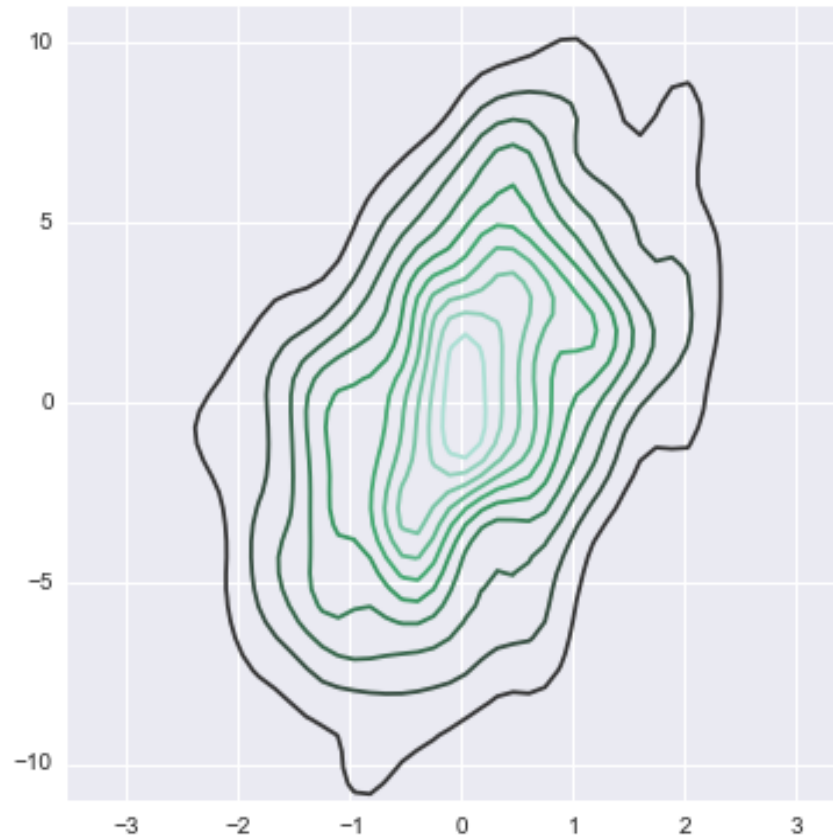
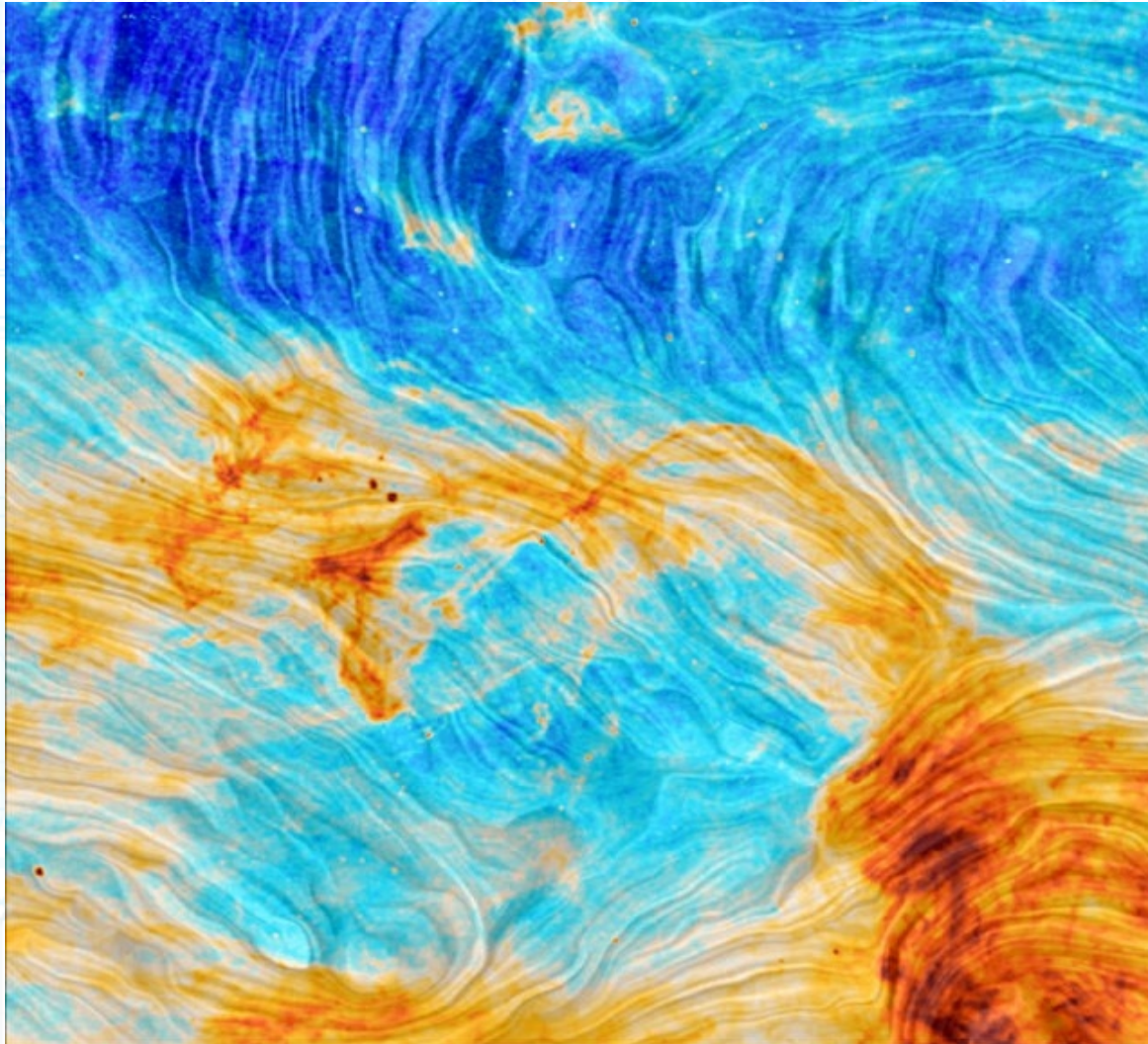


Plotting in Python



Presented by Dylan Gregersen
[*astrodsg.github.io*](https://astrodsg.github.io)

About Plotting



Graphical Excellence

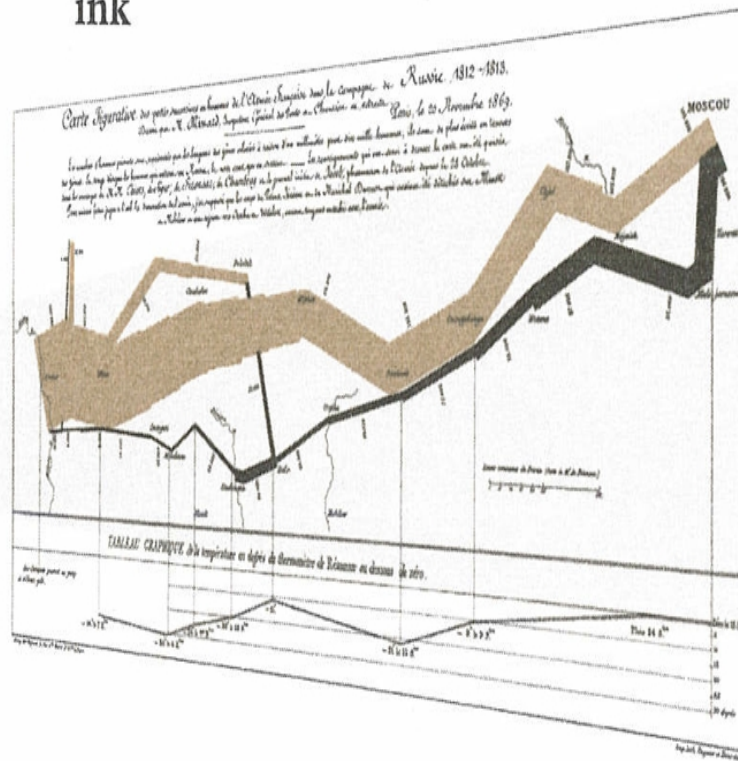
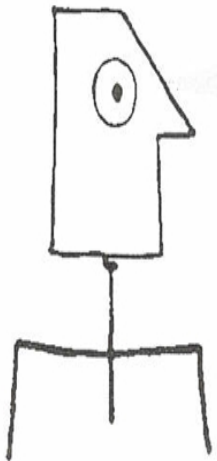
Gives the viewer the greatest number of ideas communicated with clarity, precision, and efficiency

space

ink

ideas

time

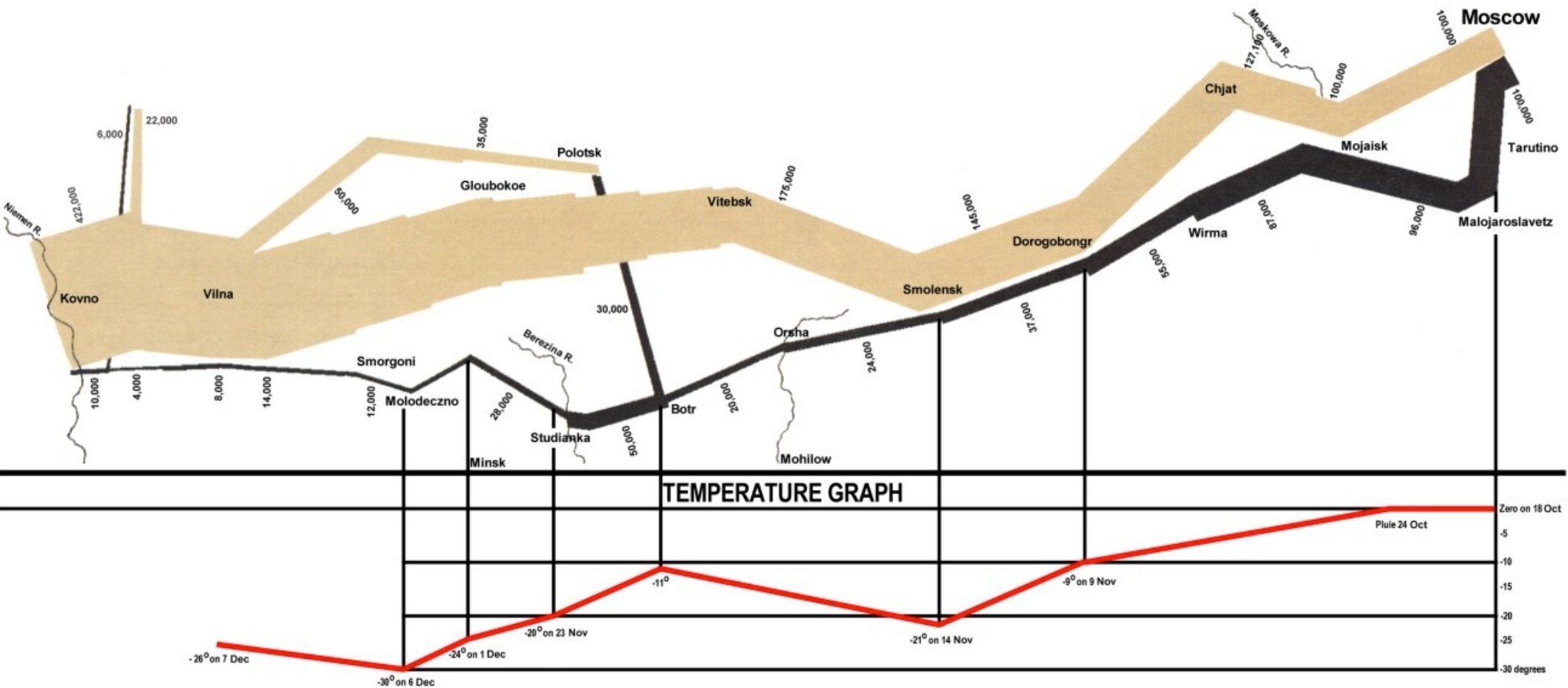


Practical Rules for Graphical Excellence

- Honest Representation of Data
- Visibility and Clarity
- Multiple Layers of Information
- Relevant to Audience
- Avoid Chart Junk

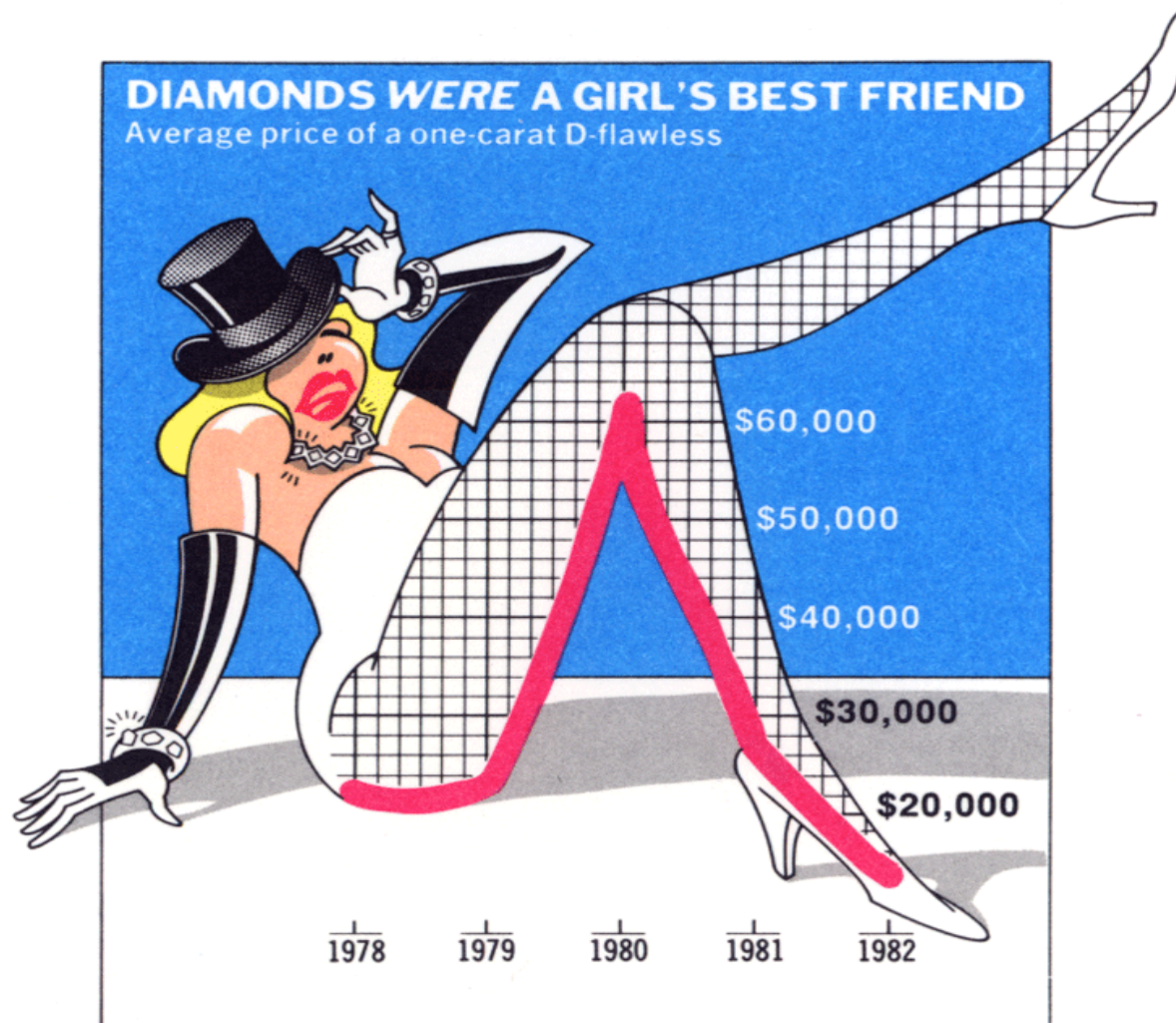
Good: Napoleon's March on Moscow

- Honest Representation of Data
- Visibility and Clarity
- Multiple Layers of Information
- Relevant to Audience
- Avoid Chart Junk



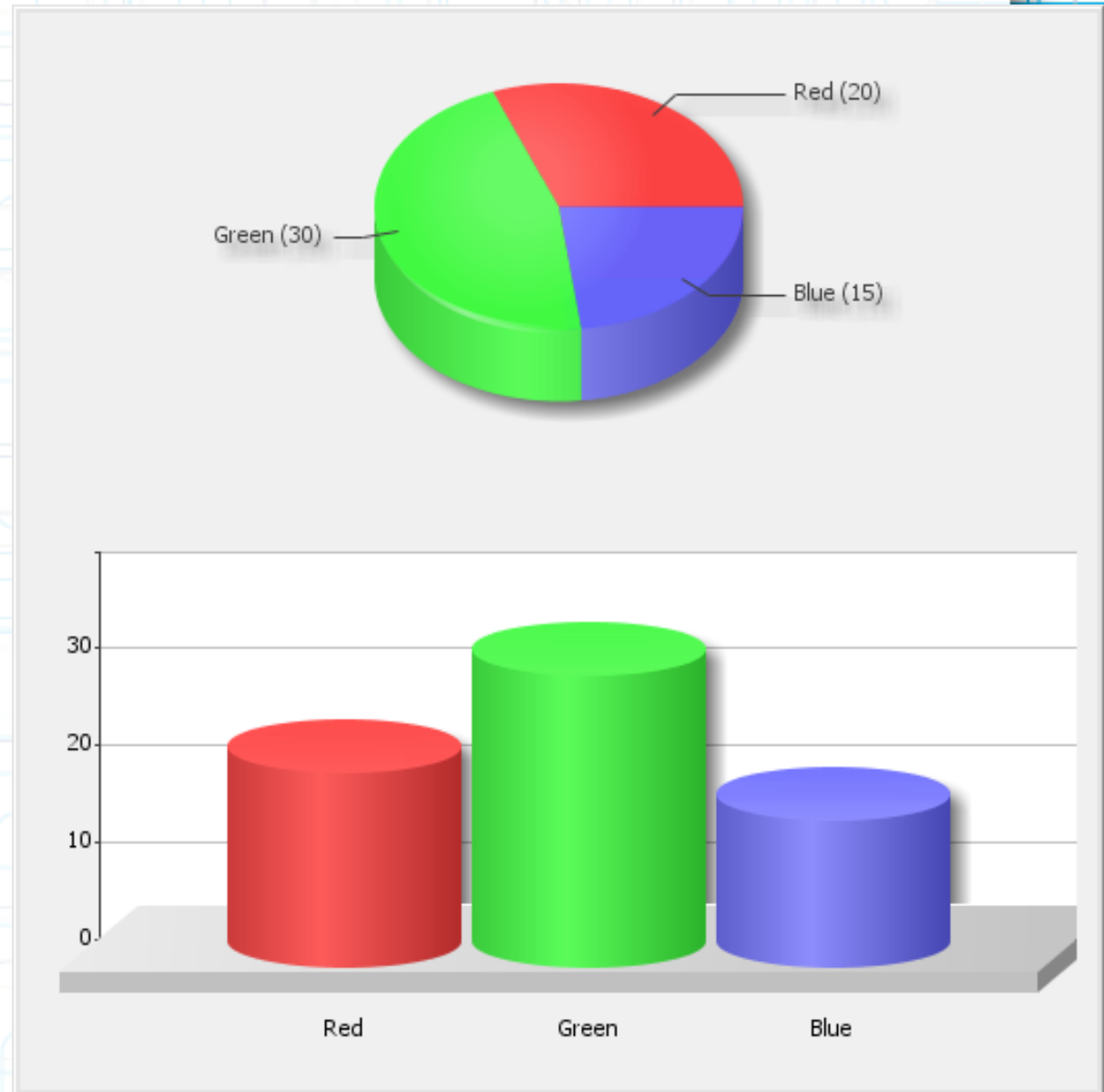
Bad: Diamonds can be Flawed

- Honest Representation of Data
- Visibility and Clarity
- Multiple Layers of Information
- Relevant to Audience
- Avoid Chart Junk



The 3D Bar Chart

- Honest Representation of Data
- Visibility and Clarity
- Multiple Layers of Information
- Relevant to Audience
- Avoid Chart Junk

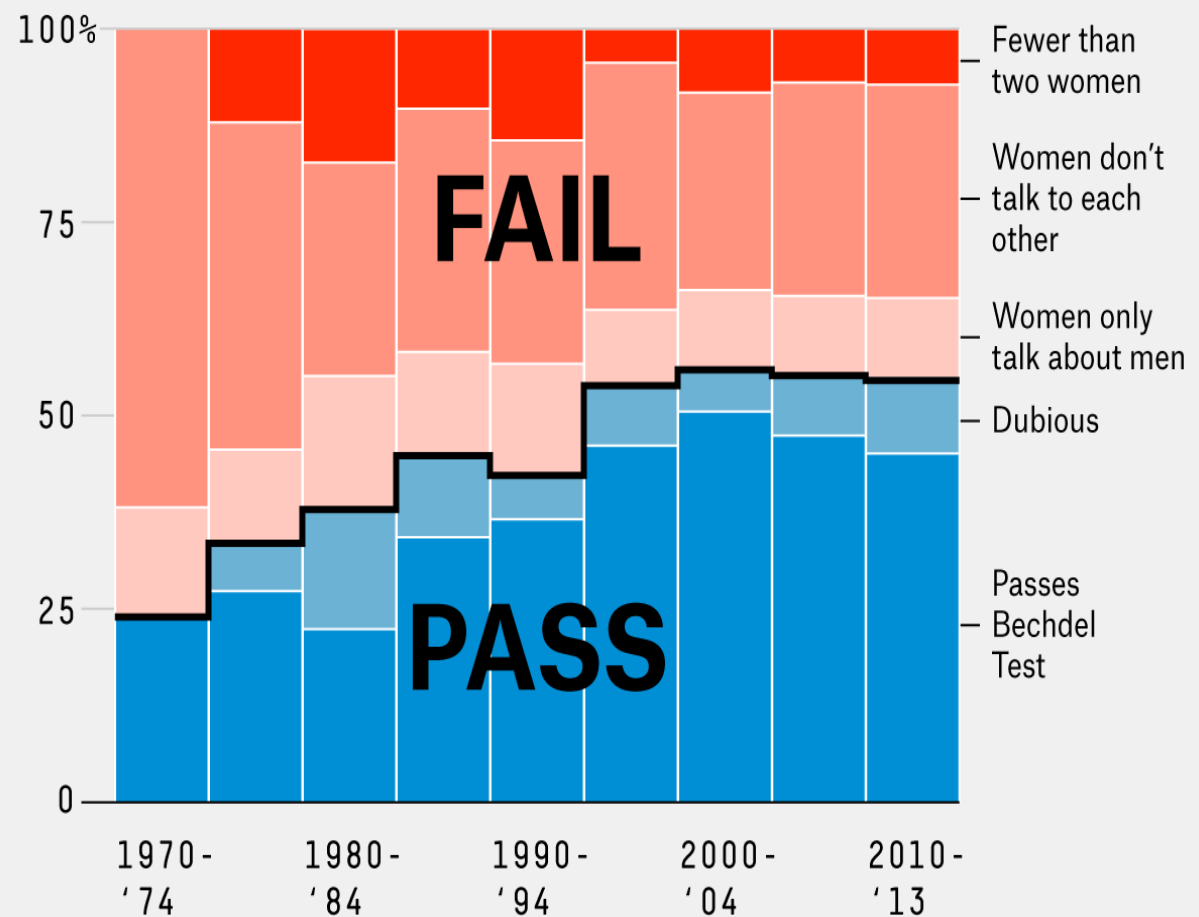


Women in the Movies

- Honest Representation of Data
- Visibility and Clarity
- Multiple Layers of Information
- Relevant to Audience
- Avoid Chart Junk

The Bechdel Test Over Time

How women are represented in movies



The Caffeine Meter

- Honest Representation of Data
- Visibility and Clarity
- Multiple Layers of Information
- Relevant to Audience
- Avoid Chart Junk



The Caffeine Meter

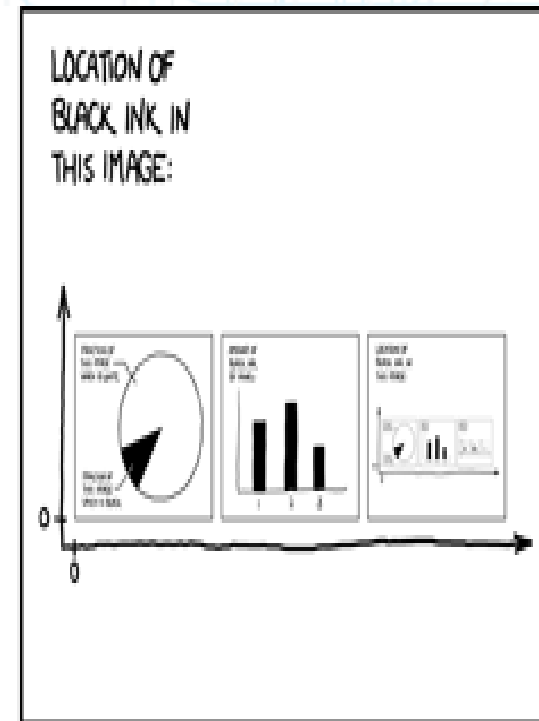
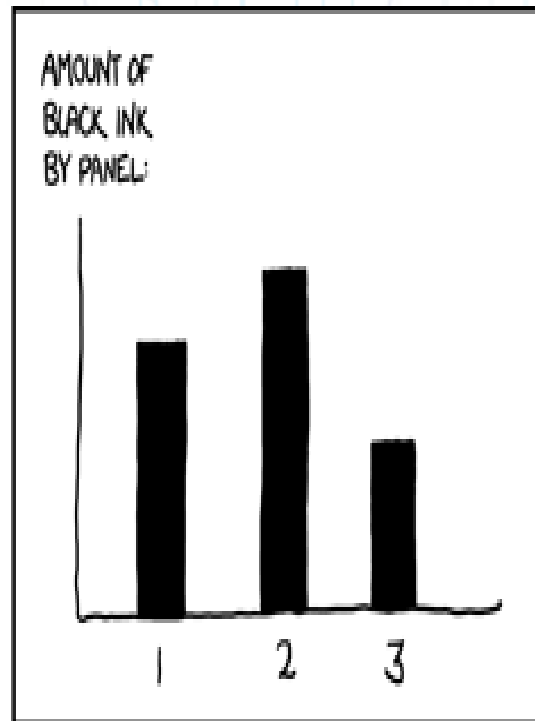
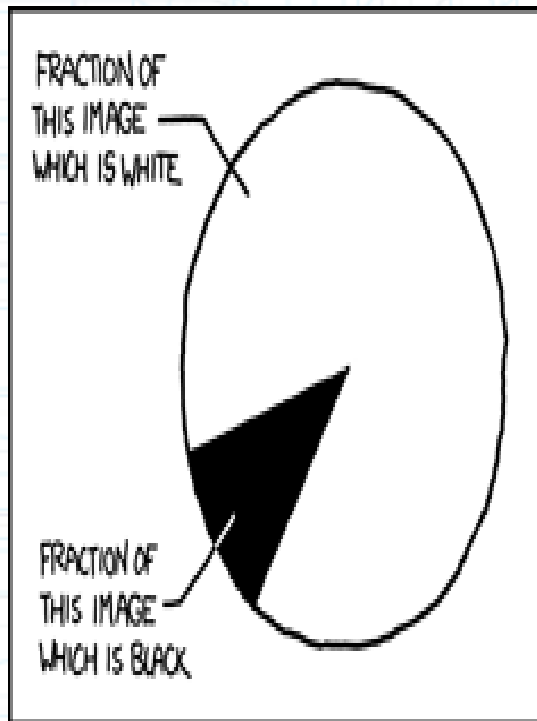
- Honest Representation of Data
- Visibility and Clarity
- Multiple Layers of Information
- Relevant to Audience
- Avoid Chart Junk

CAFF-O-METER† content per serving



† Represents average caffeine content; individual products may vary.

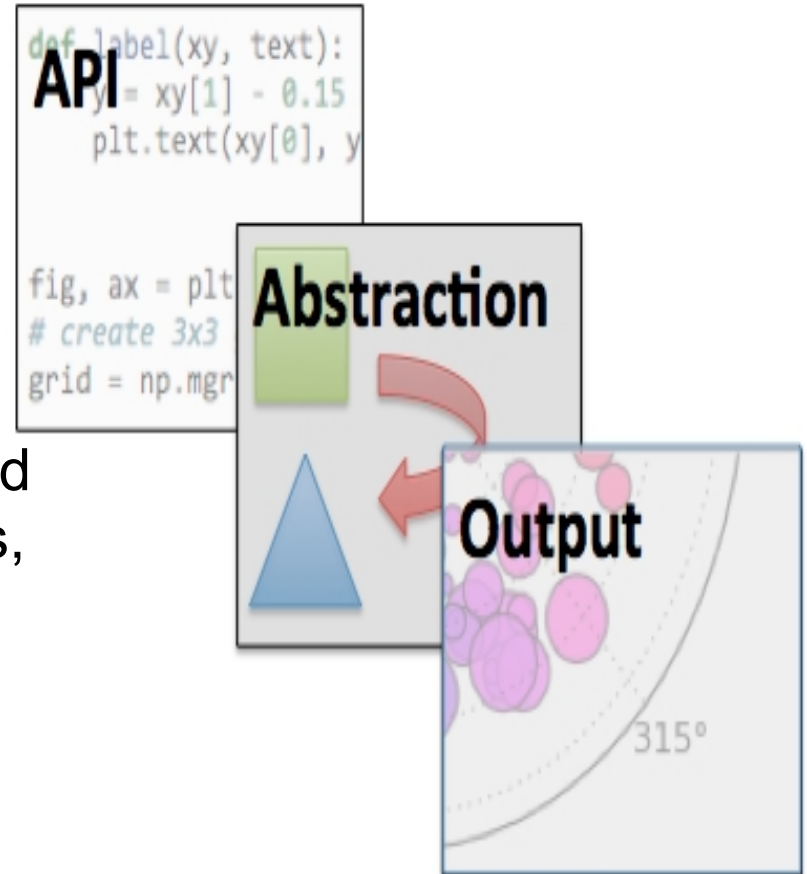
Making Graphics



Tools For Plotting

e.g. Matplotlib

- **API:** both matlab-like (stateful, terse, less powerful) and object-oriented (stateless, verbose, more powerful)
- **Abstraction:** basically a high-powered SVG internal object model
- **Output:**
 - more static backends than you'd ever need: pdf, png, svg, eps, ps, pgf, jpeg...
 - more GUI backends than you'd ever need: Tk, Agg, OSX, GTK, Qt4, WebAgg, ...



Matplotlib Break

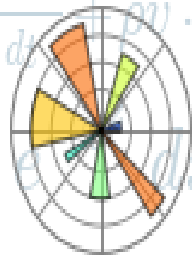
- Step to interactive portion where I do some matplotlib plotting examples

Dylan—do the thing!

matplotlib.org/gallery.html

Summary of Matplotlib

- Great for exploratory analysis
- Good for creating static content
- Try to use as an object-oriented, **stateless** framework
- Modularize your plot objects and parameters

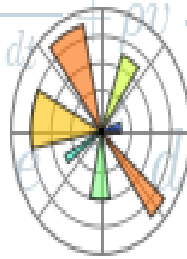


matplotlib

Pros/Cons of Matplotlib

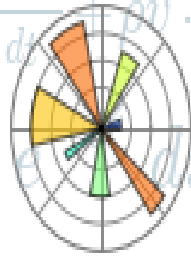
- Old and clunky
- No intermediary objects
- Bad defaults

- *Large Community*
- *REALLY comprehensive*
- *REALLY battle tested*



matplotlib

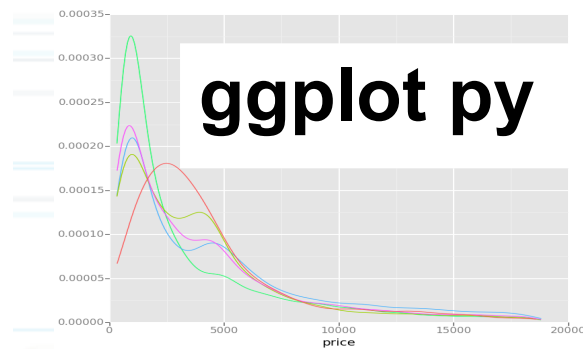
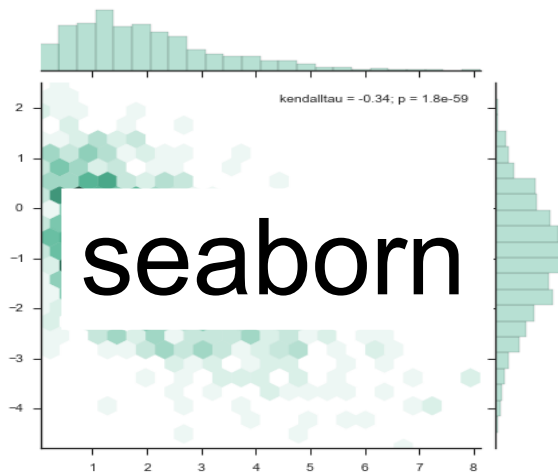
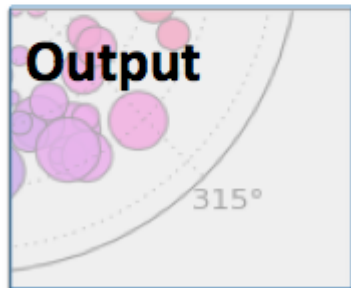
Modified



matplotlib

- A few other libraries exist to solve some of the problems of matplotlib without re-writing functionality.

```
def label(xy, text):  
    API = xy[1] - 0.15  
    plt.text(xy[0], y  
  
fig, ax = plt.subplot  
# create 3x3 grid to  
grid = np.mgrid[0.2:0
```



mpld3

Ditching Matplotlib



Bokeh

Bokeh is probably the best alternative to matplotlib. Specifically designed for web browser presentation.



This combination provides a good interface to the powerful d3 library from python



Designed for web based presentation. Has unique API and online hosting

Tools For Plotting *High Performance*

- These tools are for large data sets where you want some rapid re-plotting. Built upon the standard OpenGL plotting library



Vispy

Interactive Scientific Visualization

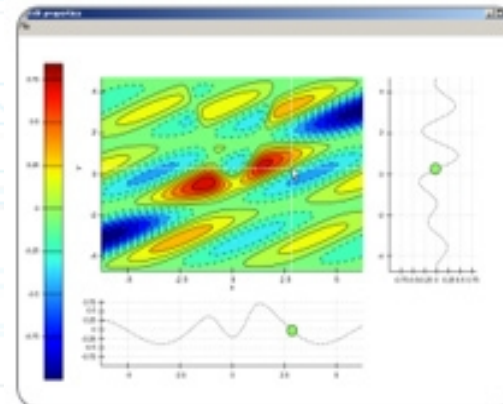


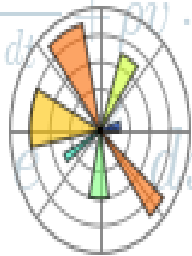
GLUMPY

OPENGL+NUMPY

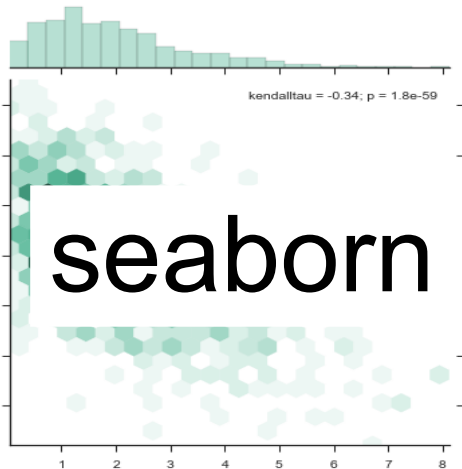
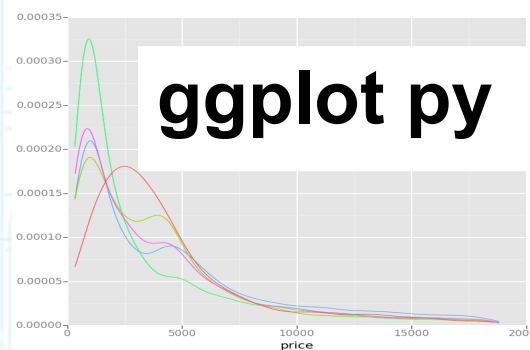
FAST NUMPY VISUALIZATION USING OPENG
[HTTP://CODE.GOOGLE.COM/P/GLUMPY](http://code.google.com/p/glumpy)
CONTACT: NICOLAS.ROUGIER@INRIA.FR

Chaco





matplotlib



Thank You!



Vispy

Interactive Scientific Visualization



Bokeh

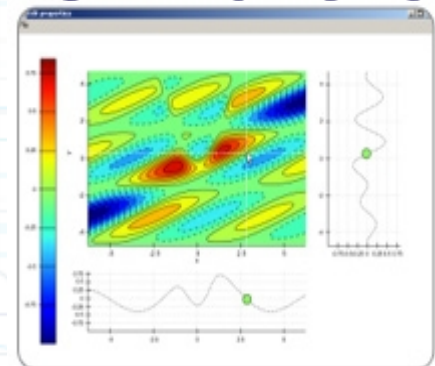
plotly



D3 + Vega + Vincent



Chaco



Last Slide

Other Worthy Plotting Packages

- Bokeh
- Vispy
- Chaco
- Plotxy
- Rpy
- Pyqtgraph
- D3py
- plot.ly

Extensions to Matplotlib

- Seaborn
- Prettyplotlib
- ggplot-py
- Mpltools

- Glue

Graphical Excellence

- Well designed presentation of good data
- Complex ideas communicated with clarity, precision, and efficiency
- Gives the viewer the greatest number of ideas in shortest time with least ink in smallest space
- Nearly always multivariate
- Telling the truth about data

<http://well-formed.eigenfactor.org/radial.html>

