
Data visualization

— Another short lecture —

Three aspects to consider

Technical: “How do I generate X visualization with Y software?”

Demonstrative: “What do I want to communicate about a given dataset?”

Aesthetic: “Which graphical concepts can I leverage to make a visually compelling plot?”

Addressing the technical aspect of visualization

Leverage *libraries* to create your visualizations.

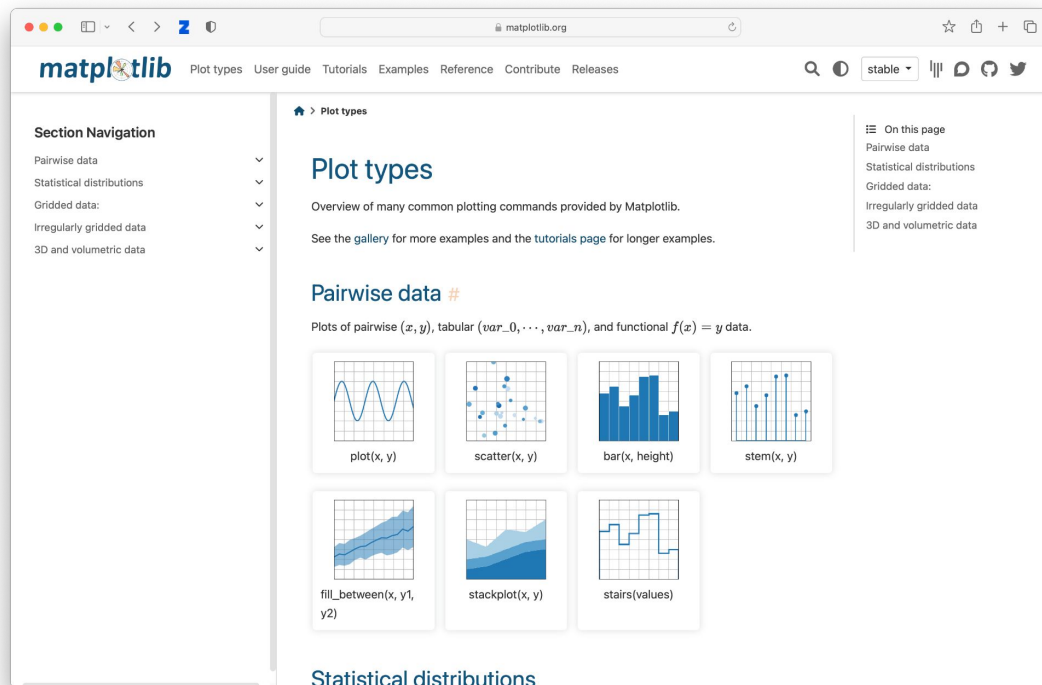
For Python: Matplotlib, Plotly, Seaborn (itself based on Matplotlib), Bokeh, etc.

In choosing a library/*plotting backend*, it is helpful to ask yourself, “**what sort of figures will I be making?**”

E.g.: Do you need interactivity? Will your plots be purely digital or will they also be printed? Do your data and analyses require special kinds of visualization (3D or geographical, for example)?

Many libraries have excellent documentation

Take advantage of this fact!



Visualizations:

(Initially) help with **data exploration and characterization**

(Eventually) **tell a story**

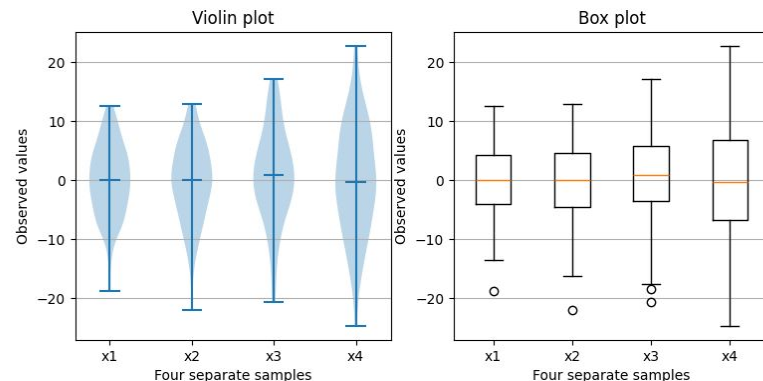
Data characteristics via visualizations

Your goal is to understand the makeup of your dataset.

Histograms and *box plots* can assist with describing the distribution and variability of data.

Scatter plots are especially useful for understanding how variables covary.

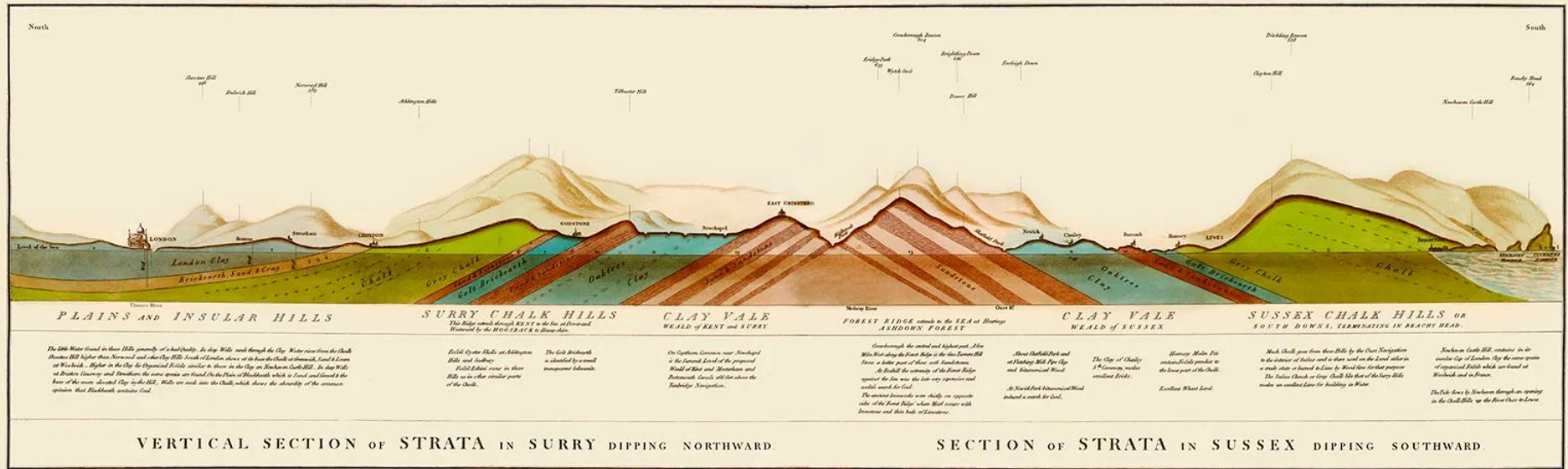
Heatmaps provide easy-to-read information about magnitude.



What sort of visualizations do/could you use?

(Specifically for characterizing a dataset.)

The geosciences have a history of compelling figures



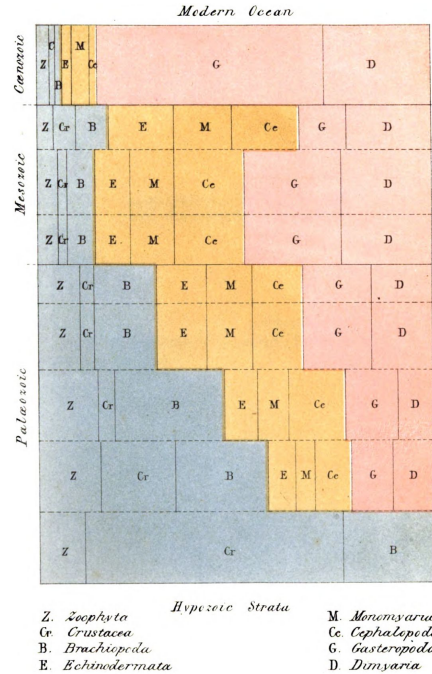
LONDON: PUBLISHED BY JOHN CARY, N^o 171 STRAND MAY 1st 1819

SECTION OF STRATA IN SUSSEX DIPPING SOUTHWARD.

Smith and Cary, 1819

The geosciences have a history of compelling figures

SUCCESSIVE SYSTEMS OF MARINE
INVERTEBRAL LIFE. *Fig 6*

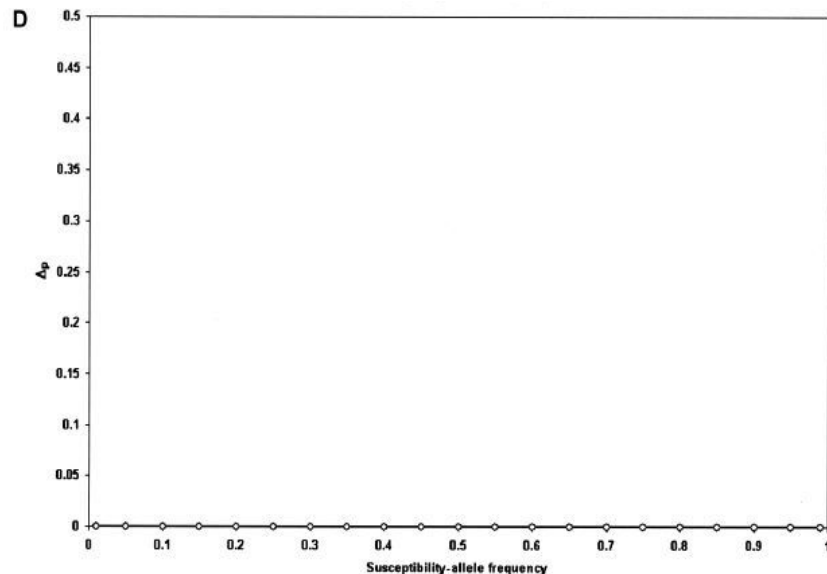


Phillips, 1860

Making appealing visualizations is a skill

Everyone is guilty of making at least one bad figure.

Some issues (e.g., creating a redundant or information-less figure) are easily avoidable. Others (e.g., using the proper *line weights*) are nuanced and require practice.



Use precedents

When starting off, good artists/designers/etc. copy ideas wholesale.

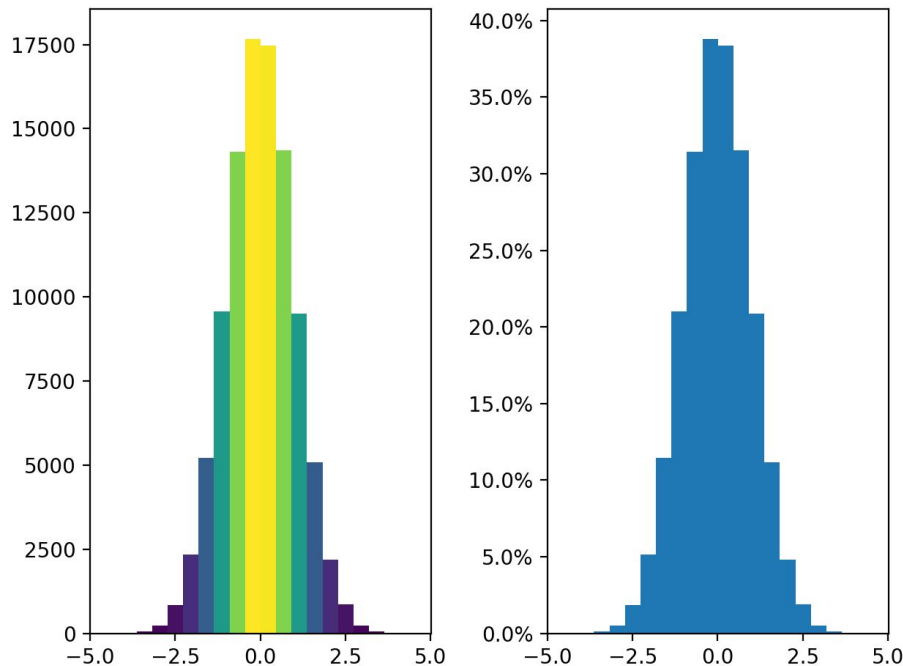
Start developing a collection of *precedents*. Save figures that appeal (visually, graphically, scientifically) to you.

Figure out *why* those visualizations work.

Don't forget the basics!

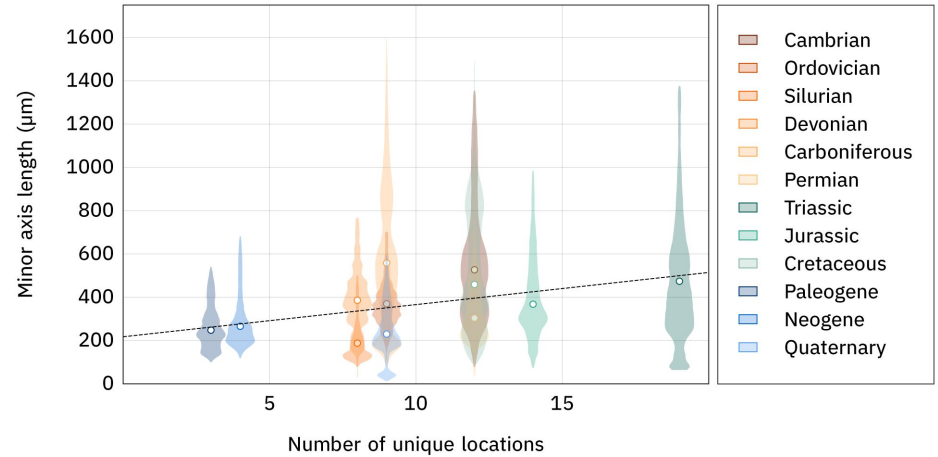
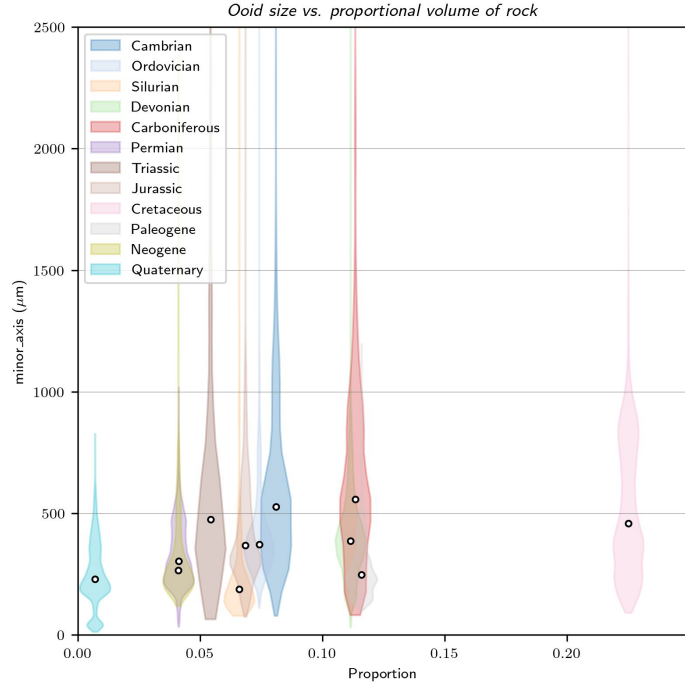
Always include:

- Axes labels
- A legend (in the case of histograms, what is the total n?)
- If standalone, a title
- If applicable, depictions of uncertainty



<https://matplotlib.org/stable/gallery/statistics/hist.html>

Do not finalize figures prematurely



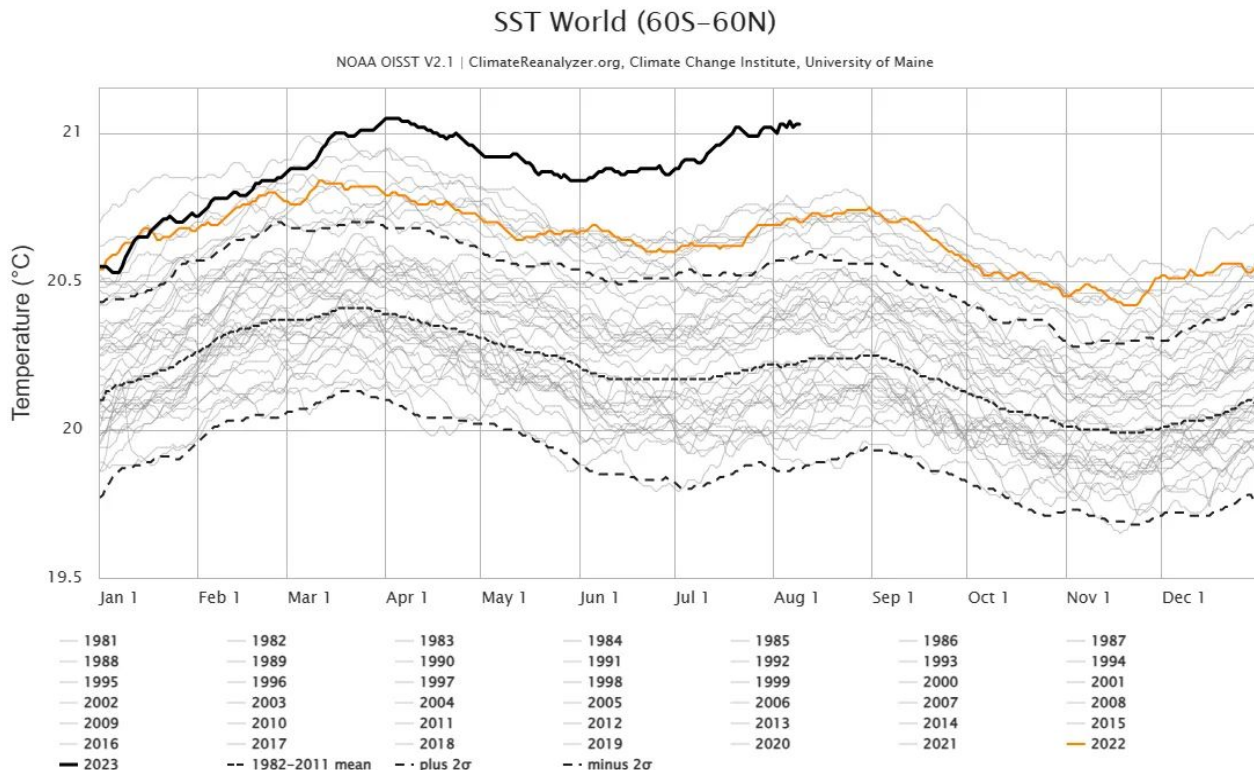
Keep in mind

Line weights

Color schemes

Opacity

How your figures will
look online/in
print/on your slides



https://climatoreanalyzer.org/clim/sst_daily/

Tell a story with your figure(s)

