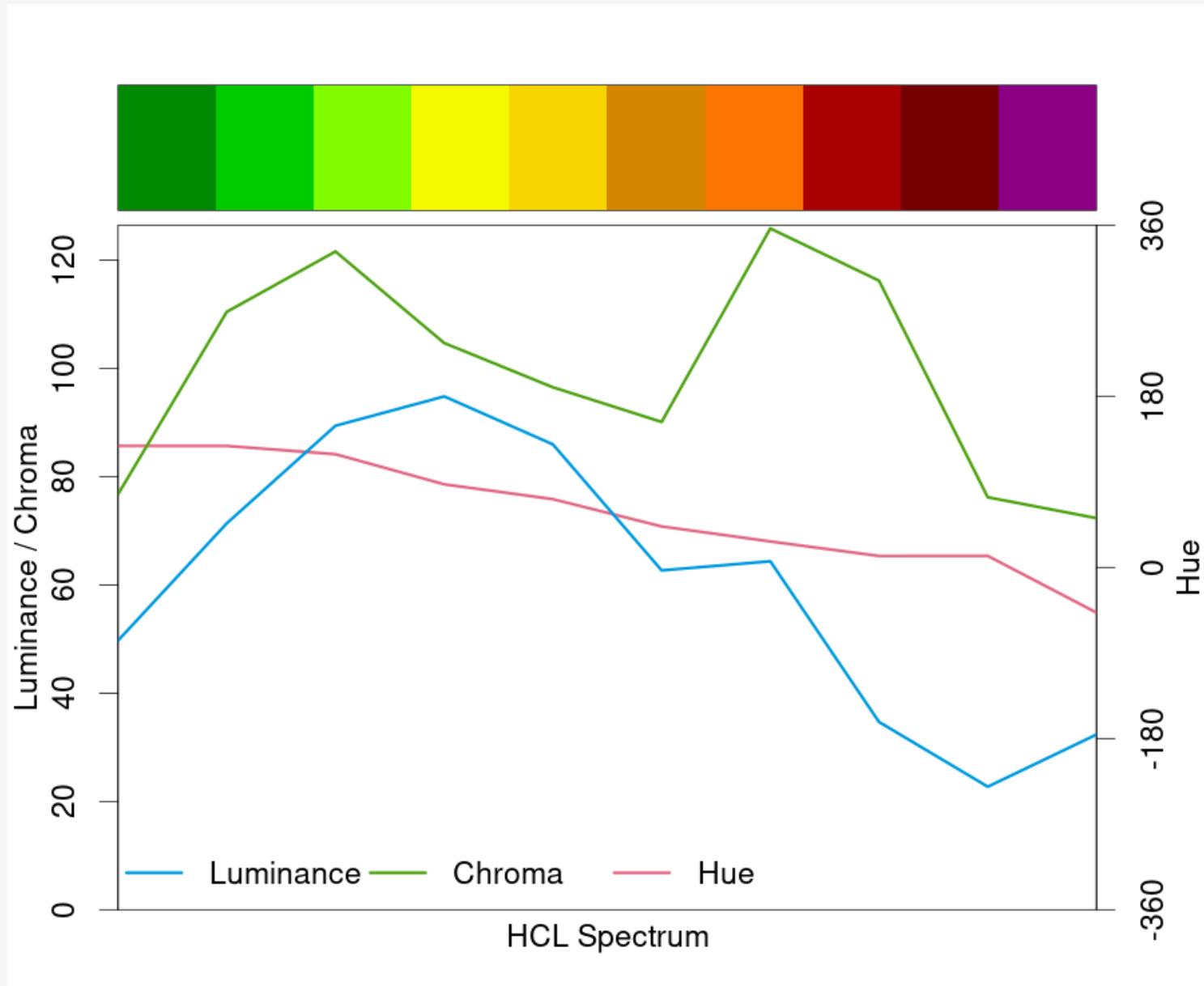
SOURCE: H.E. GRECCO ET AL / NATURE METHODS 2010

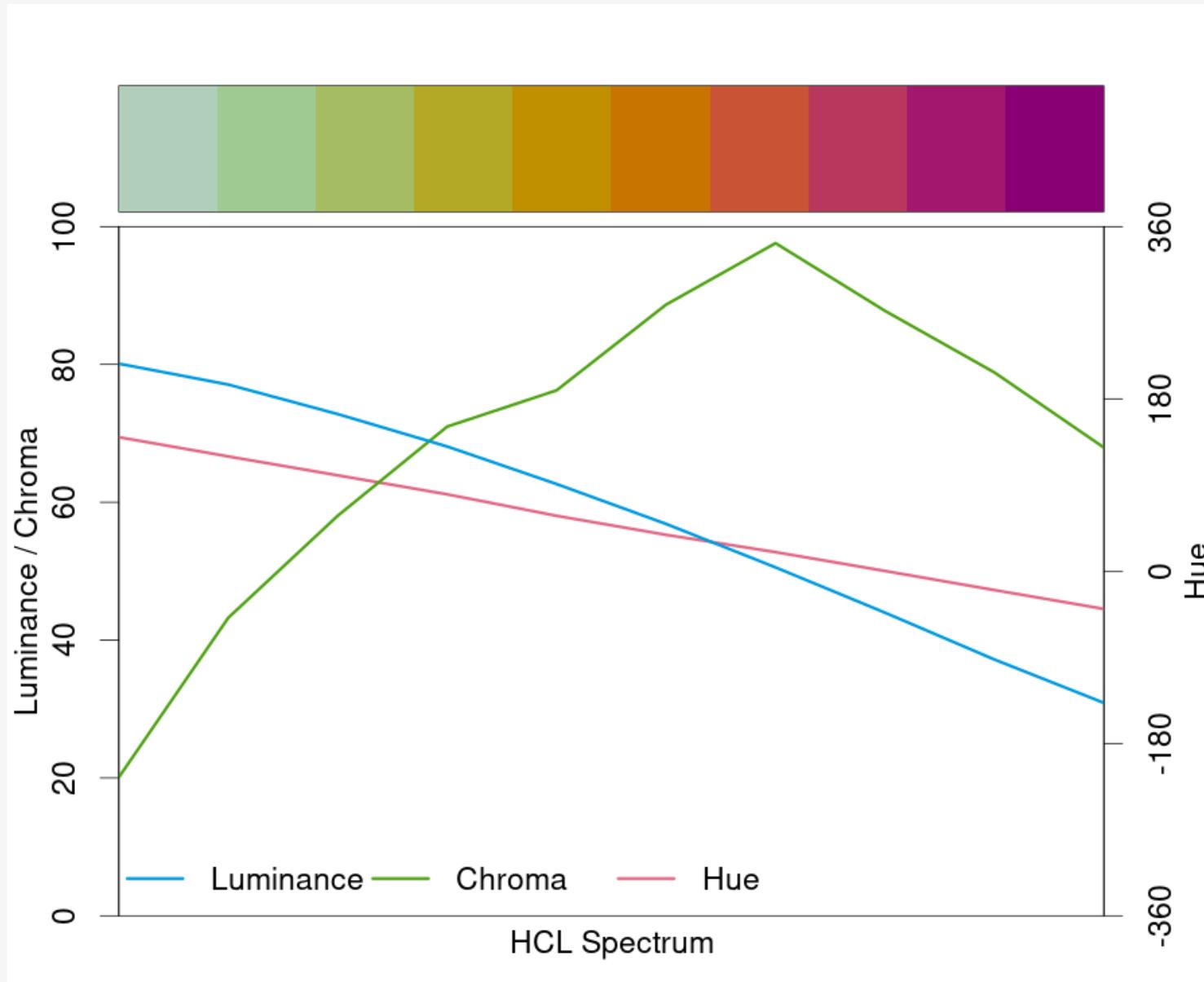
5W INFOGRAPHIC / KNOWABLE



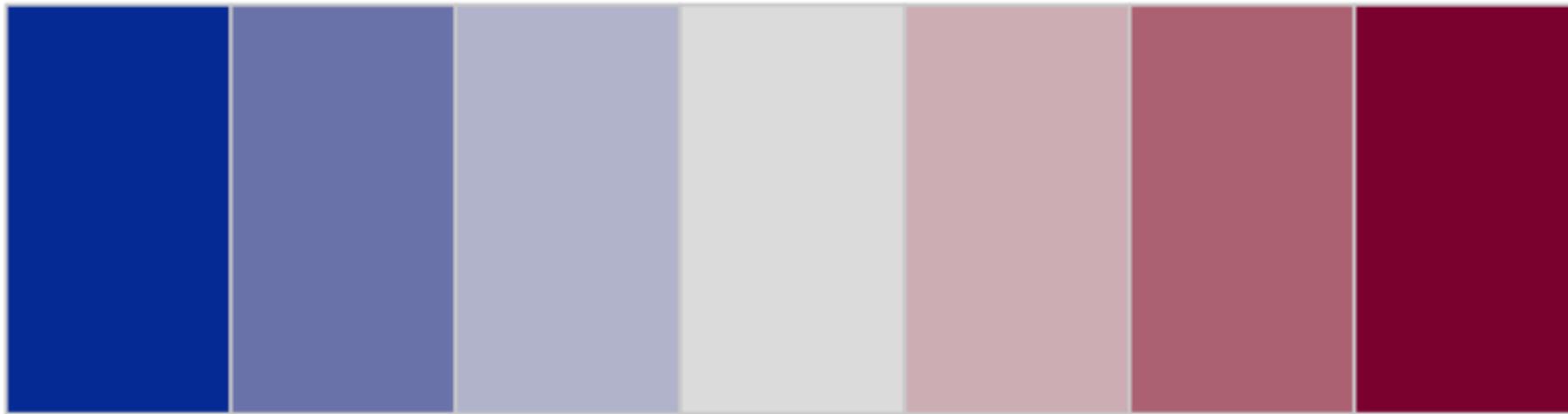


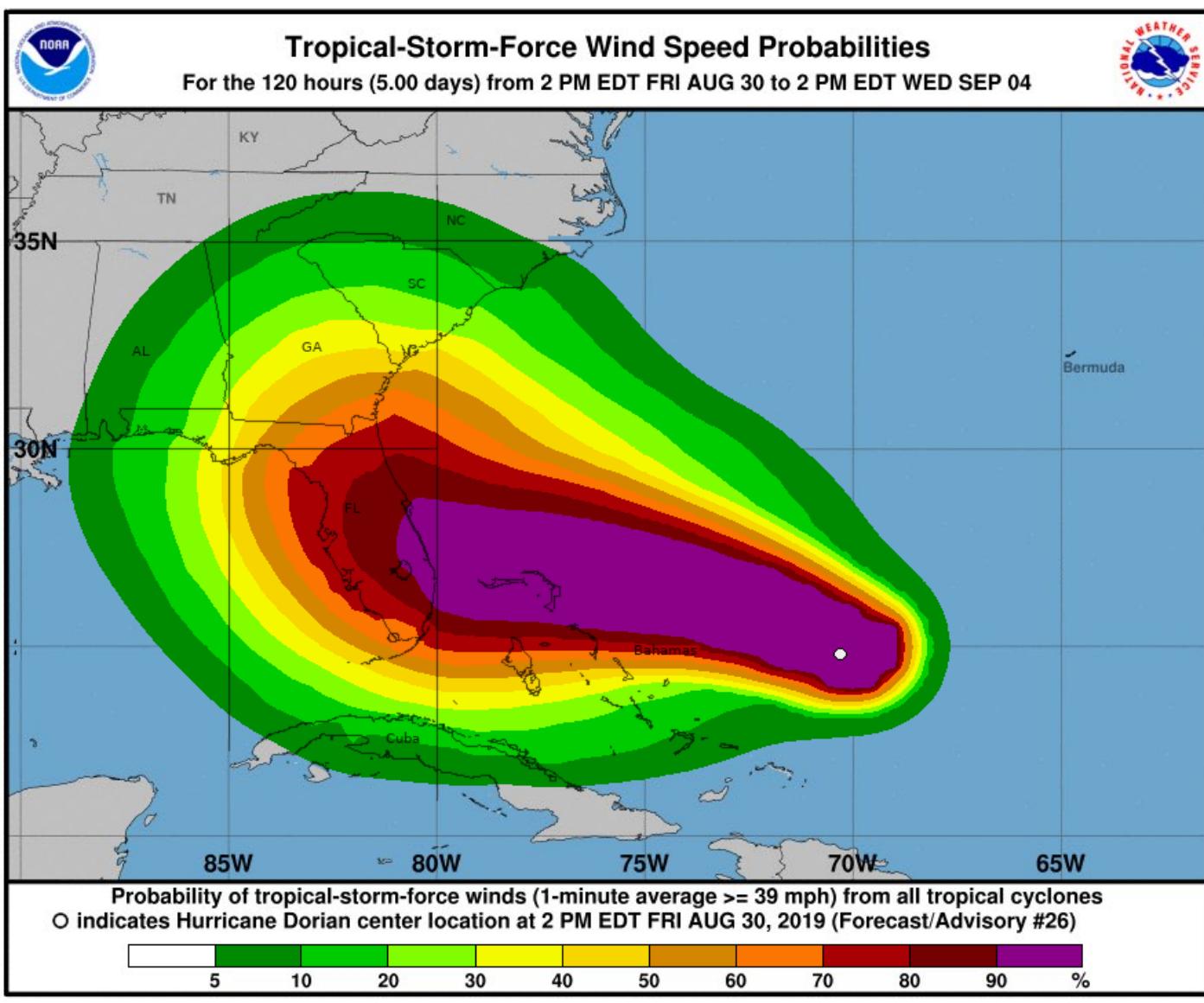




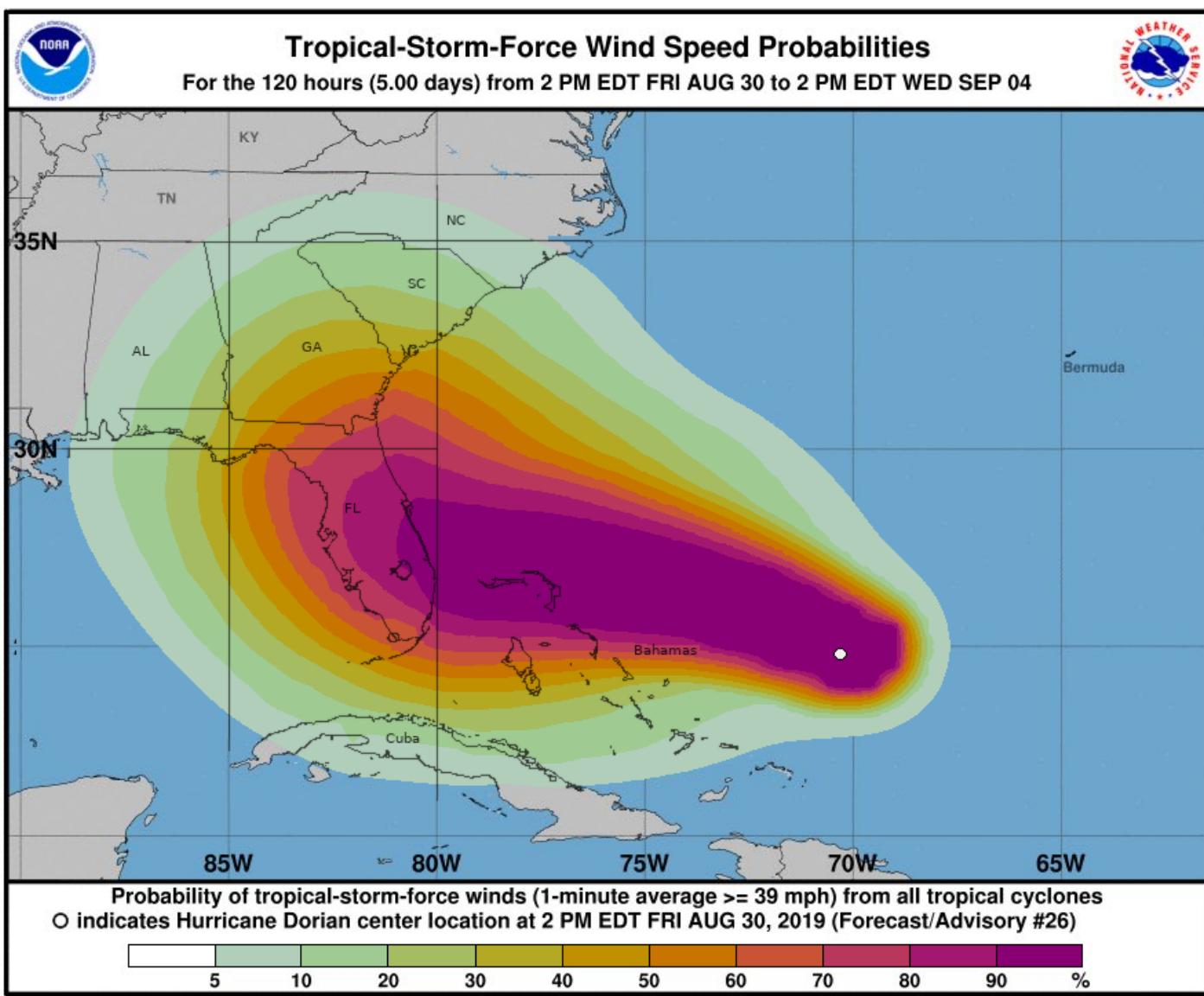




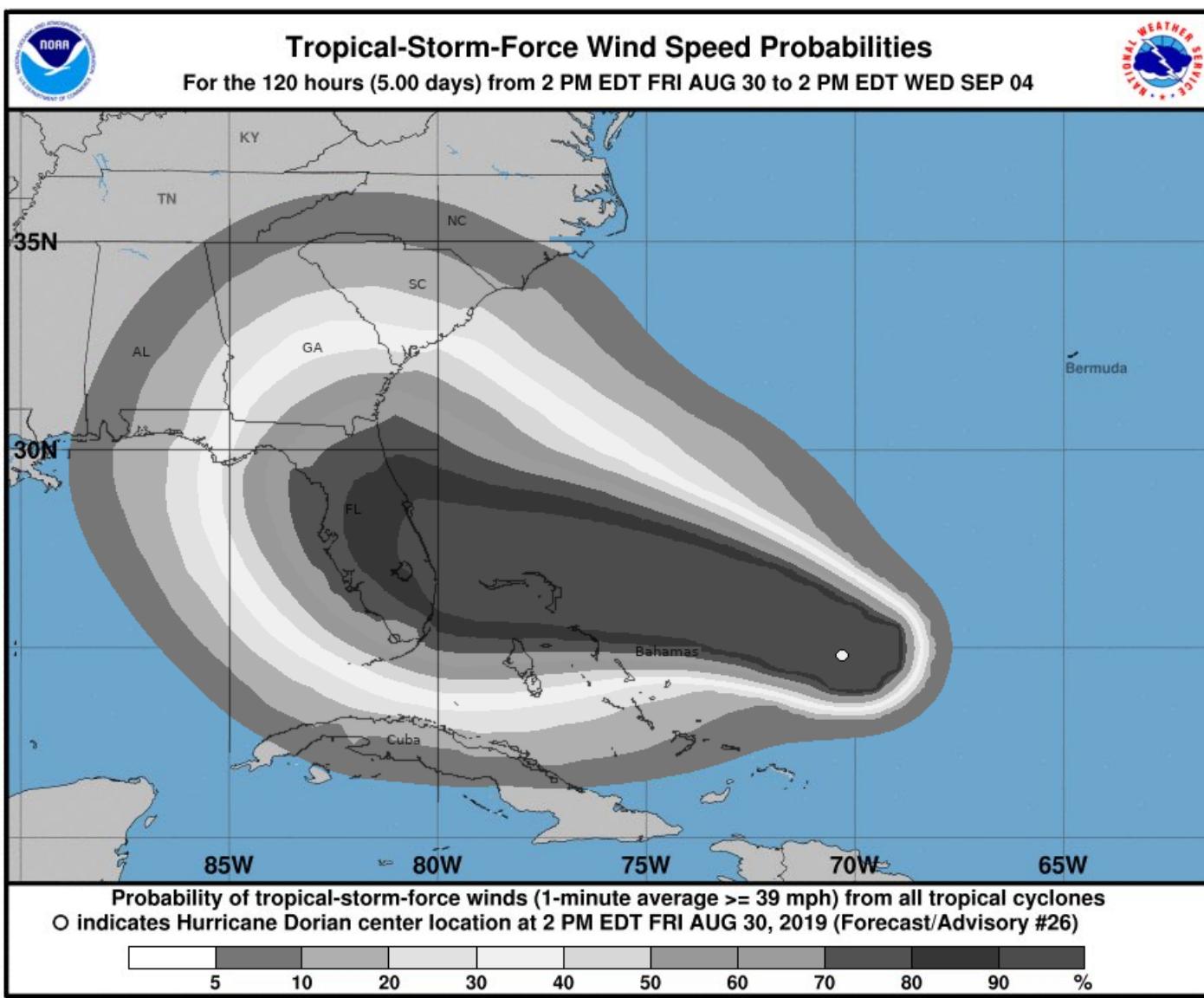




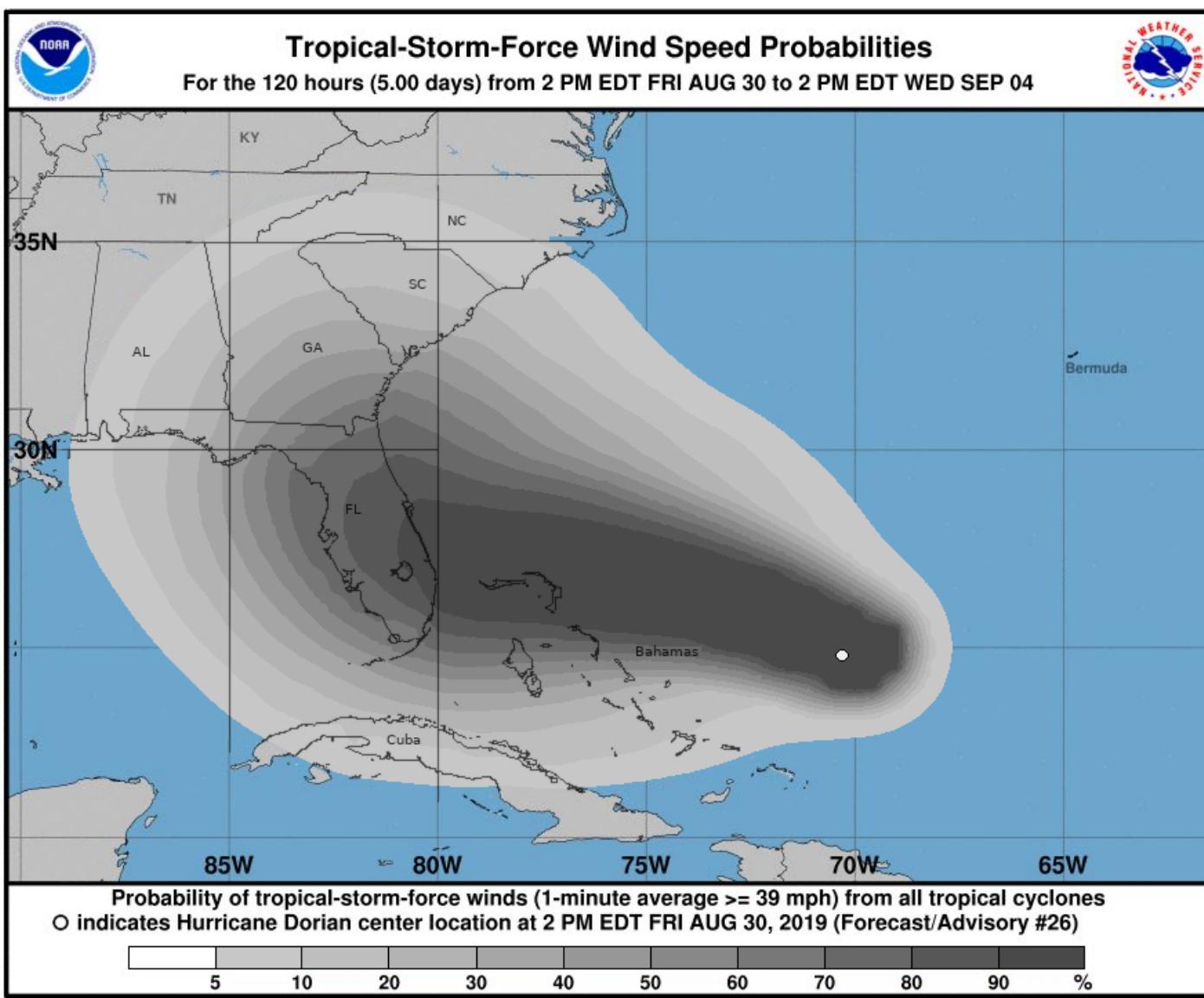
National Weather Service



Achim Zeileis



Achim Zeileis



Achim Zeileis