

# Lecture 1: Introduction

CS 7250

SPRING 2020

*Prof. Cody Dunne*

*NORTHEASTERN UNIVERSITY*

*Slides and inspiration from Michelle Borkin, Krzysztof Gajos, Hanspeter Pfister, Miriah Meyer, Jonathan Schwabish, and David Sprague*

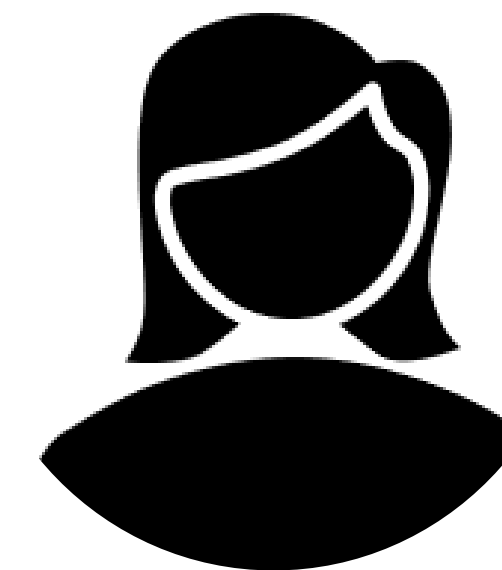
# STAFF INTRODUCTIONS



Cody Dunne  
Assistant Professor  
Instructor



Sara Di Bartolomeo, CS  
PhD  
TA



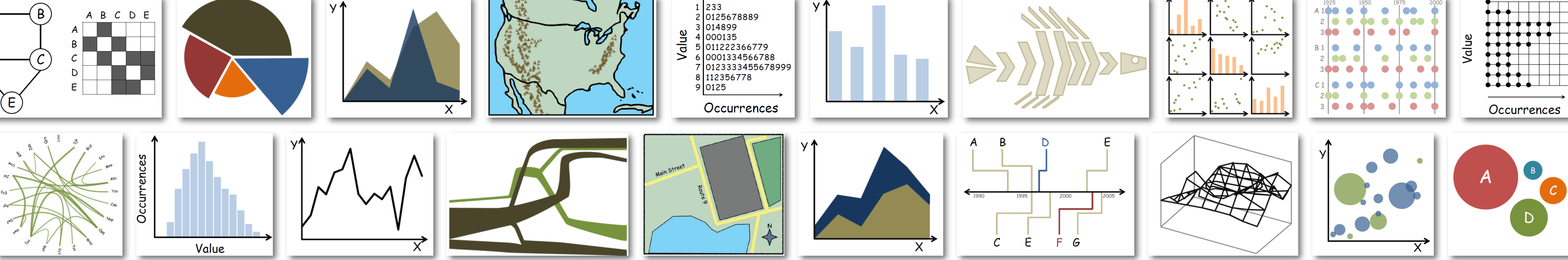
Gayathri Raj  
UG  
Service-Learning TA

# Course Homepage

<https://canvas.instructure.com/courses/1781732>

- If you don't have an account on our Canvas yet:  
<https://canvas.instructure.com/enroll/CMAPDM>
- Use your name as known by the registrar and your @husky.neu.edu email.

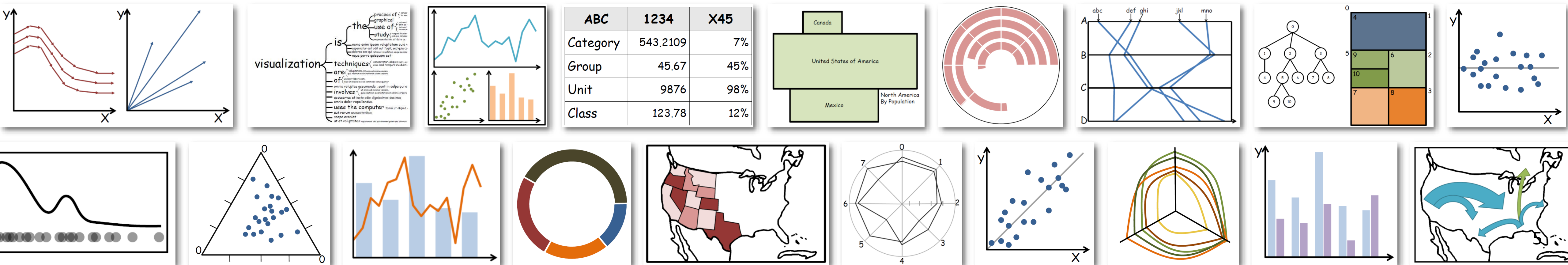
What is visualization  
anyway?



(static or interactive)

(abstract or spatial)

visualization: the visual representation of data to reinforce human cognition

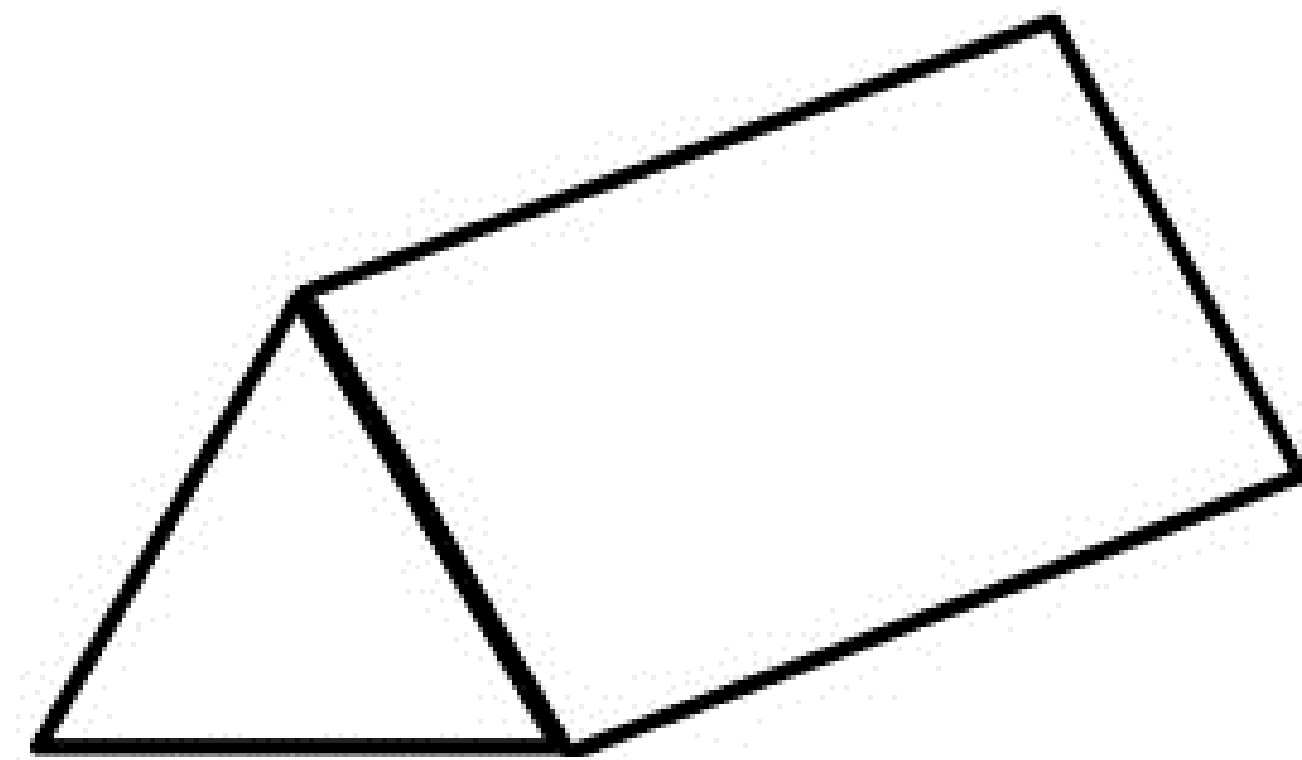
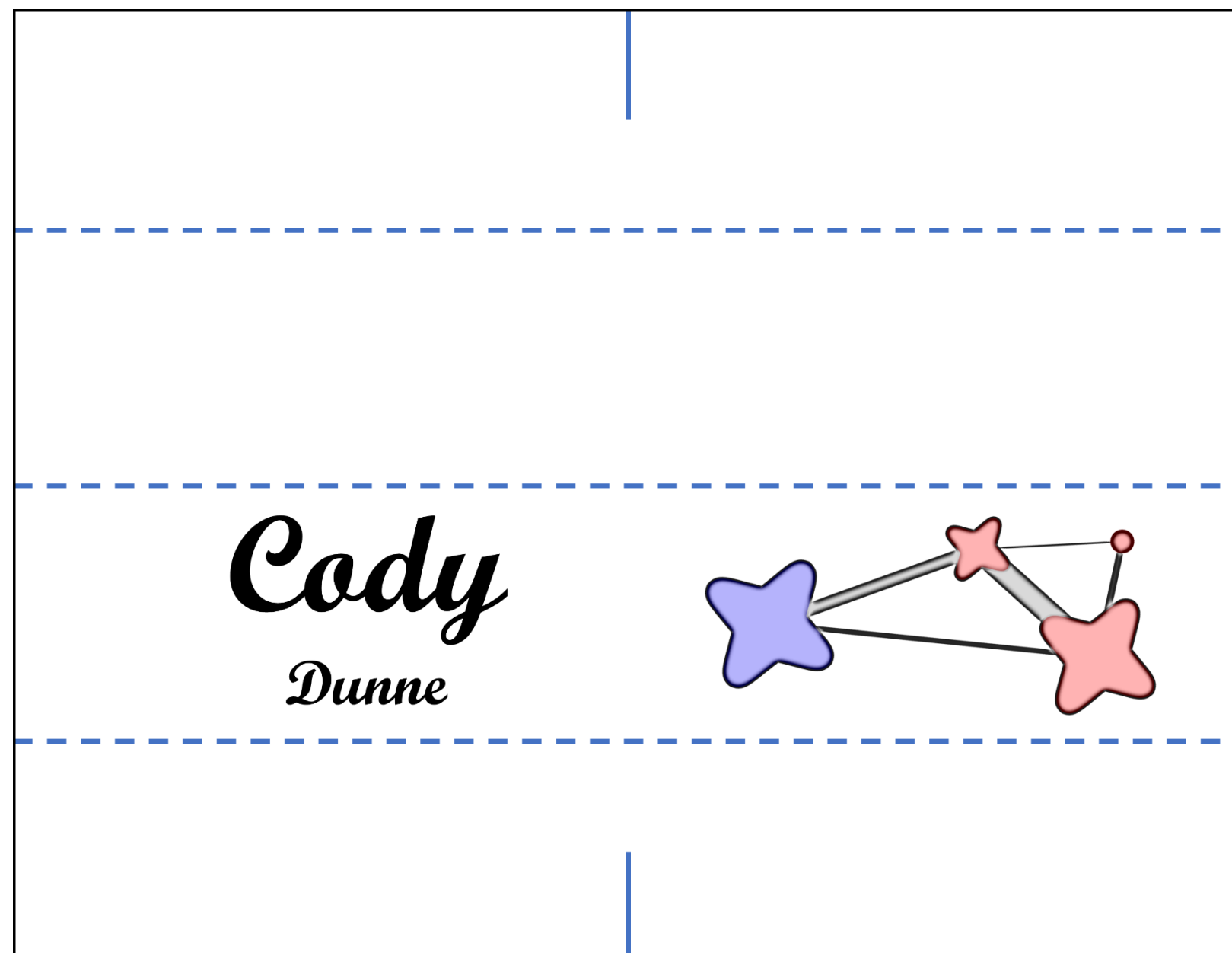


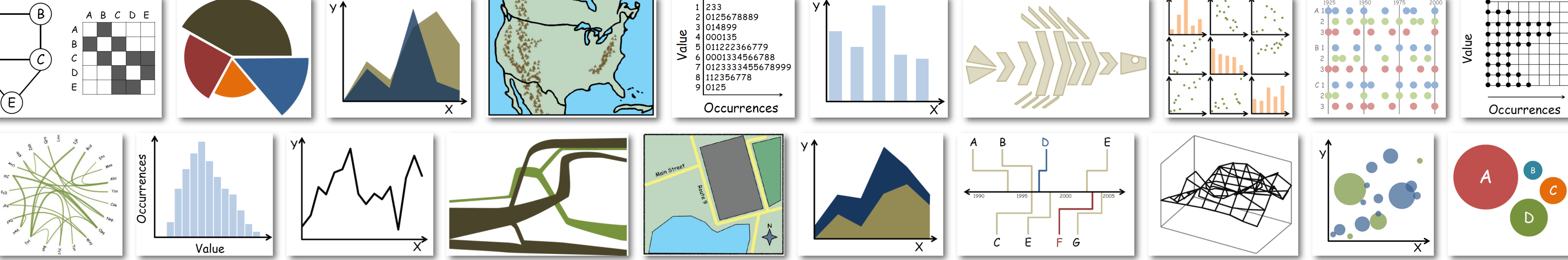
# IN-CLASS EXERCISE

# In-Class Sketching — Table Tents

*15 min*

<https://canvas.instructure.com/courses/1781732/assignments/13386377>

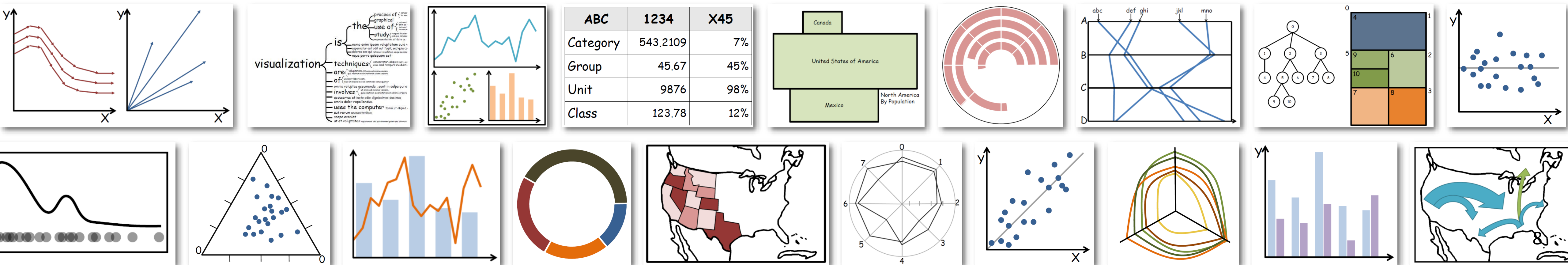




(static or interactive)

(abstract or spatial)

visualization: the visual representation of data to reinforce human cognition

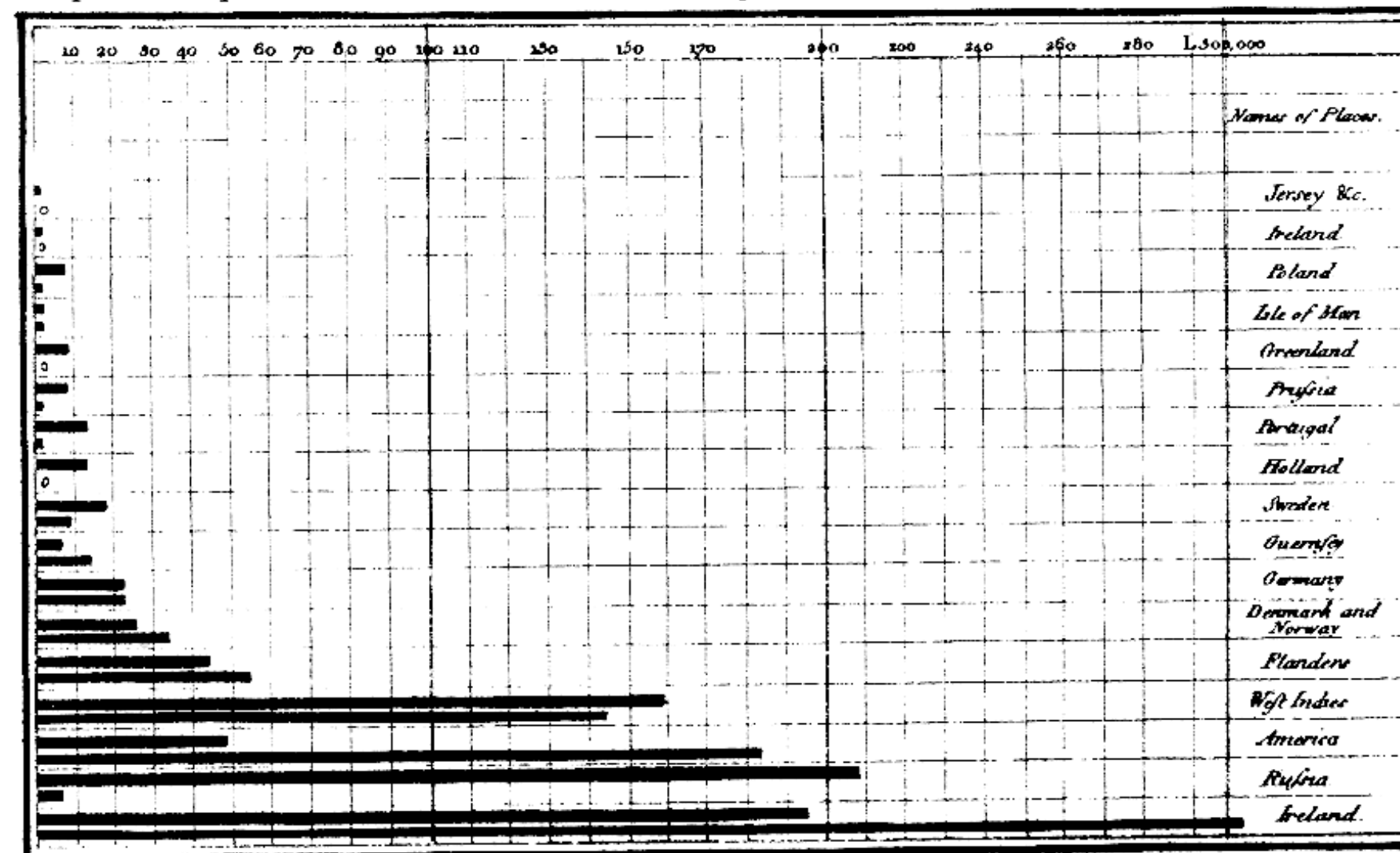






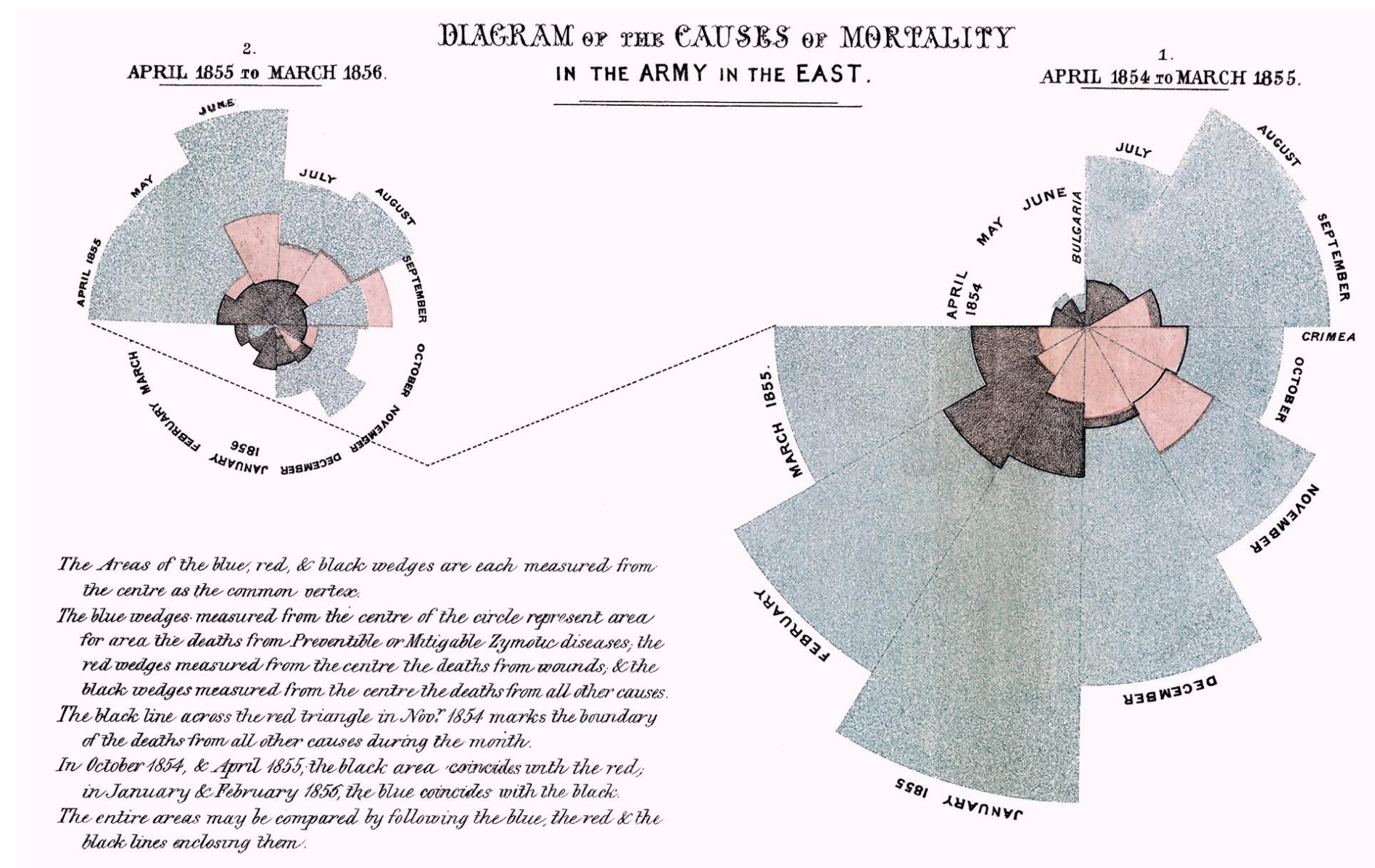
PTOLEMY (c. 150)

Exports and Imports of SCOTLAND to and from different parts for one Year from Christmas 1780 to Christmas 1781.

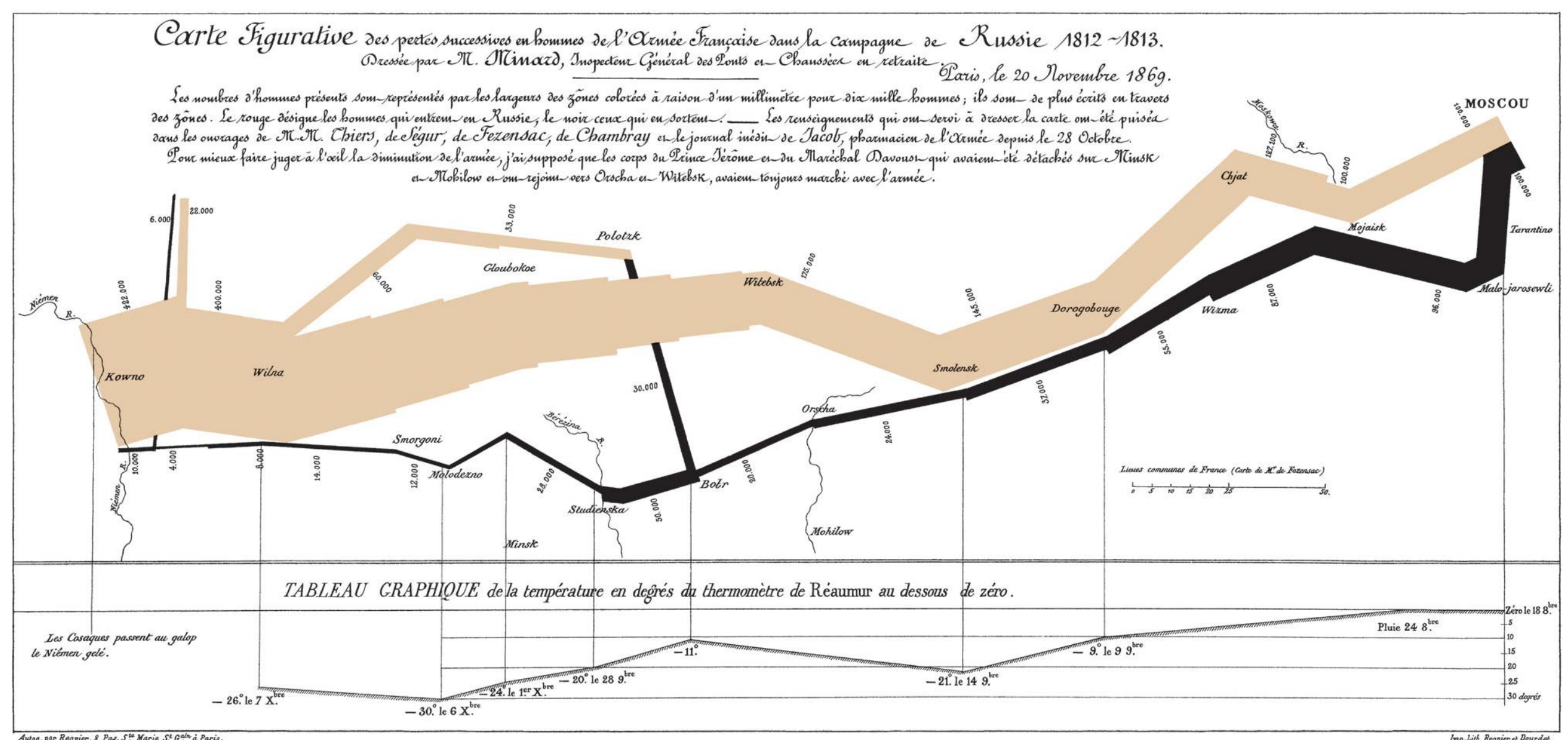


The Upright divisions are Ten Thousand Pounds each. The Black Lines are Exports the Ribbed Lines Imports.  
 Published as the Act above June 7<sup>th</sup> 1788 by W<sup>m</sup> Playfair  
 Made comp<sup>t</sup> 352. 1/2 Londn

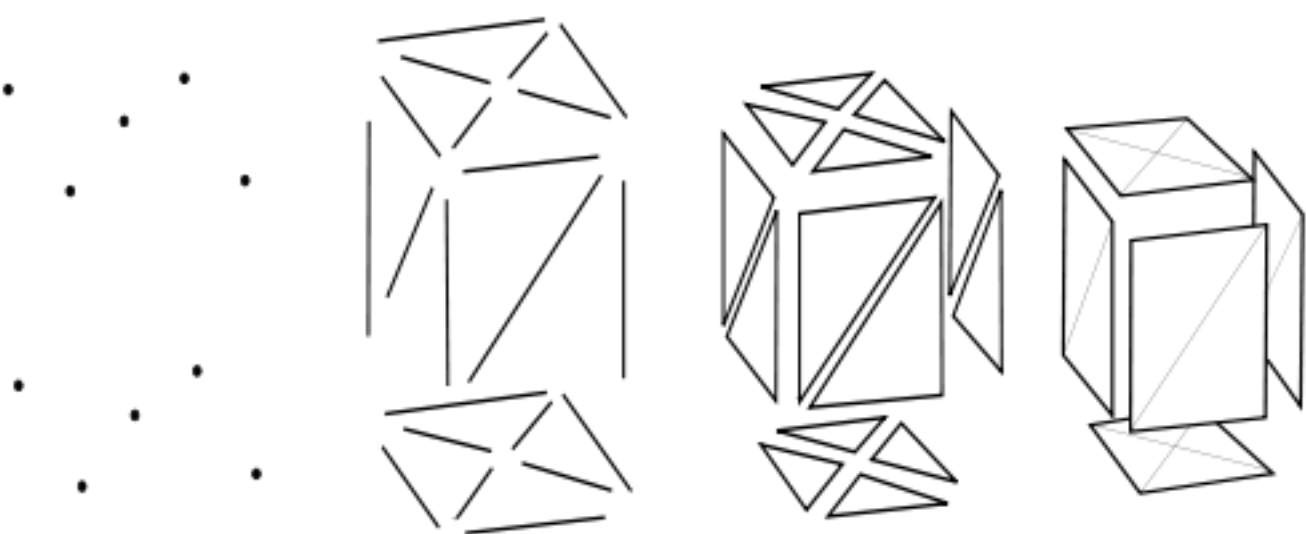
WILLIAM PLAYFAIR (c. 1786)



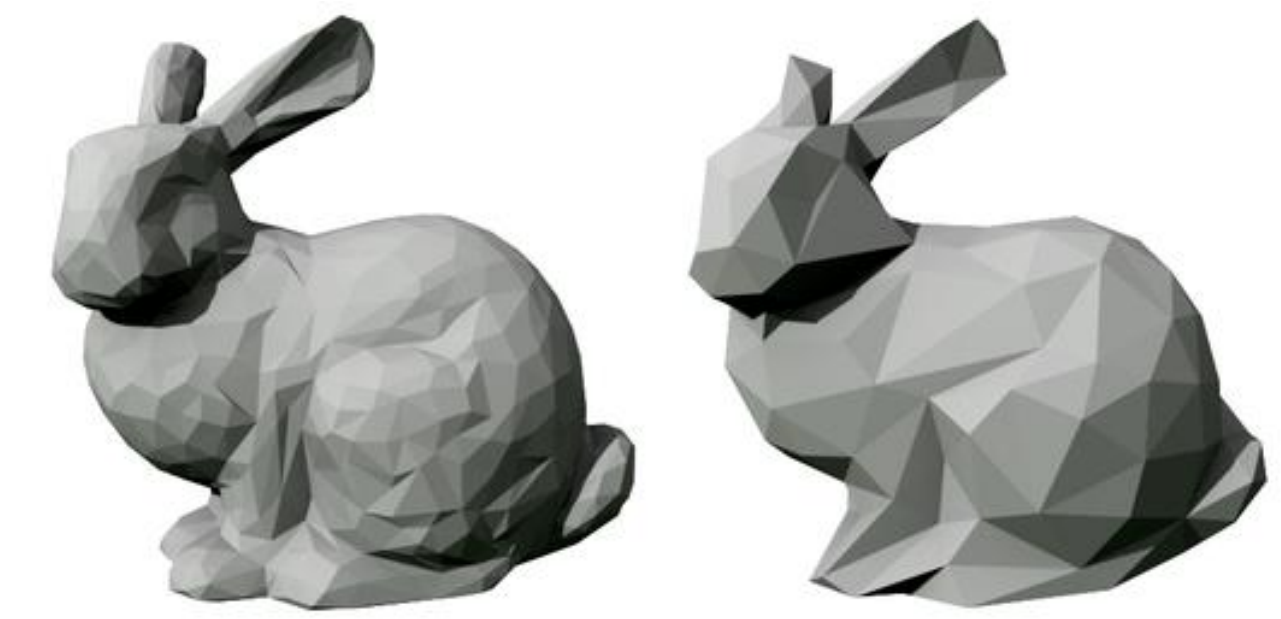
FLORENCE NIGHTINGALE (c. 1858)



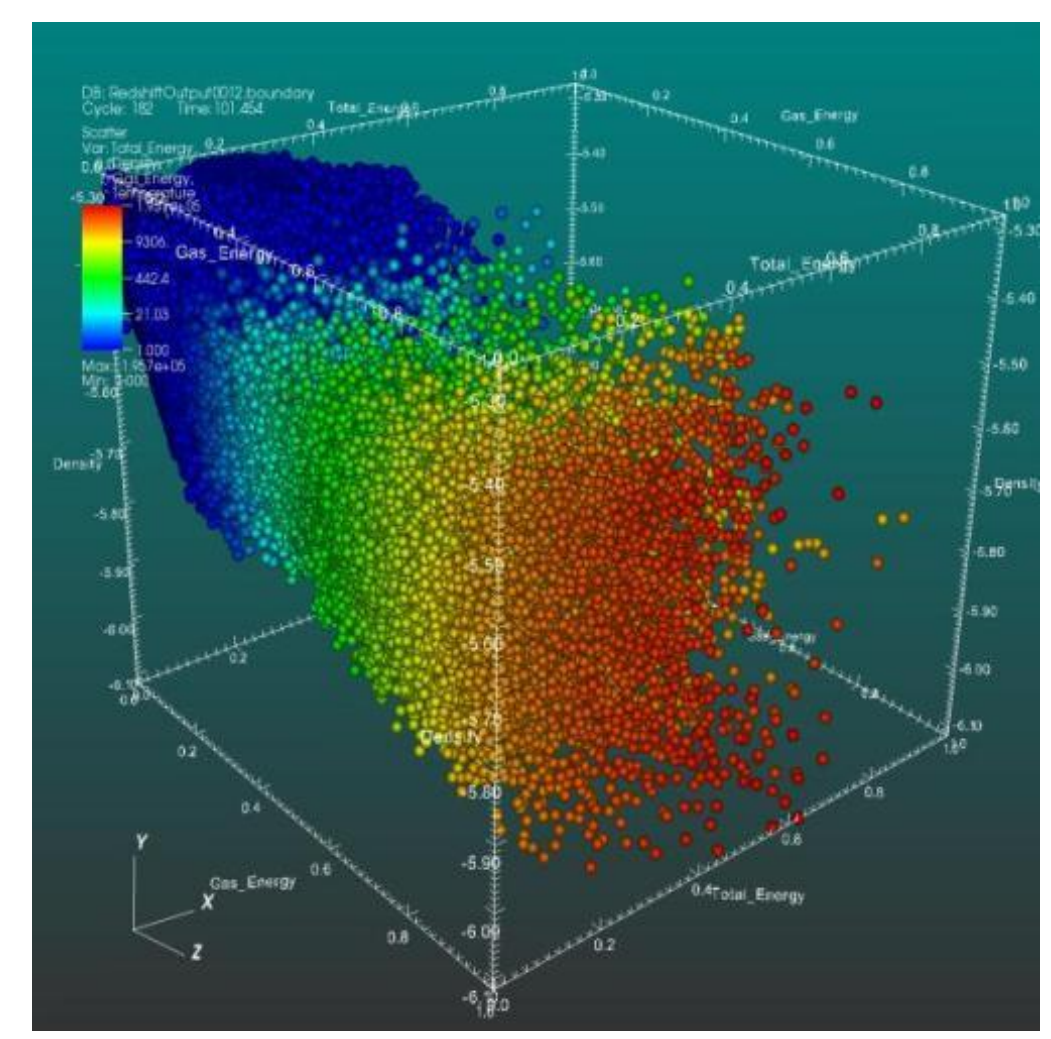
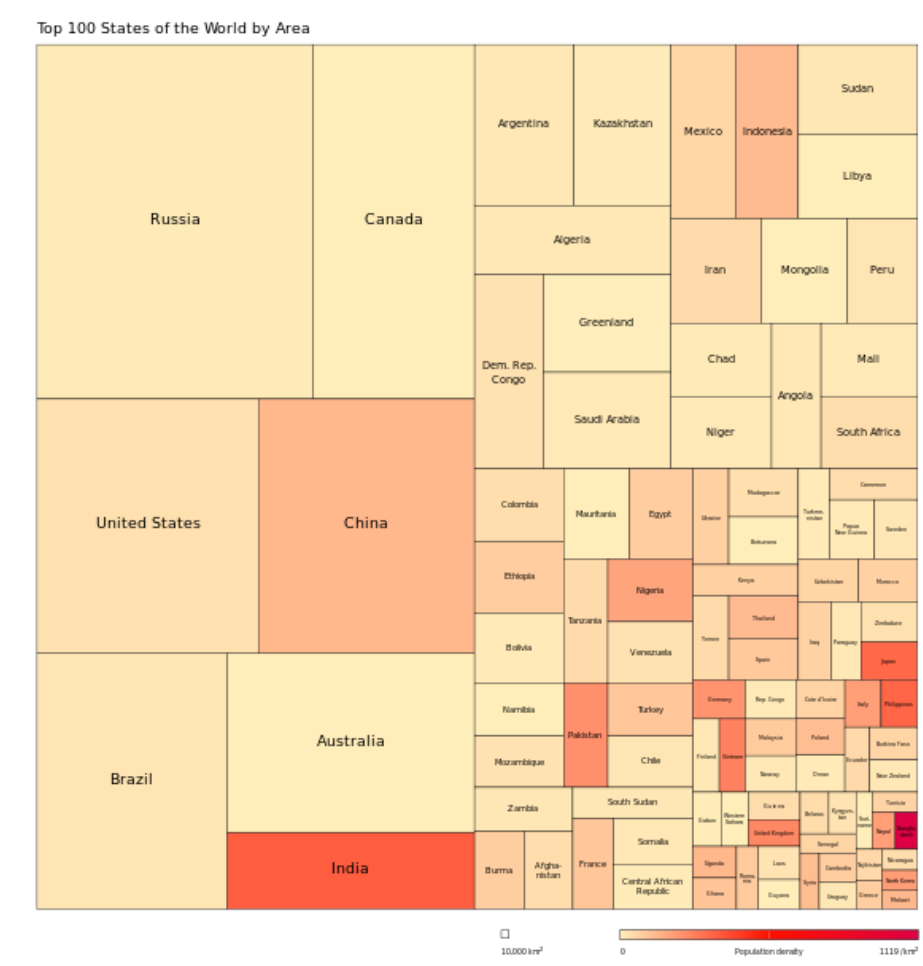
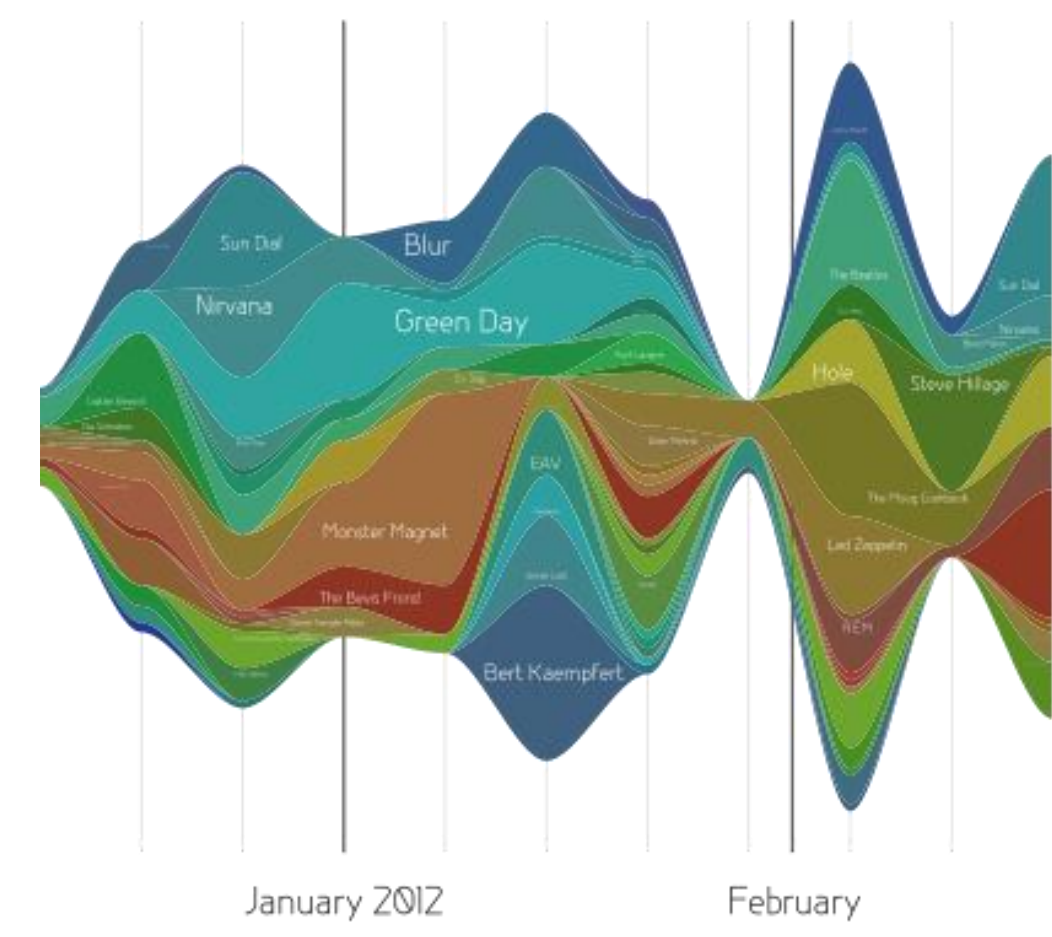
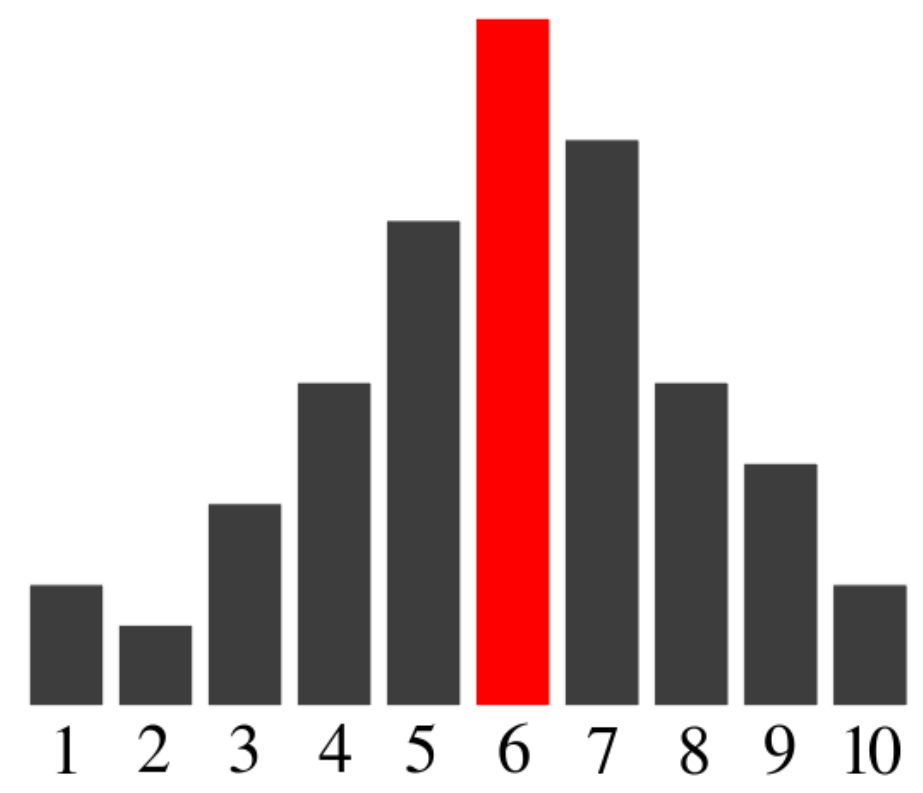
CHARLES MINARD (c. 1869)



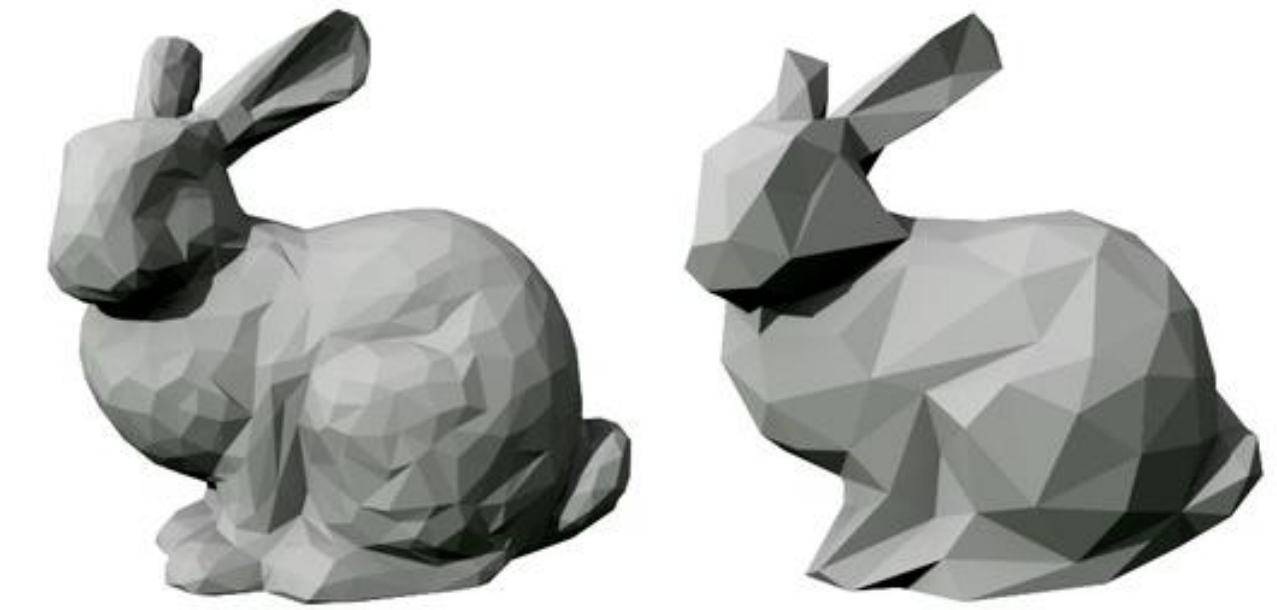
# computer graphics



# visualization

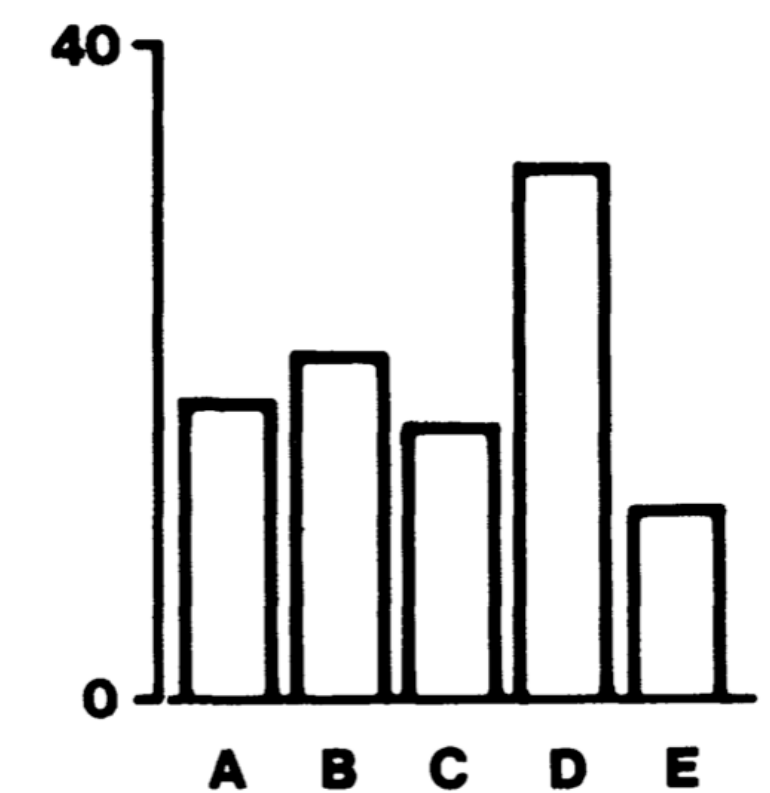
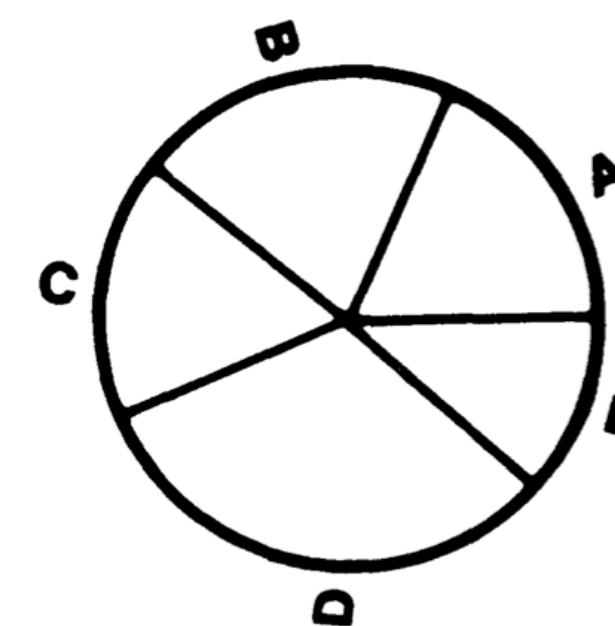
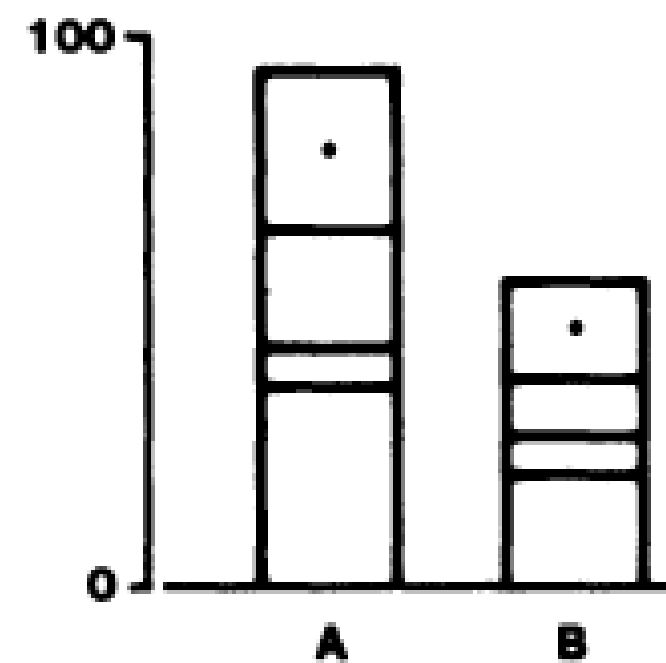
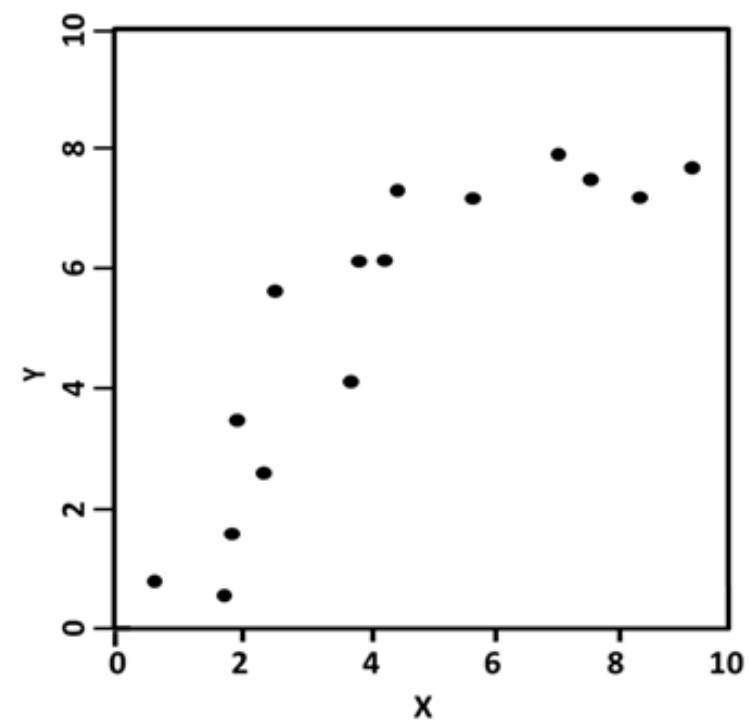


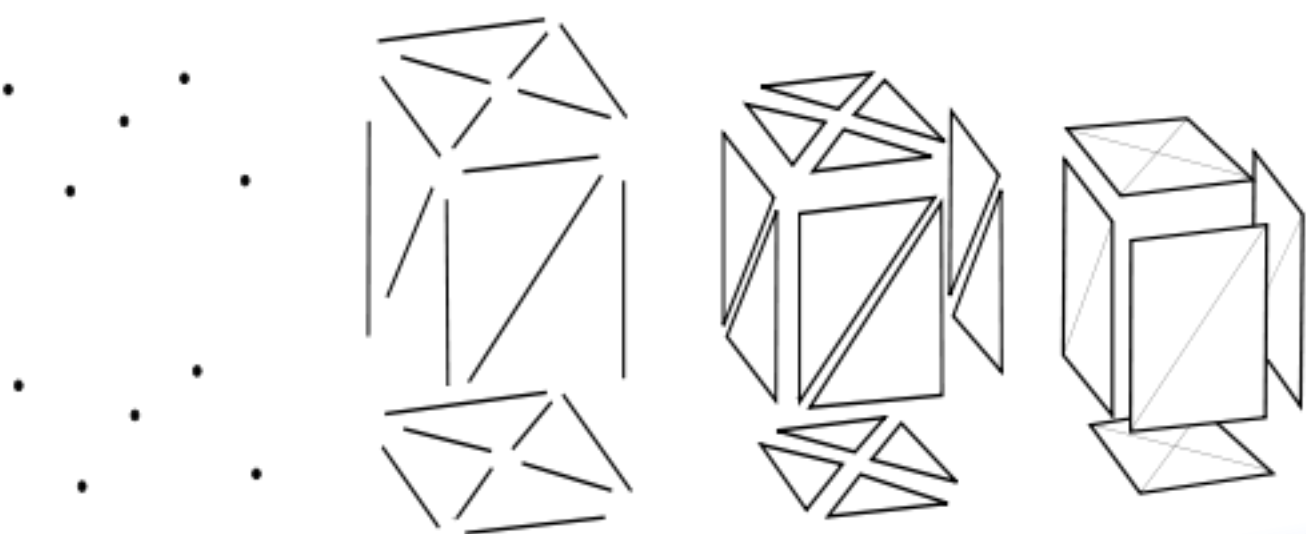
computer graphics



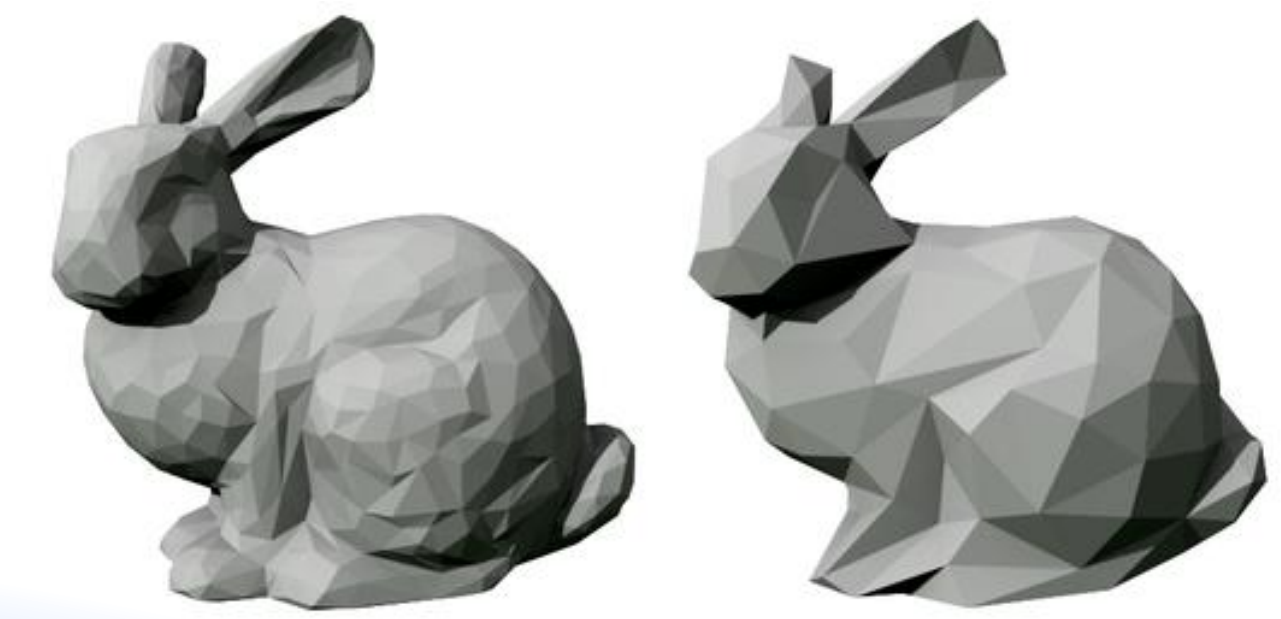
visualization

statistics





computer graphics



HCI

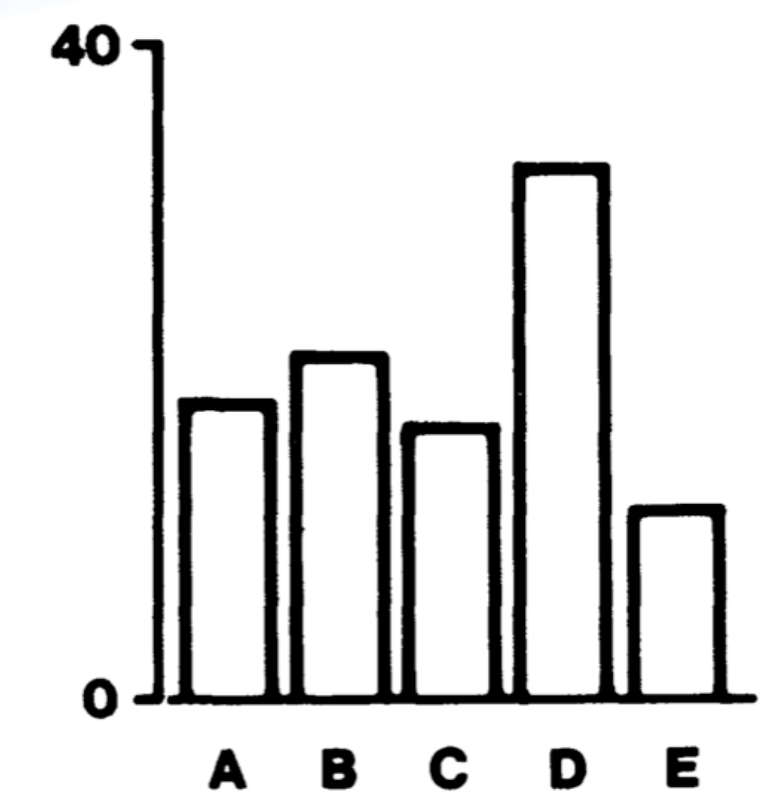
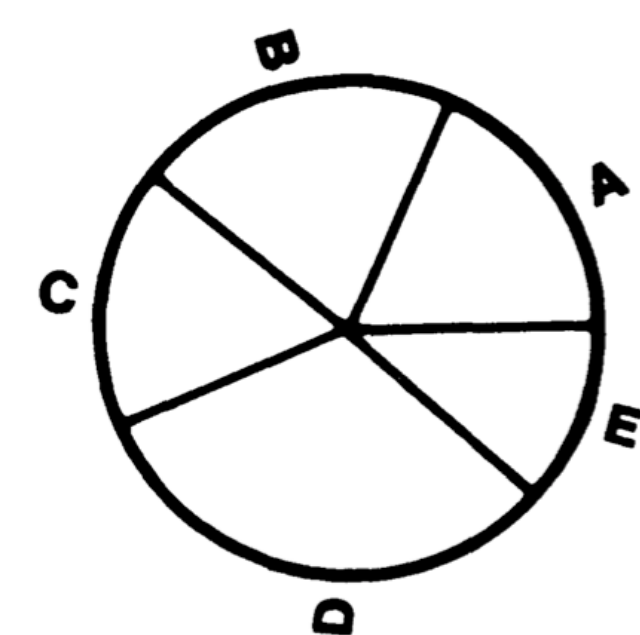
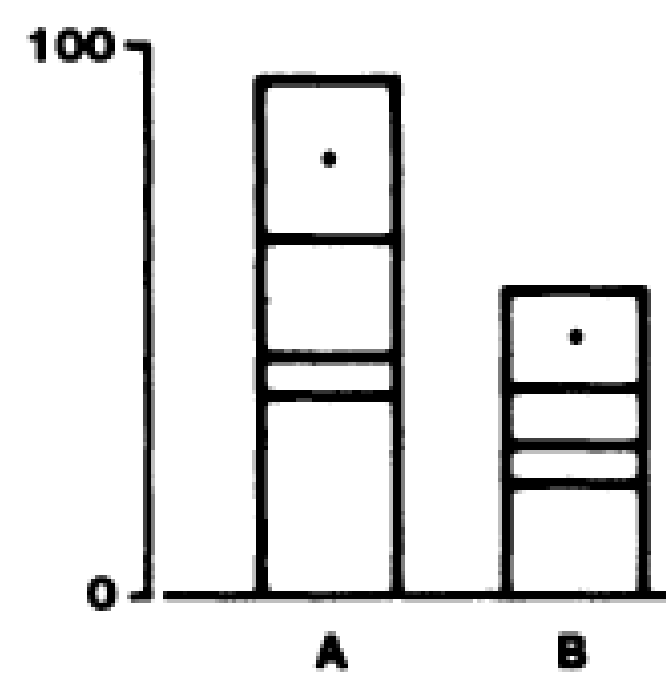
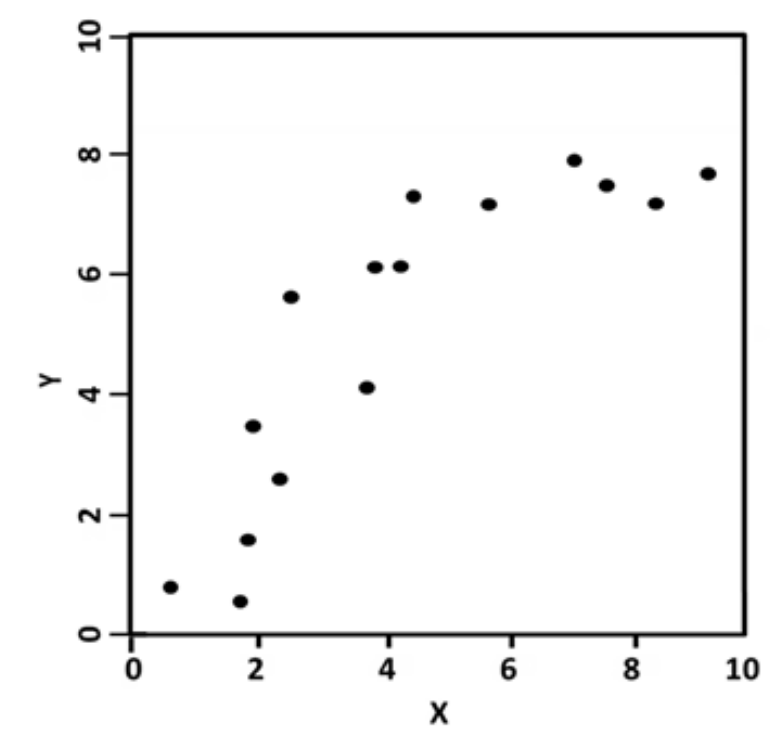
design

visualization

psychology

art

statistics



Ok, but why do we need  
visualization?

LSST



Financial Markets



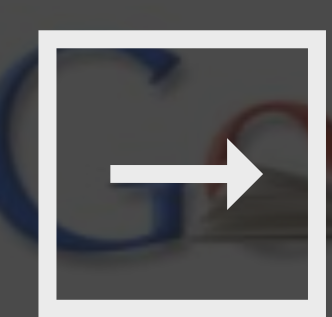
# CHALLENGES:

- Scalability
- Complexity reduction
- Humans in-the-loop



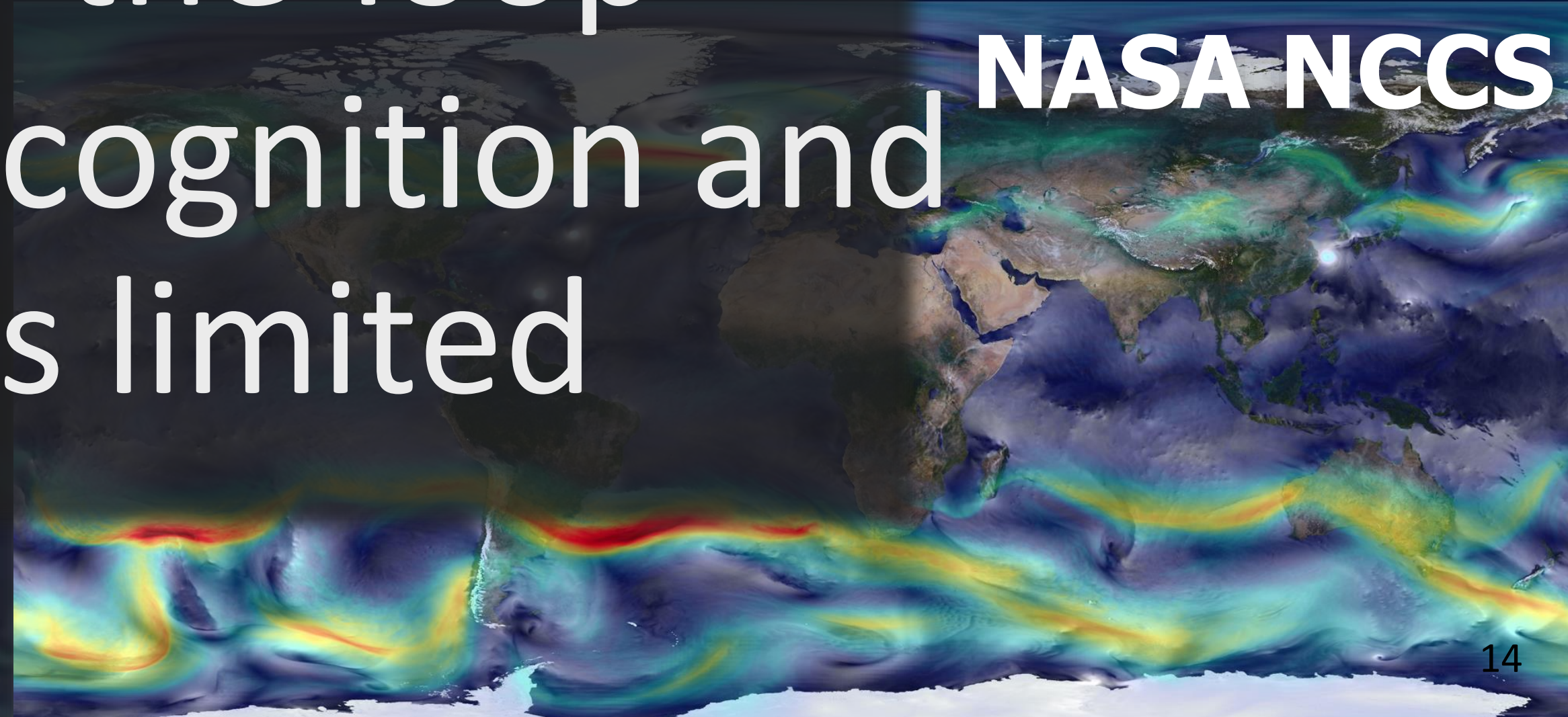
LHC

GenBank



human cognition and memory is limited

NASA NCCS



ngrams



q t f j n i x i g j u n a s b b t g r  
k c l b v t x j x z x m x r g k l x  
q h m z y w t e y j w n o

q t f j n i x i g j u n a s b b t g r  
k c l b v t x j x z x m x r g k l x  
q h m z y w t e y j w n o



# “change blindness”



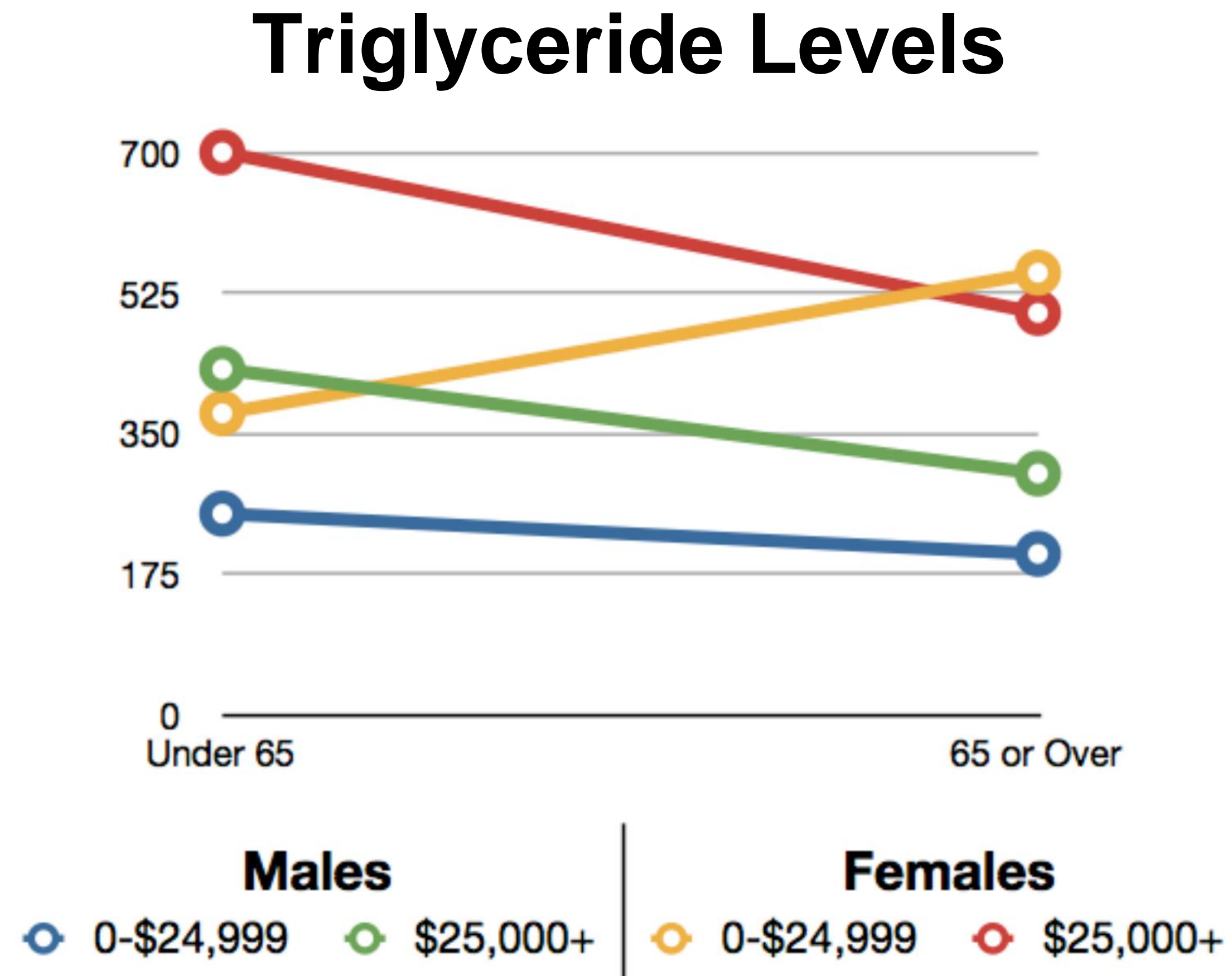
<https://www.youtube.com/watch?v=FW5xSQsspiQ>

Which gender and income level shows a different effect of age on triglyceride levels?

## Triglyceride Levels

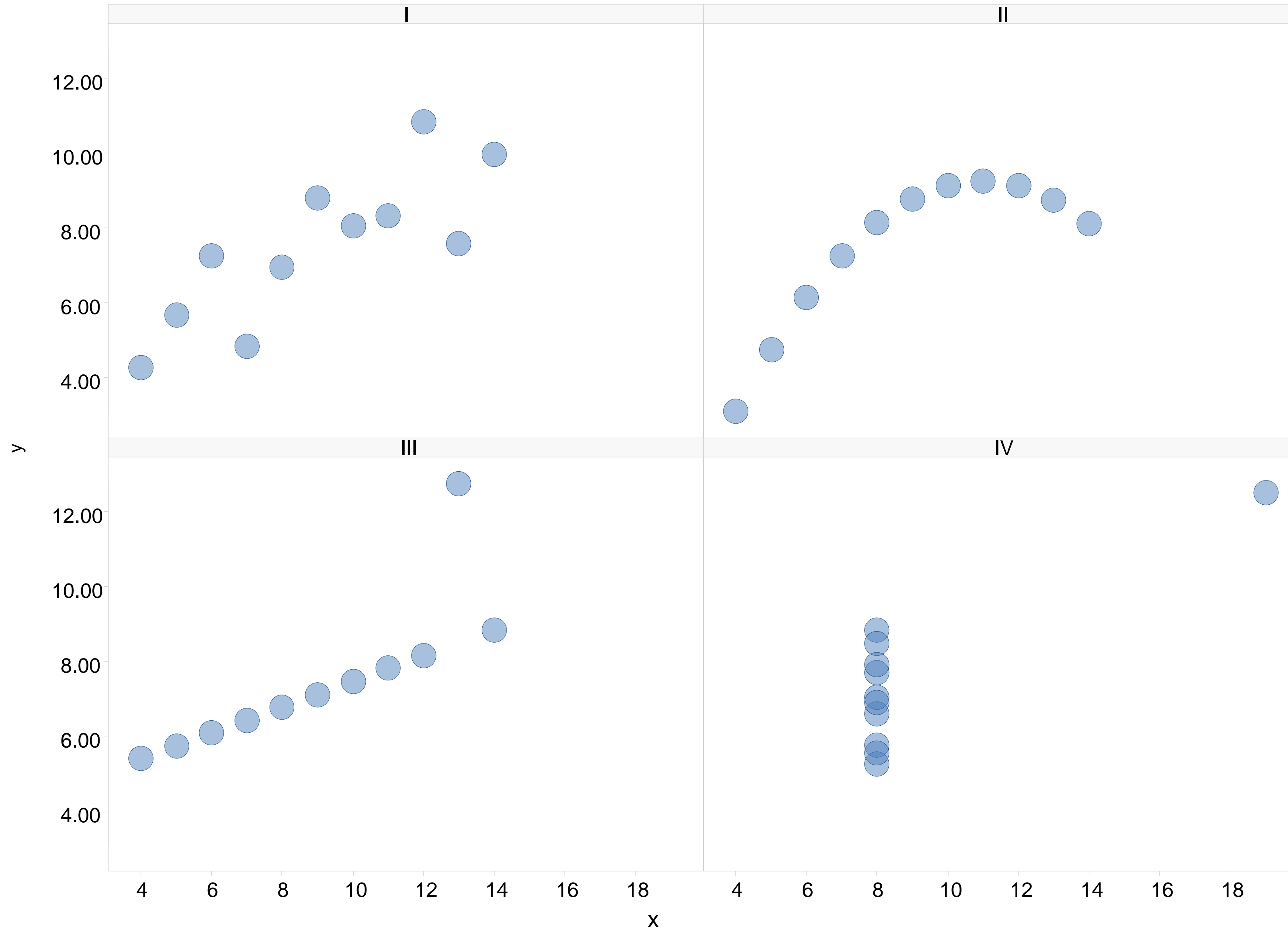
	Males		Females	
Income Group	Under 65	65 or Over	Under 65	65 or Over
0-\$24,999	250	200	375	550
\$25,000+	430	300	700	500

Which gender and income level shows a different effect of age on triglyceride levels?



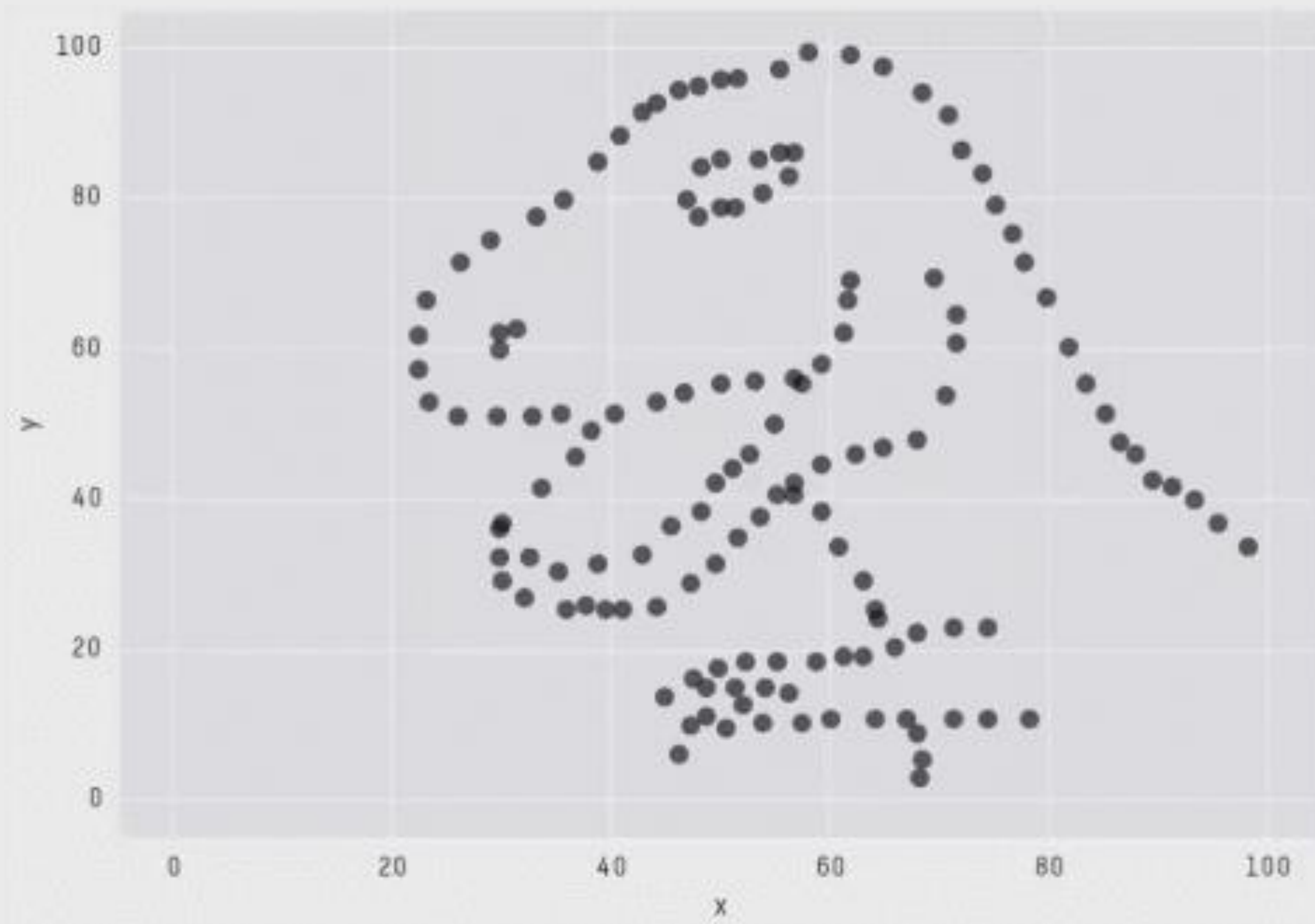
I		II		III		IV	
x	y	x	y	x	y	x	y
10.00	8.04	10.00	9.14	10.00	7.46	8.00	6.58
8.00	6.95	8.00	8.14	8.00	6.77	8.00	5.76
13.00	7.58	13.00	8.74	13.00	12.74	8.00	7.71
9.00	8.81	9.00	8.77	9.00	7.11	8.00	8.84
11.00	8.33	11.00	9.26	11.00	7.81	8.00	8.47
14.00	9.96	14.00	8.10	14.00	8.84	8.00	7.04
6.00	7.24	6.00	6.13	6.00	6.08	8.00	5.25
4.00	4.26	4.00	3.10	4.00	5.39	19.00	12.50
12.00	10.84	12.00	9.13	12.00	8.15	8.00	5.56
7.00	4.82	7.00	7.26	7.00	6.42	8.00	7.91
5.00	5.68	5.00	4.74	5.00	5.73	8.00	6.89

	<b>Value</b>	<b>Equality</b>
<b>X Mean</b>	9	=
<b>Y Mean</b>	7.50	.00
<b>X Variance</b>	11	=
<b>Y Variance</b>	4.12	.00
<b>Correlation</b>	0.816	.000
<b>Linear regression line</b>	$y = 3.00 + 0.500x$	.00 and .000



There are three types of lies: lies,  
damned lies, and statistics

Mark Twain (maybe)

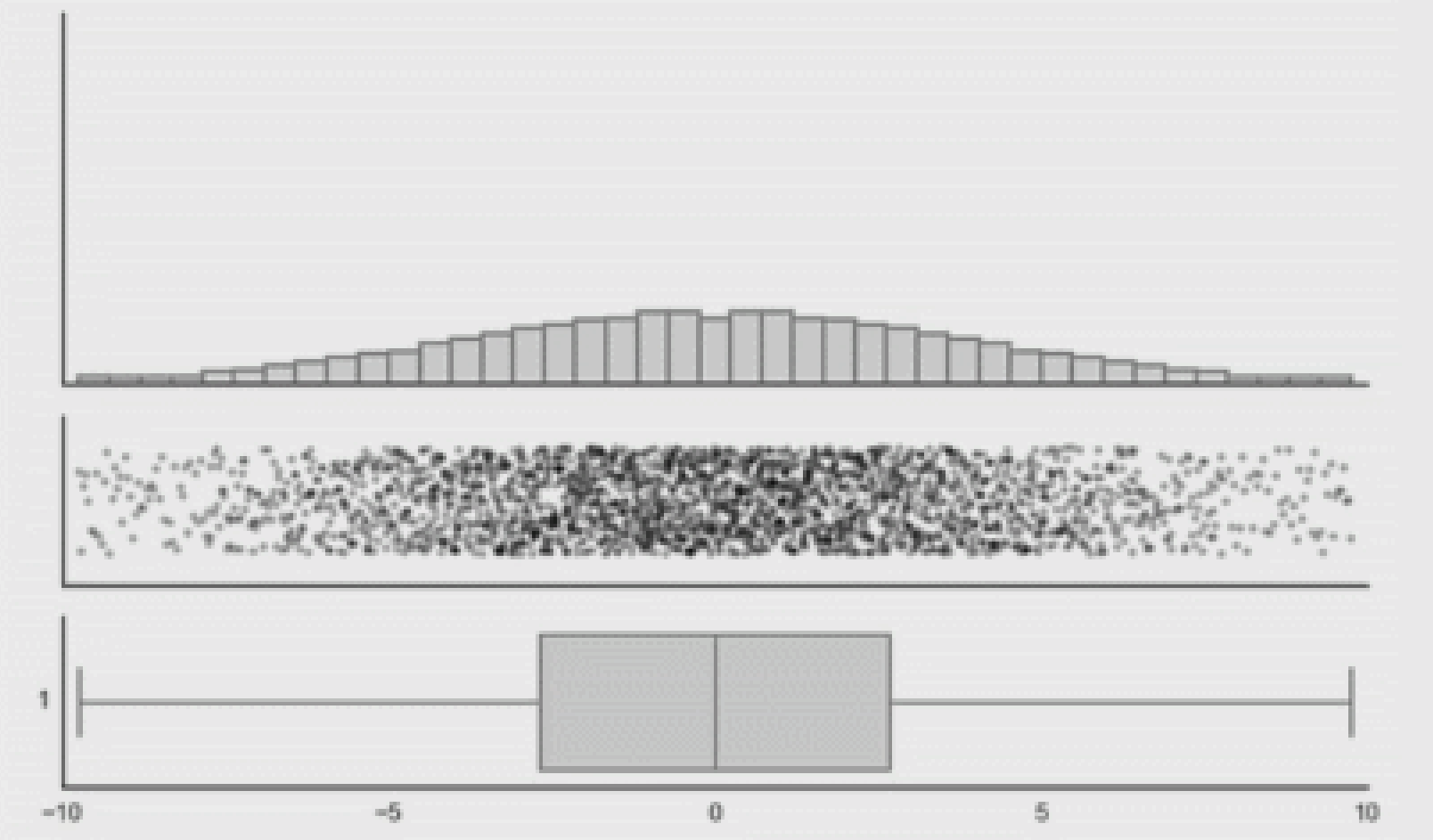
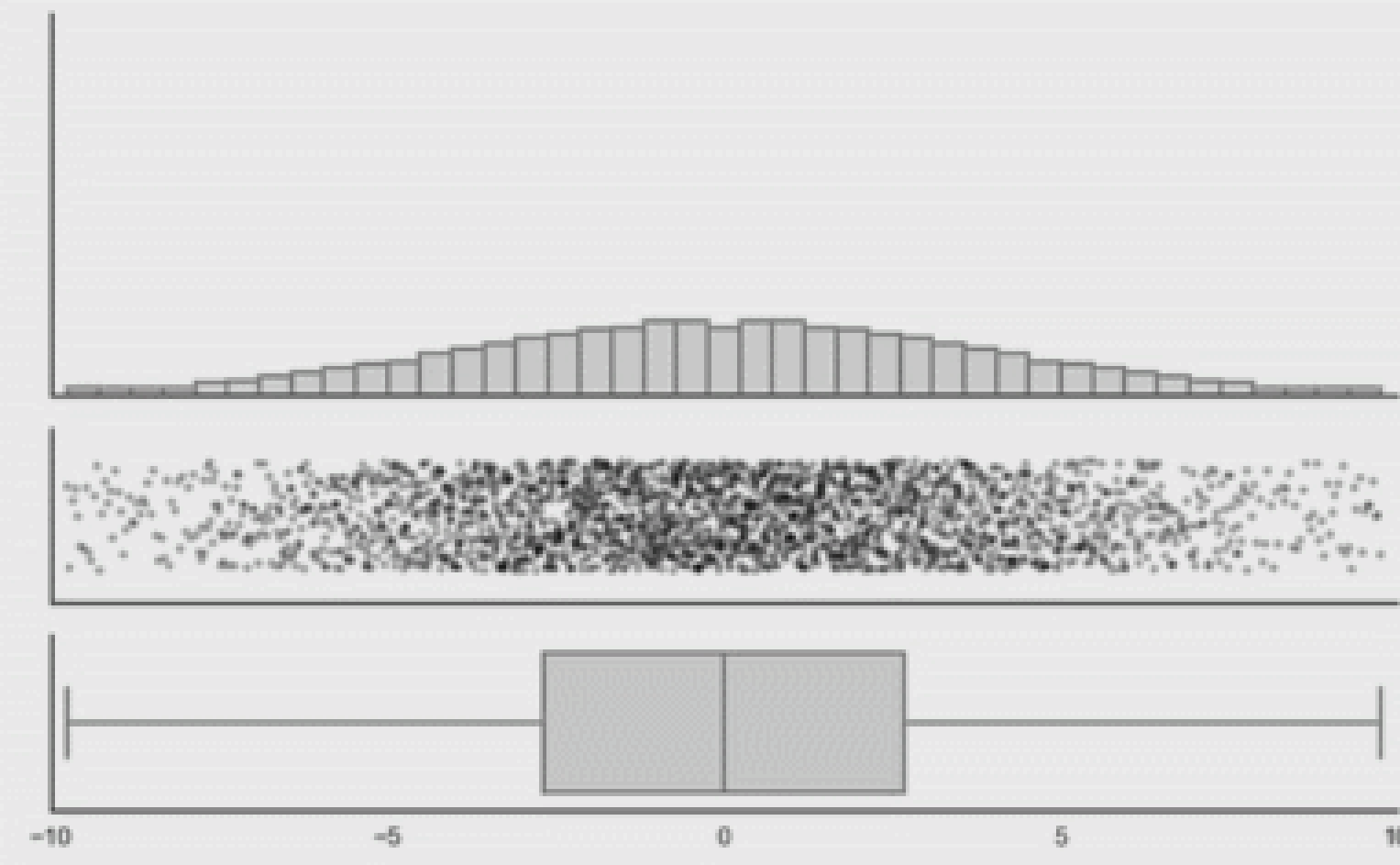
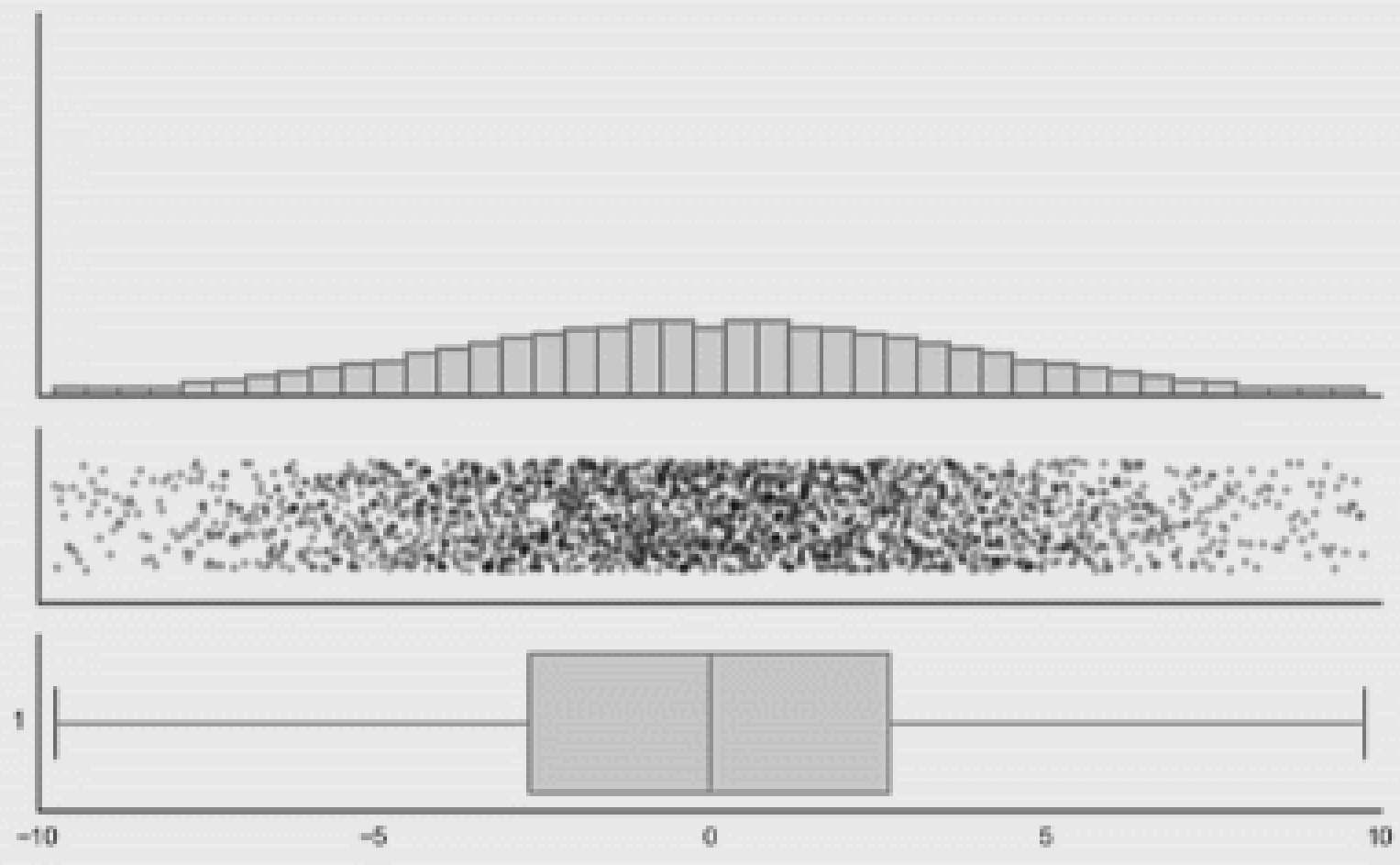


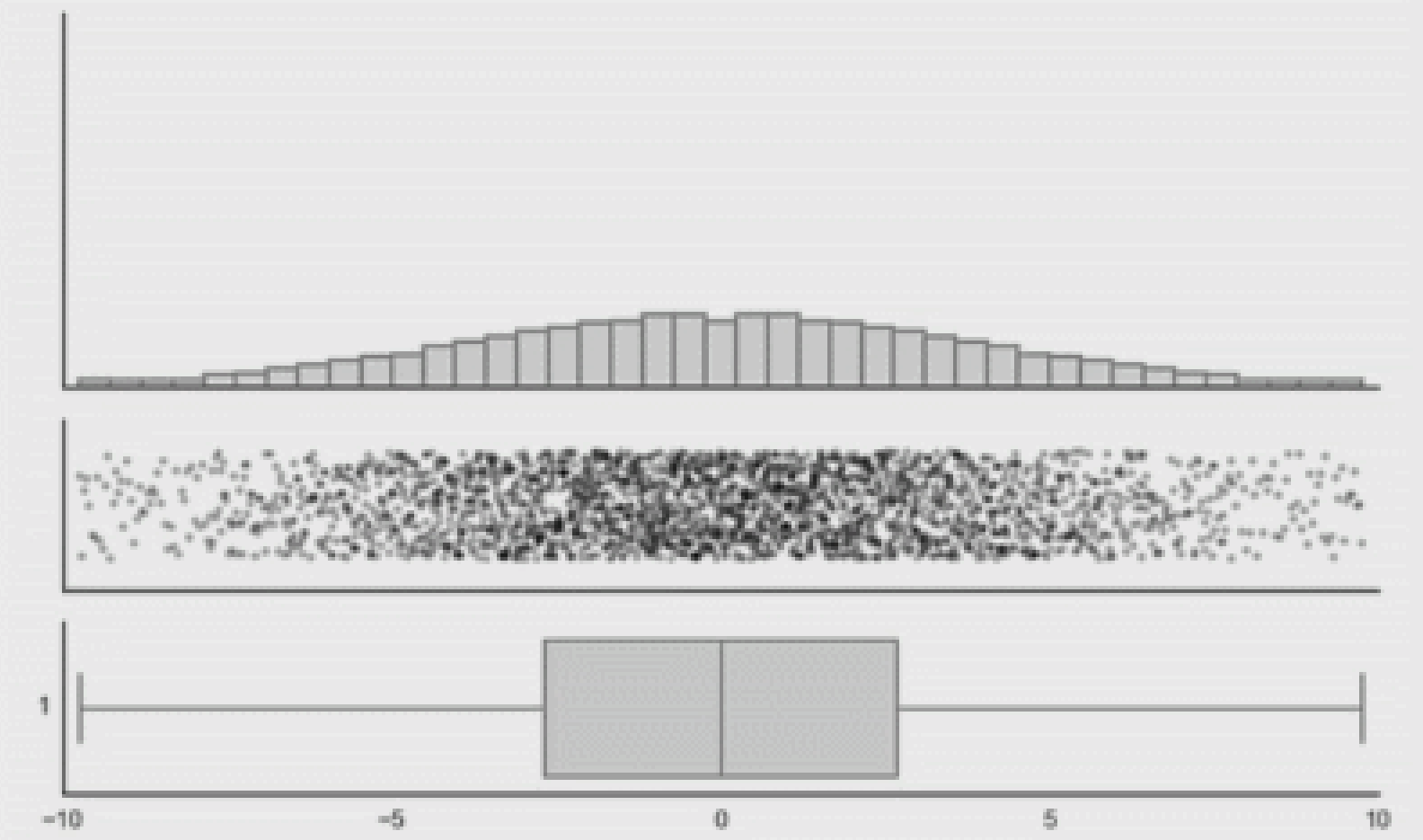
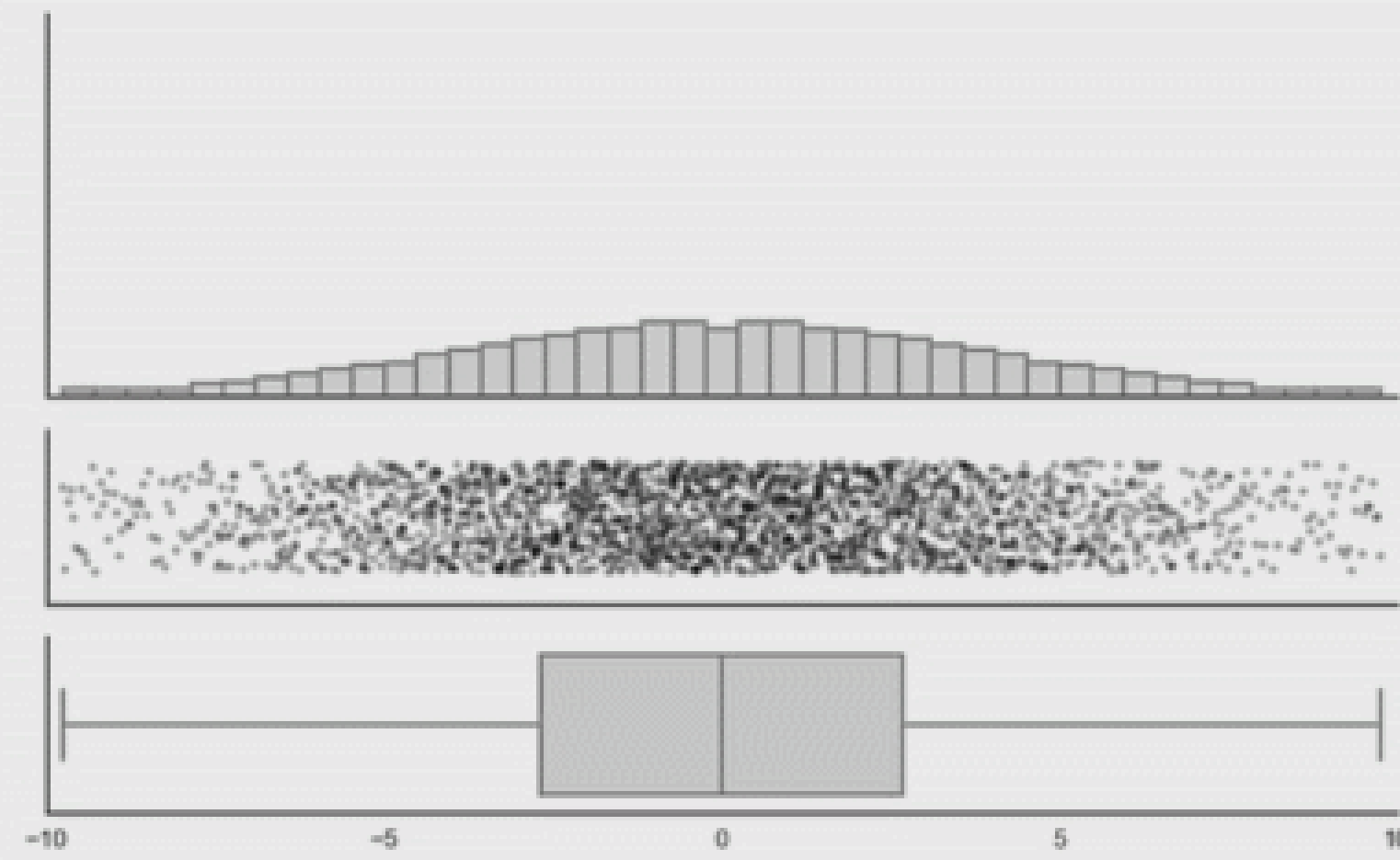
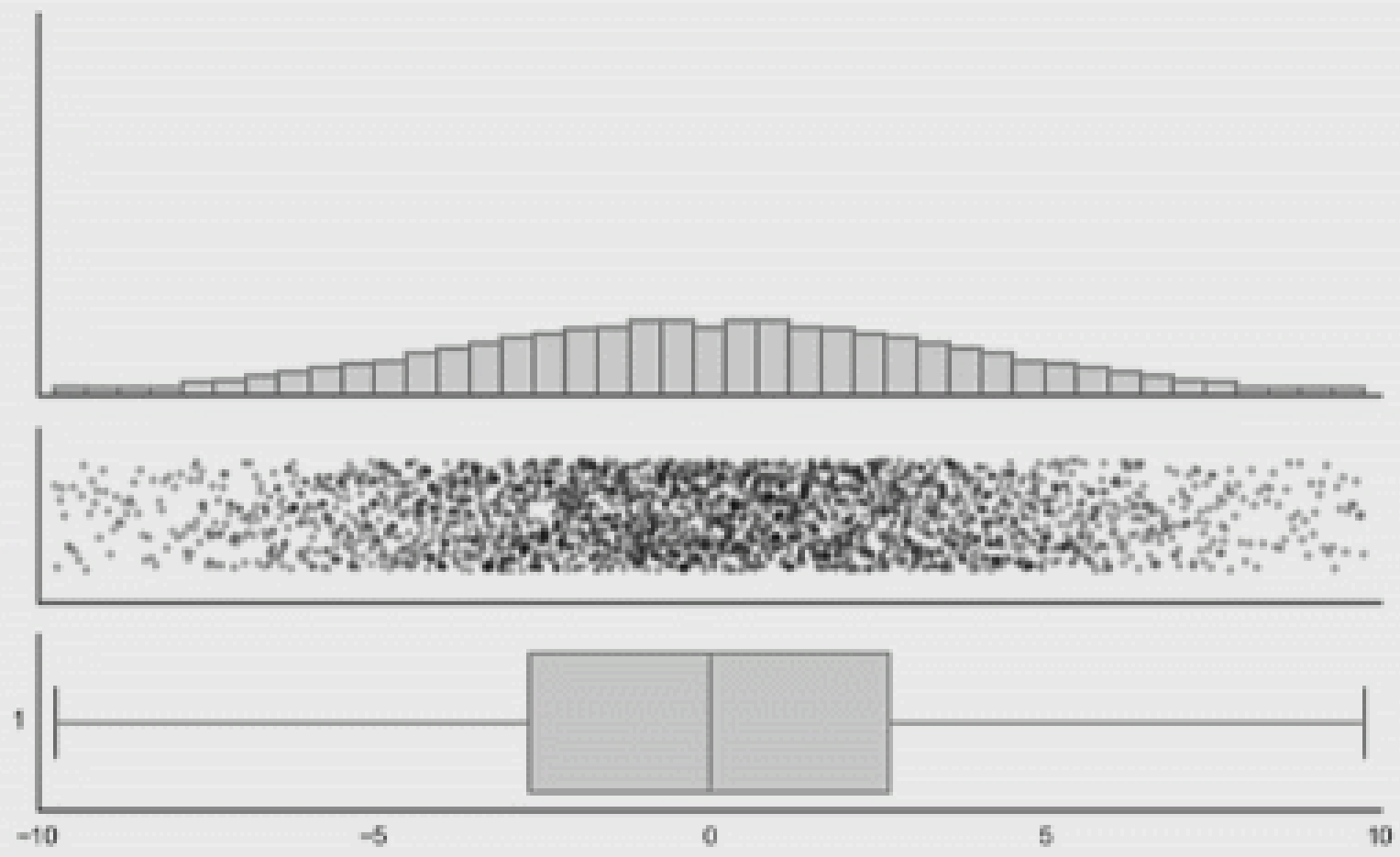
X Mean: 54.2659224  
Y Mean: 47.8313999  
X SD : 16.7649829  
Y SD : 26.9342120  
Corr. : -0.0642526



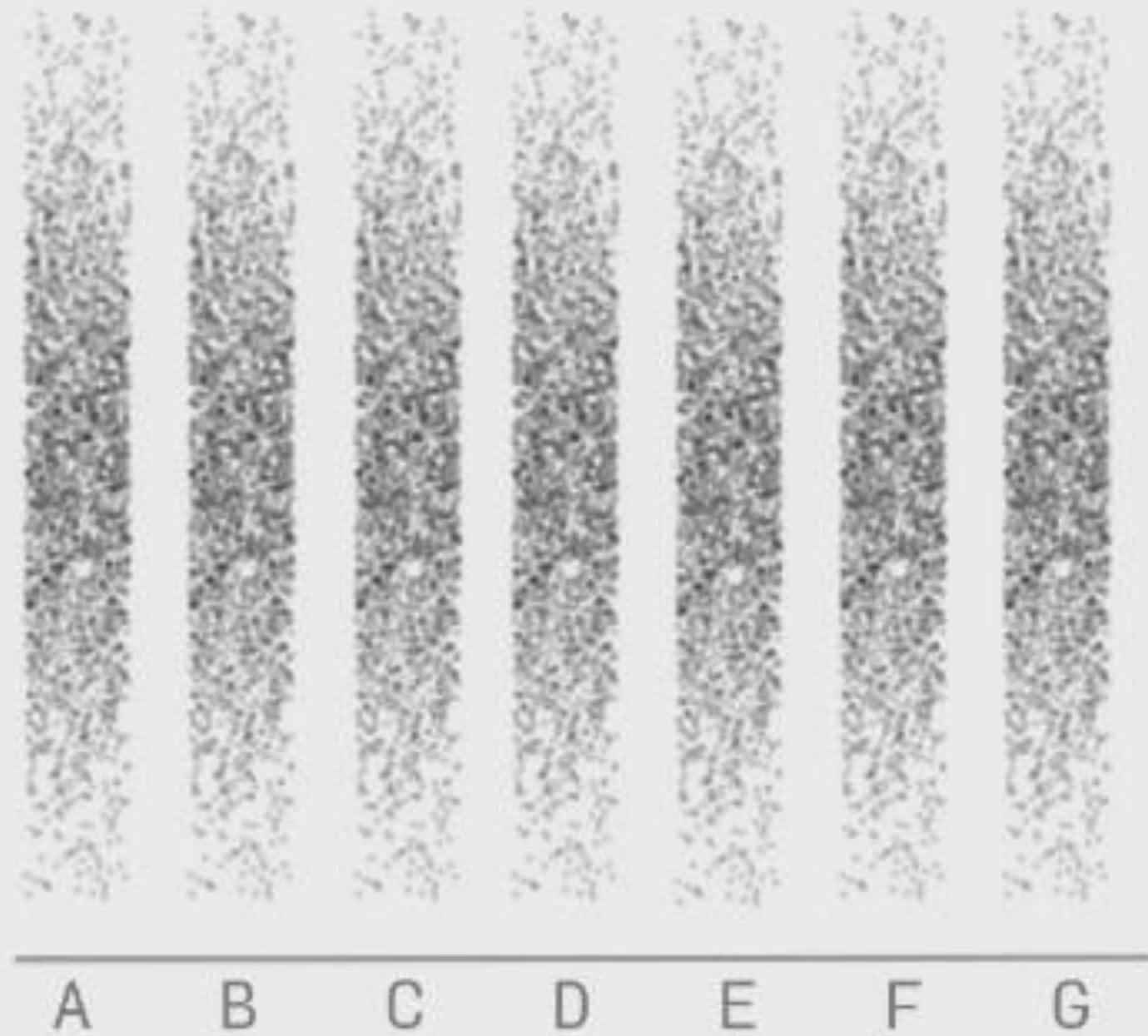
No catalogue of techniques can convey a willingness to look for what can be seen, whether or not anticipated. Yet this is at the heart of exploratory data analysis. ... the picture-examining eye is the best finder we have of the wholly unanticipated.

– Tukey, 1980

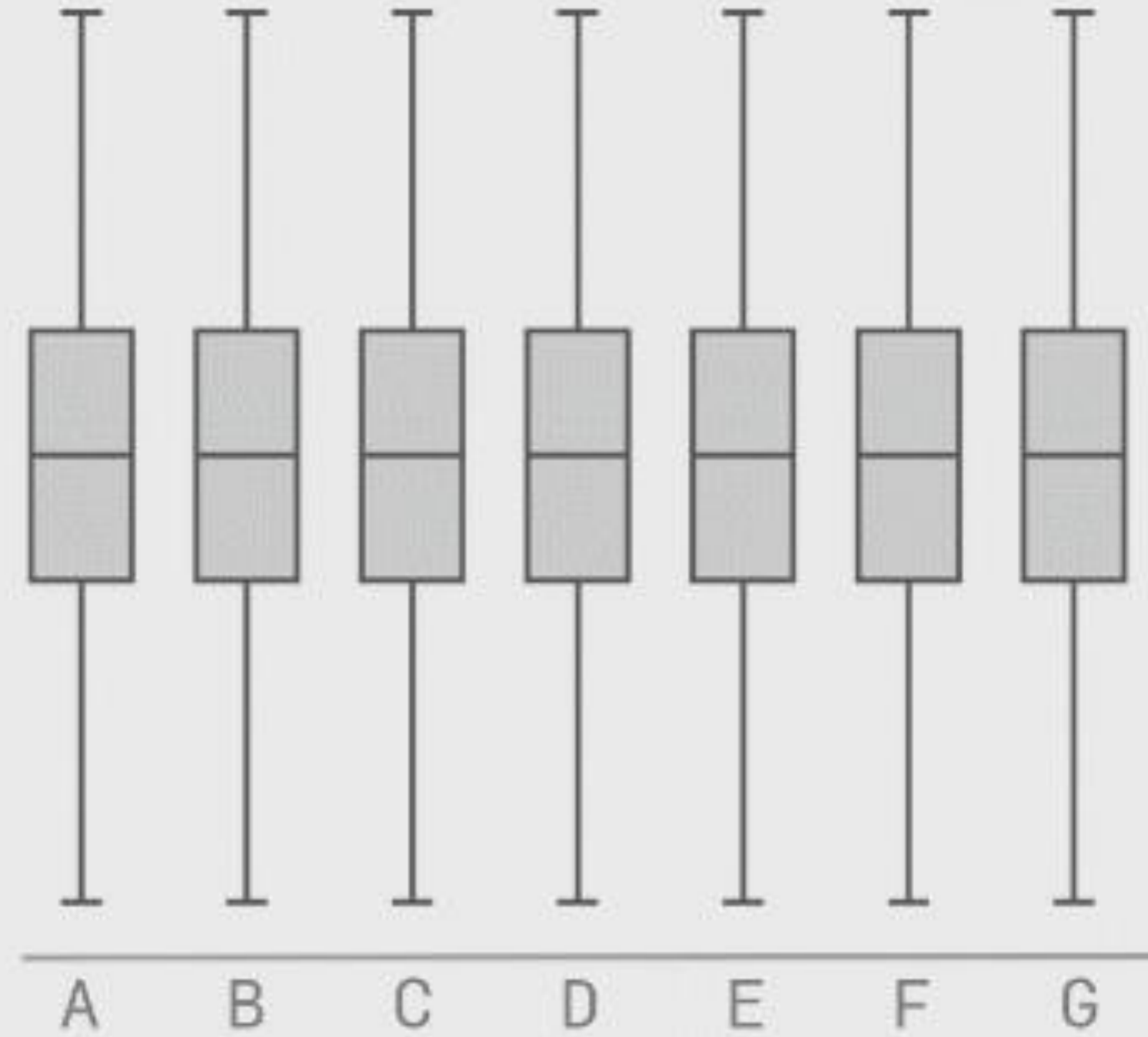




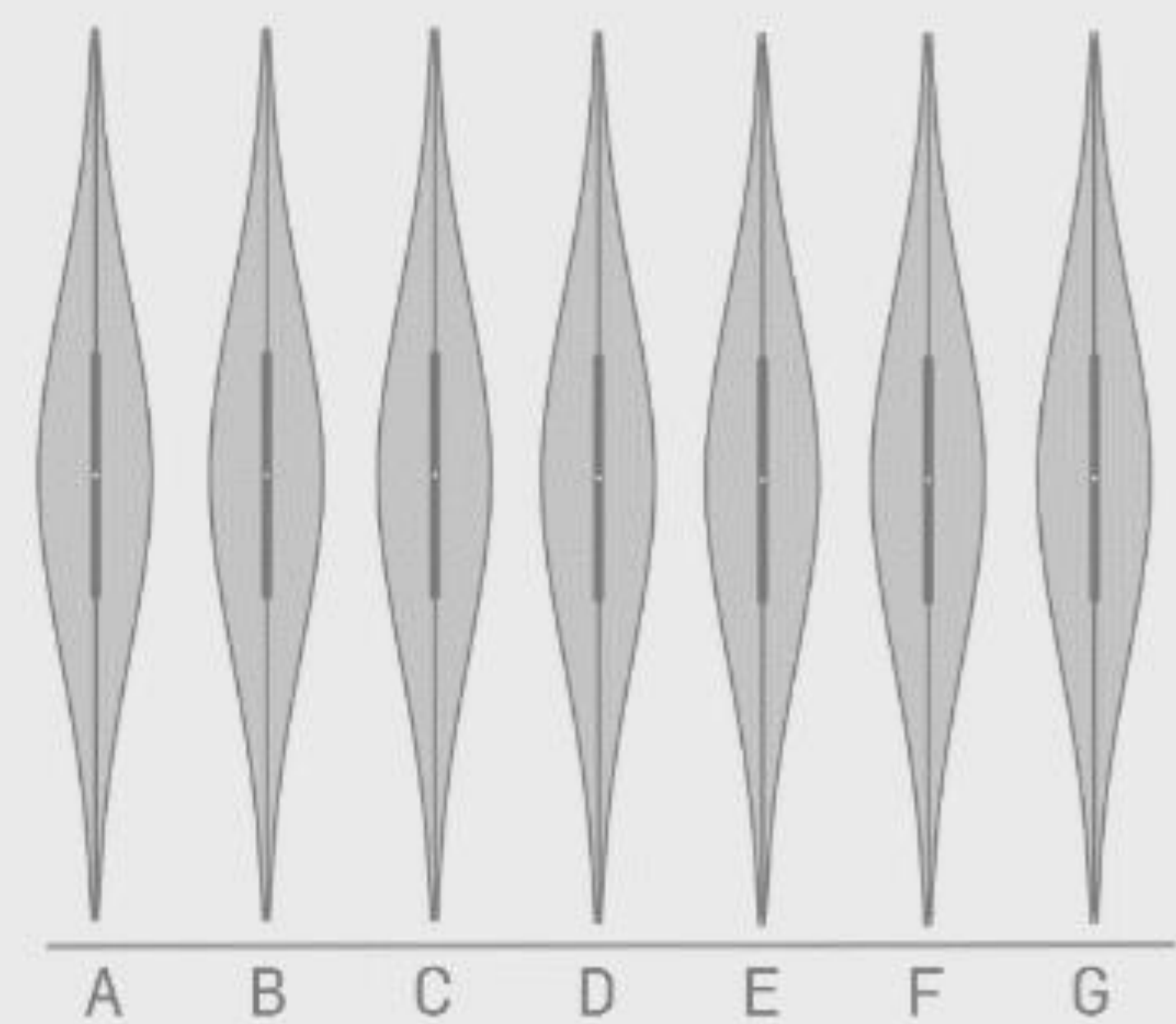
**Raw Data**



**Box-plot of the Data**



**Violin-plot of the Data**



Ok, but why do we need  
visualization?

# Why visualize your data?

- Help cognition
- Expand memory
- Generate hypotheses
- Answer questions
- Make decisions
- Find patterns
- Record
- Clarify
- Communicate
- Inspire

# Why visualize your data?

Hans Rosling:

## The best stats you've ever seen

TED2006 · 19:50 · Filmed Feb 2006

48 subtitle languages ?

View interactive transcript





# Why visualize your data?

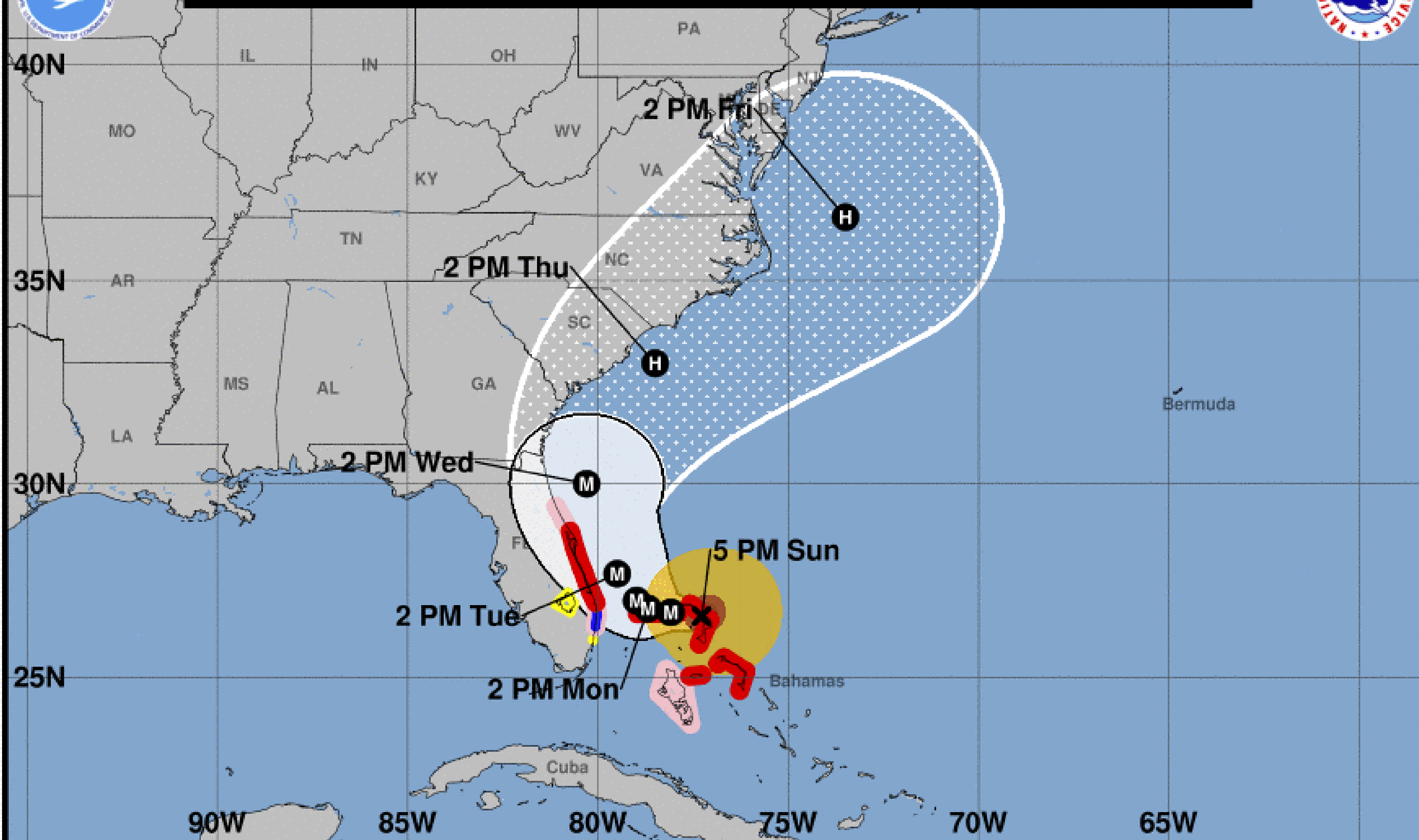


Generate hypotheses, Answer questions, Find patterns,  
Record, Clarify, Communicate, Inspire





Note: The cone contains the probable path of the storm center but does not show the size of the storm. Hazardous conditions can occur outside of the cone.



**Hurricane Dorian**  
 Sunday September 01, 2019  
 5 PM EDT Advisory 34  
 NWS National Hurricane Center

**Current information: x**  
 Center location 26.6 N 77.3 W  
 Maximum sustained wind 185 mph  
 Movement W at 5 mph

**Forecast positions:**  
 ● Tropical Cyclone ○ Post/Potential TC  
 Sustained winds: D < 39 mph  
 S 39-73 mph H 74-110 mph M > 110 mph

**Potential track area:**



**Watches:**



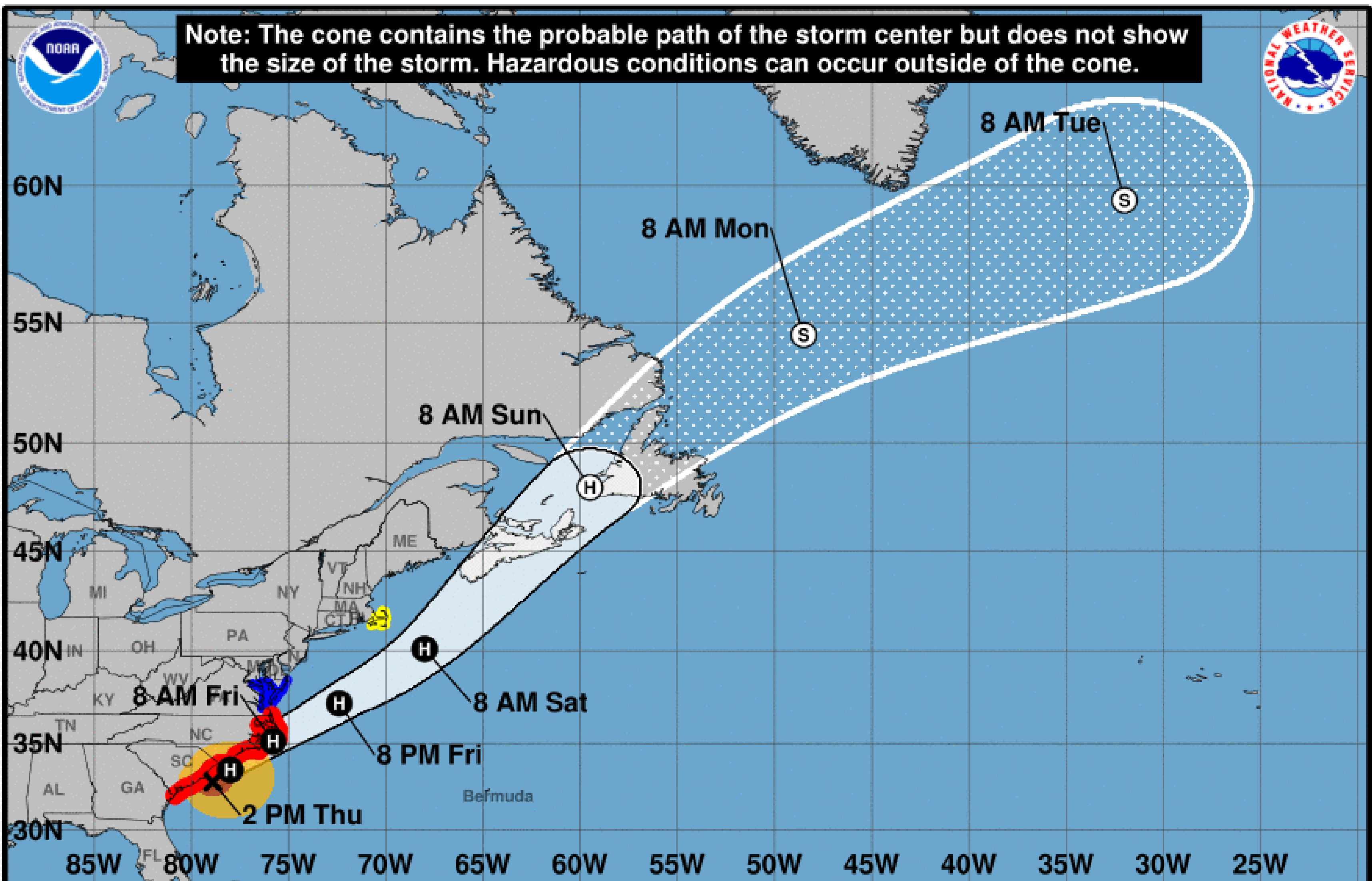
**Warnings:**



**Current wind extent:**



[https://www.nhc.noaa.gov/refresh/graphics\\_at5+shtml/155815.shtml?cone#contents](https://www.nhc.noaa.gov/refresh/graphics_at5+shtml/155815.shtml?cone#contents)



**Hurricane Dorian**  
 Thursday September 05, 2019  
 2 PM EDT Intermediate Advisory 49A  
 NWS National Hurricane Center

**Current information: x**  
 Center location 32.8 N 78.9 W  
 Maximum sustained wind 110 mph  
 Movement NNE at 8 mph

**Forecast positions:**  
 ● Tropical Cyclone ○ Post/Potential TC  
 Sustained winds: D < 39 mph  
 S 39-73 mph H 74-110 mph M > 110 mph

**Potential track area:**  
 Day 1-3 (solid line) Day 4-5 (dotted line)

**Watches:**  
 Hurricane (pink) Trop Stm (yellow)

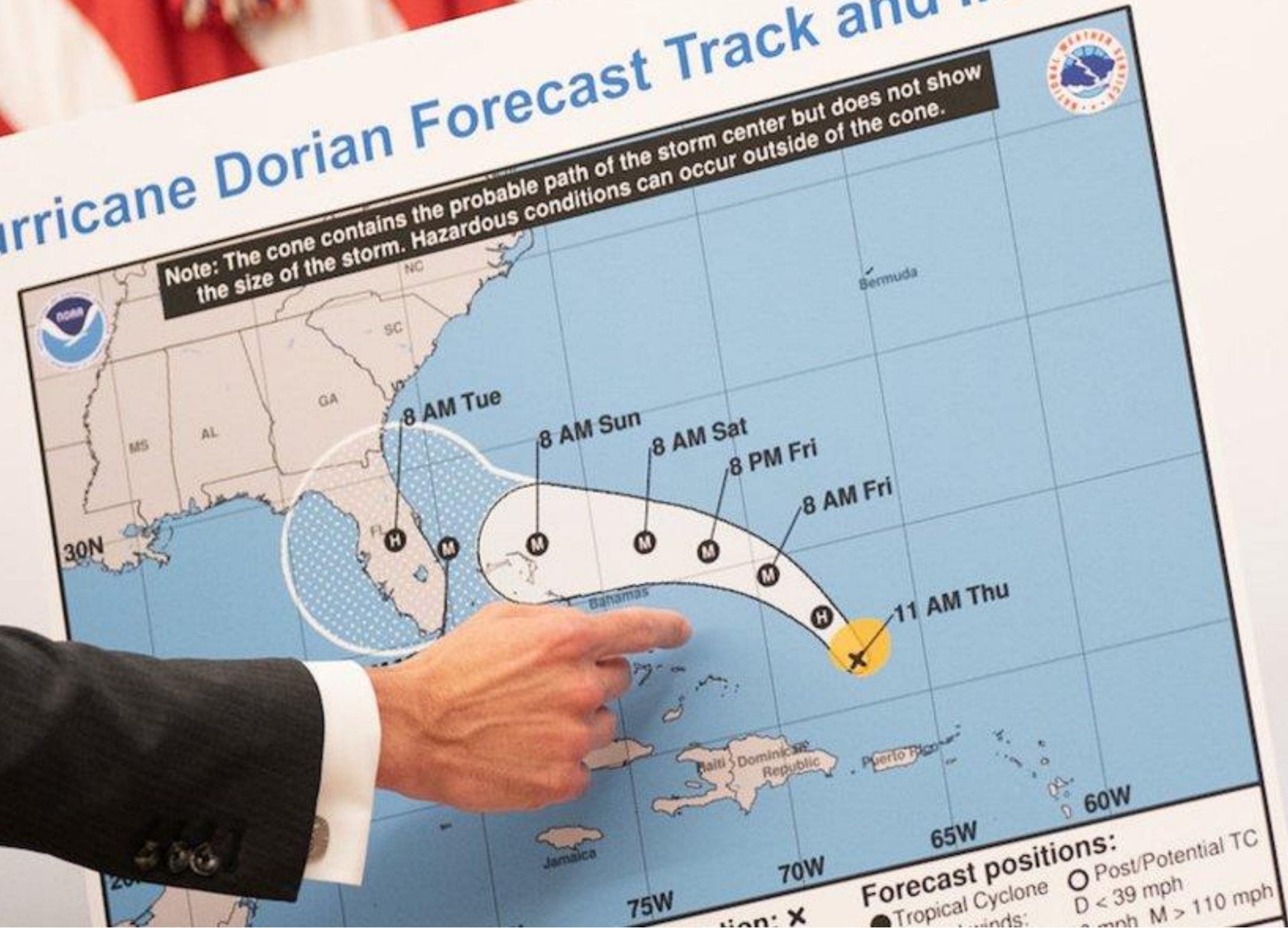
**Warnings:**  
 Hurricane (red) Trop Stm (blue)

**Current wind extent:**  
 Hurricane (brown) Trop Stm (orange)



# Hurricane Dorian Forecast Track and Intensity

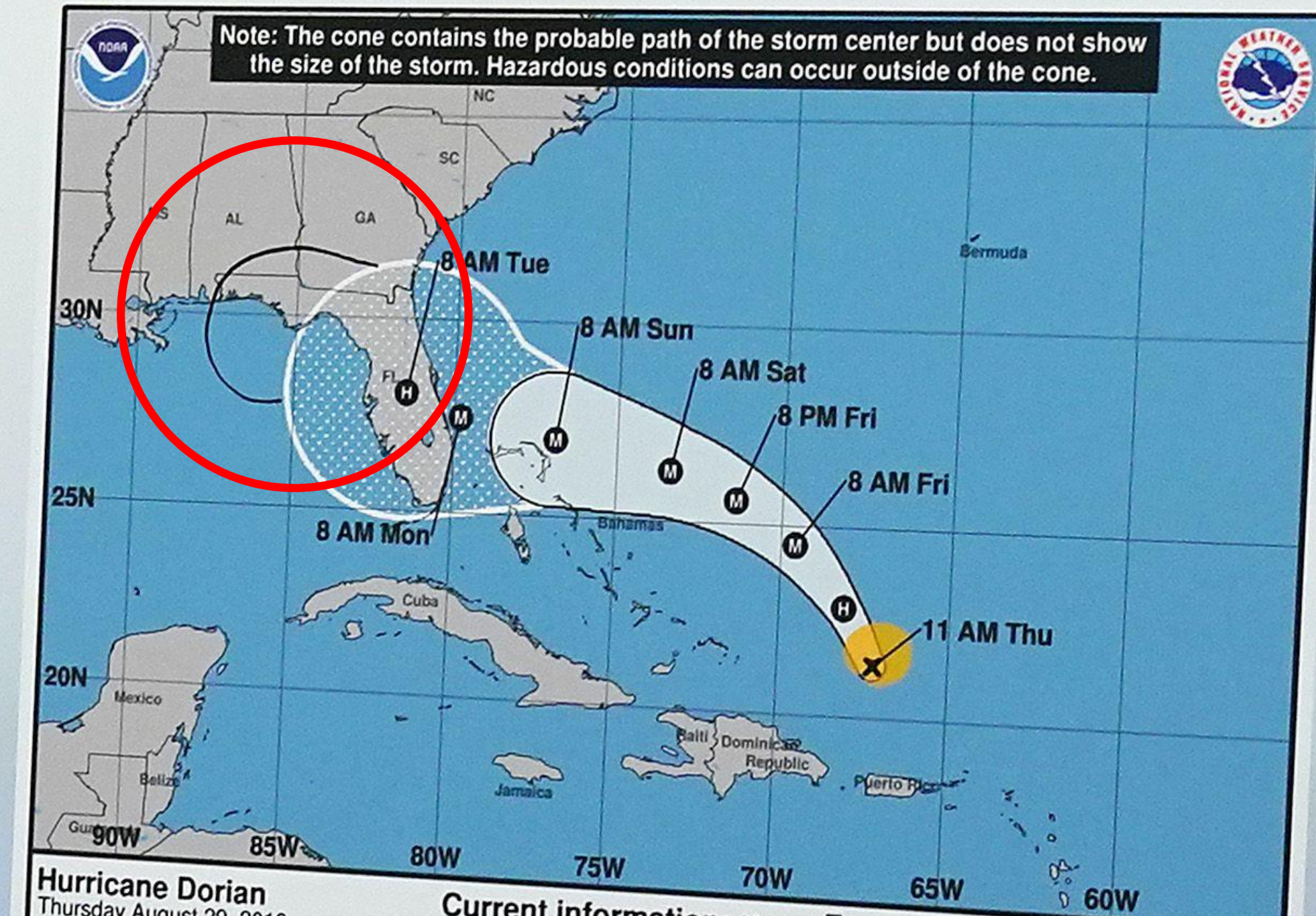
Note: The cone contains the probable path of the storm center but does not show the size of the storm. Hazardous conditions can occur outside of the cone.





# Hurricane Dorian Forecast Track and Intensity

Note: The cone contains the probable path of the storm center but does not show the size of the storm. Hazardous conditions can occur outside of the cone.



**Hurricane Dorian**  
 Thursday August 29, 2019  
 11 AM AST Advisory 21  
 NWS National Hurricane Center

**Current information:** x  
 Center location 21.4 N 67.2 W  
 Maximum sustained wind 85 mph  
 Movement NW at 13 mph

**Forecast positions:**  
 ● Tropical Cyclone    ○ Post/Potential TC  
 Sustained winds: D < 39 mph  
 S 39-73 mph H 74-110 mph M > 110 mph

**Potential track area:**  
 Day 1-3    Day 4-5

**Watches:**

Hurricane    Trop Stm

**Warnings:**

Hurricane    Trop Stm

**Current wind extent:**

Hurricane    Trop Stm

Opinion

# Those Hurricane Maps Don't Mean What You Think They Mean

We use hurricane forecasts to warn people. Why do we misinterpret them so often?

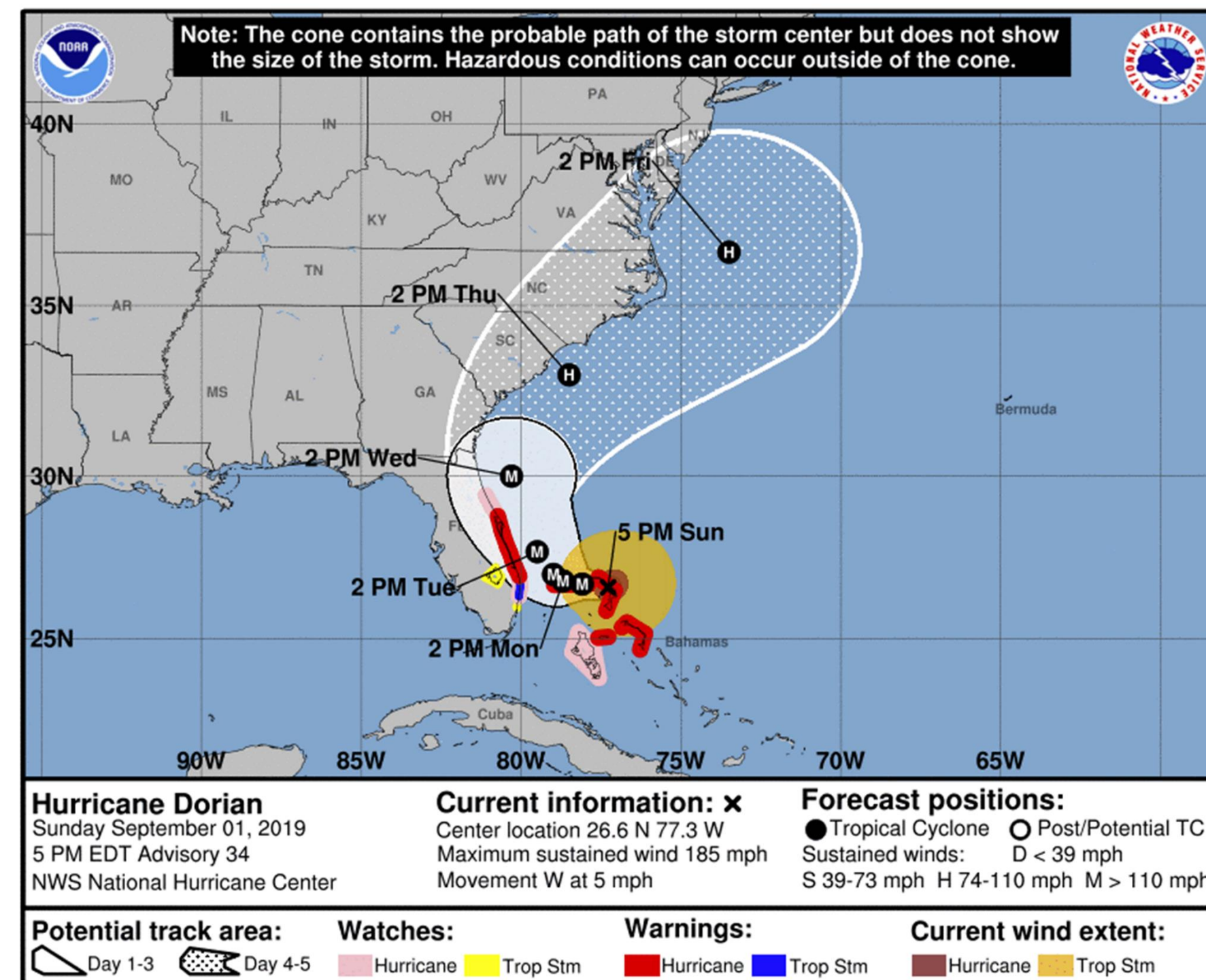
**By Alberto Cairo**

**With Tala Schlossberg**

# In-Class Redesign — Hurricane Funnel

35 min

<https://canvas.instructure.com/courses/1781732/assignments/13386302>



[https://www.nhc.noaa.gov/refresh/graphics\\_at5+shtml/155815.shtml?cone#contents](https://www.nhc.noaa.gov/refresh/graphics_at5+shtml/155815.shtml?cone#contents)

# Upcoming Assignments & Communication

<https://canvas.instructure.com/courses/1781732>

If you don't have an account on our Canvas yet:

<https://canvas.instructure.com/enroll/CMAPDM>

Use your name as known by the registrar and your @husky.neu.edu email.

Look at the upcoming assignments and deadlines (**12:01am**)!

- Textbook, Readings & Reading Quizzes
- Assignment 1a,b,c
- Projects

Everyday Required Supplies:

- 5+ colors of pen/pencil
- White paper
- Laptop and charger
- Table tent

Use Canvas Discussions for general questions, email the instructor/TAs for questions specific to you.

CS 7250 S20 > Syllabus

Home Syllabus Pages Assignments Discussions Grades People Files

Account Dashboard Calendar Inbox Help

## Course Syllabus [Jump to Today](#)

Please see [the course homepage](#) —also the [Home](#) link in the Course Navigation Menu to the left — for the regular syllabus. The course schedule is listed below. You can use the Jump to Today link to the top-right to advance to the present.

### Course Summary:

Date	Details	
Mon Jan 6, 2020	Introduction	11:45am
	In-Class Redesign — Hurricane Funnels	due by 11:59pm
	In-Class Sketching — Table Tents	due by 11:59pm
Thu Jan 9, 2020	Readings — Design Rules of Thumb	due by 11:45am
Mon Jan 13, 2020	Assignment 1a — Critique the Syllabus	due by 12:01am
	Assignment 1b — Introduction to Web Development	due by 12:01am
	Assignment 1c — Tableau Setup	due by 12:01am
	Git, Local Server, D3, & Tableau Tutorials	11:45am
	Readings — Marks and Channels	due by 11:45am
Thu Jan 16, 2020	D3 Tutorial (1/2) and S-L Introduction	11:45am
Mon Jan 20, 2020	**No Class or Office Hours — MLK Day**	12am
	Assignment 2a — Critique "Polaris"	due by 12:01am
	Assignment 2b — Who Lives in the South End? (Tableau)	due by 12:01am
Thu Jan 23, 2020	D3 Tutorial (2/2)	11:45am
Mon Jan 27, 2020	**Last day to drop without a W or add online**	12am
	Assignment 3 — Critique "39 studies in 30 minutes"	due by 12:01am
	Project 1 — Initial Idea Pitches & Related Work	due by 12:01am
	In-Class Project Pitches	11:45am
Thu Jan 30, 2020	Readings — Data Types & Tasks	due by 11:45am

You are currently logged into Student View

Resetting the test student will clear all history for this student, allowing you to view the course as a brand new student.

Reset Student

Leave Student View