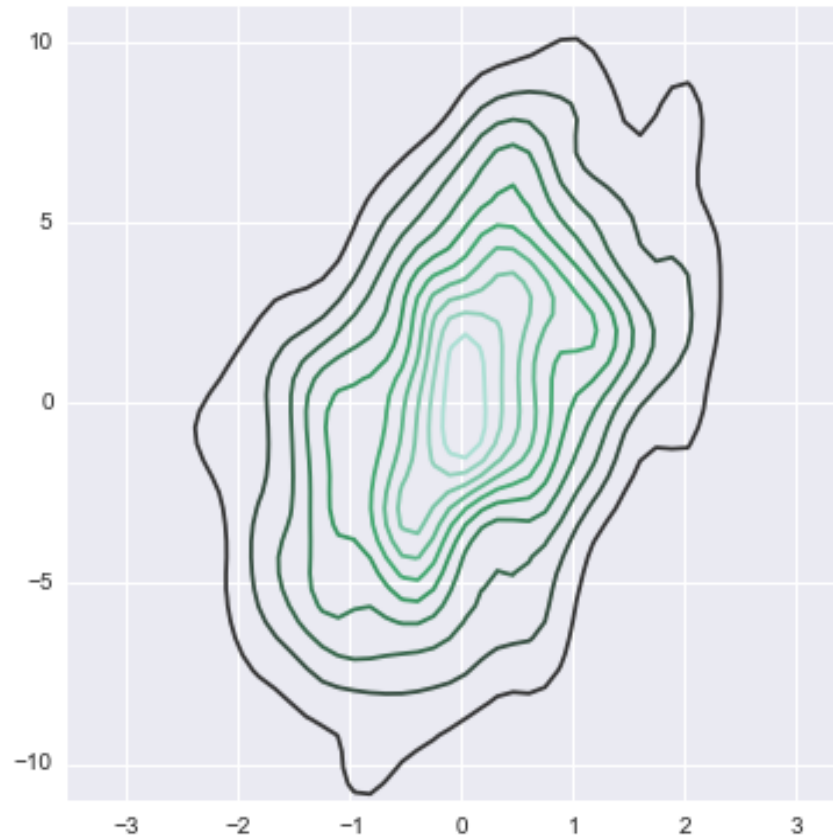
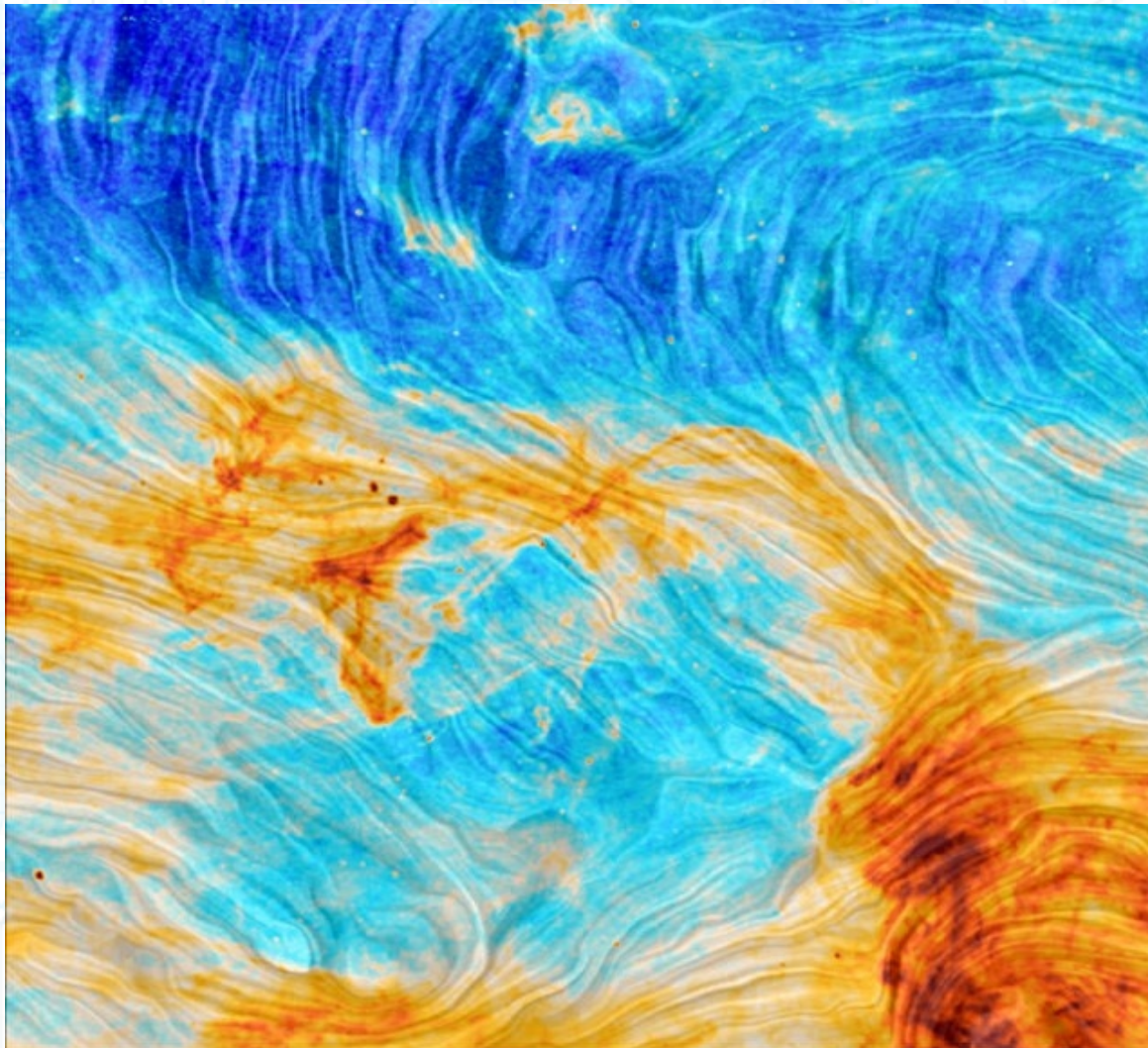


Plotting in Python



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

First, About Plotting Then, About Making Plots



Graphical Excellence

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

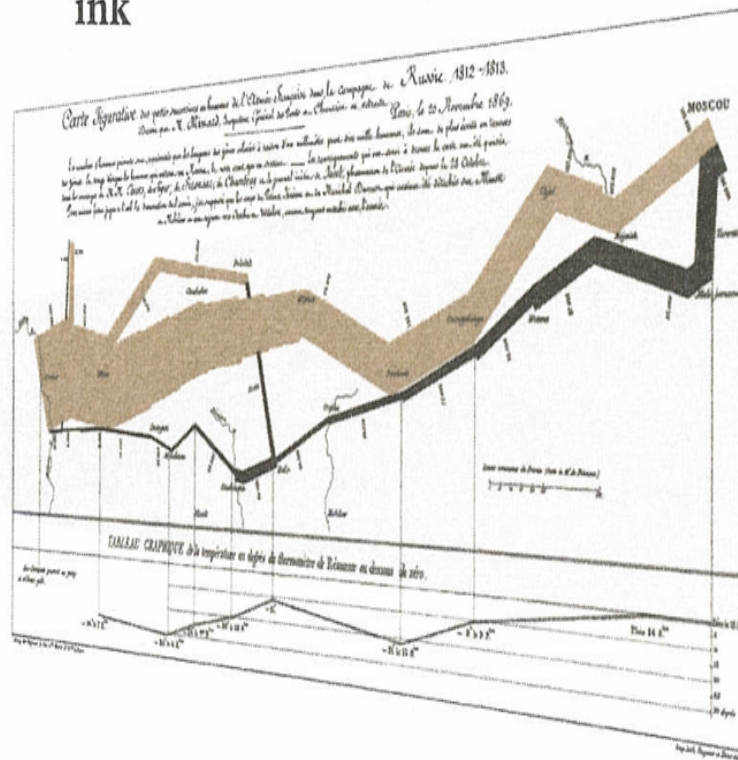
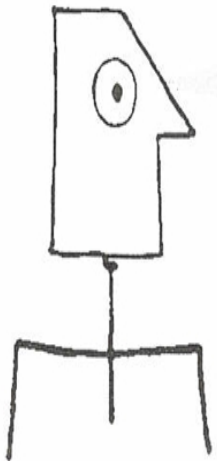
space

ink

ideas

time

Data

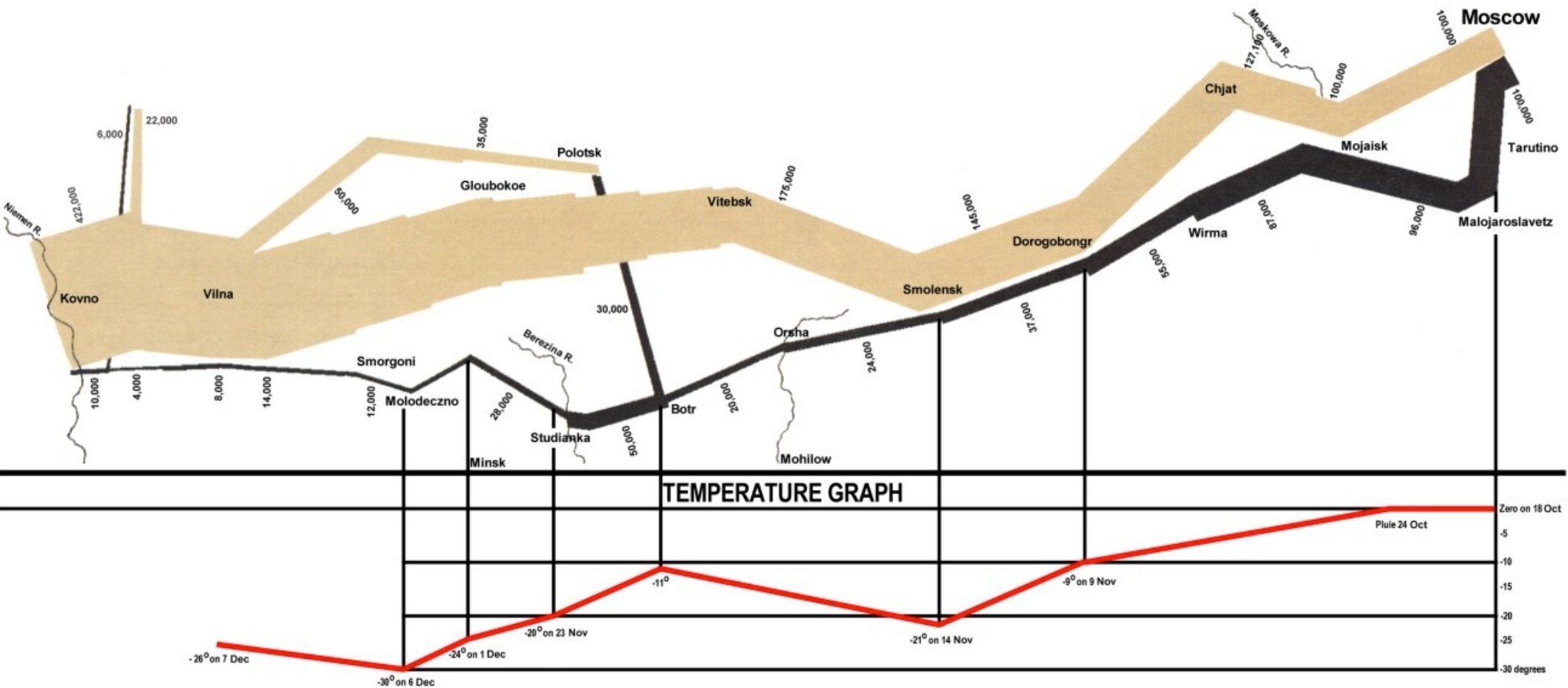


Practical Rules for Graphical Excellence

- Honest Representation of Data
- Visibility and Clarity
- Multiple Layers of Information
- Tailored for your Audience
- Avoid Chart Junk

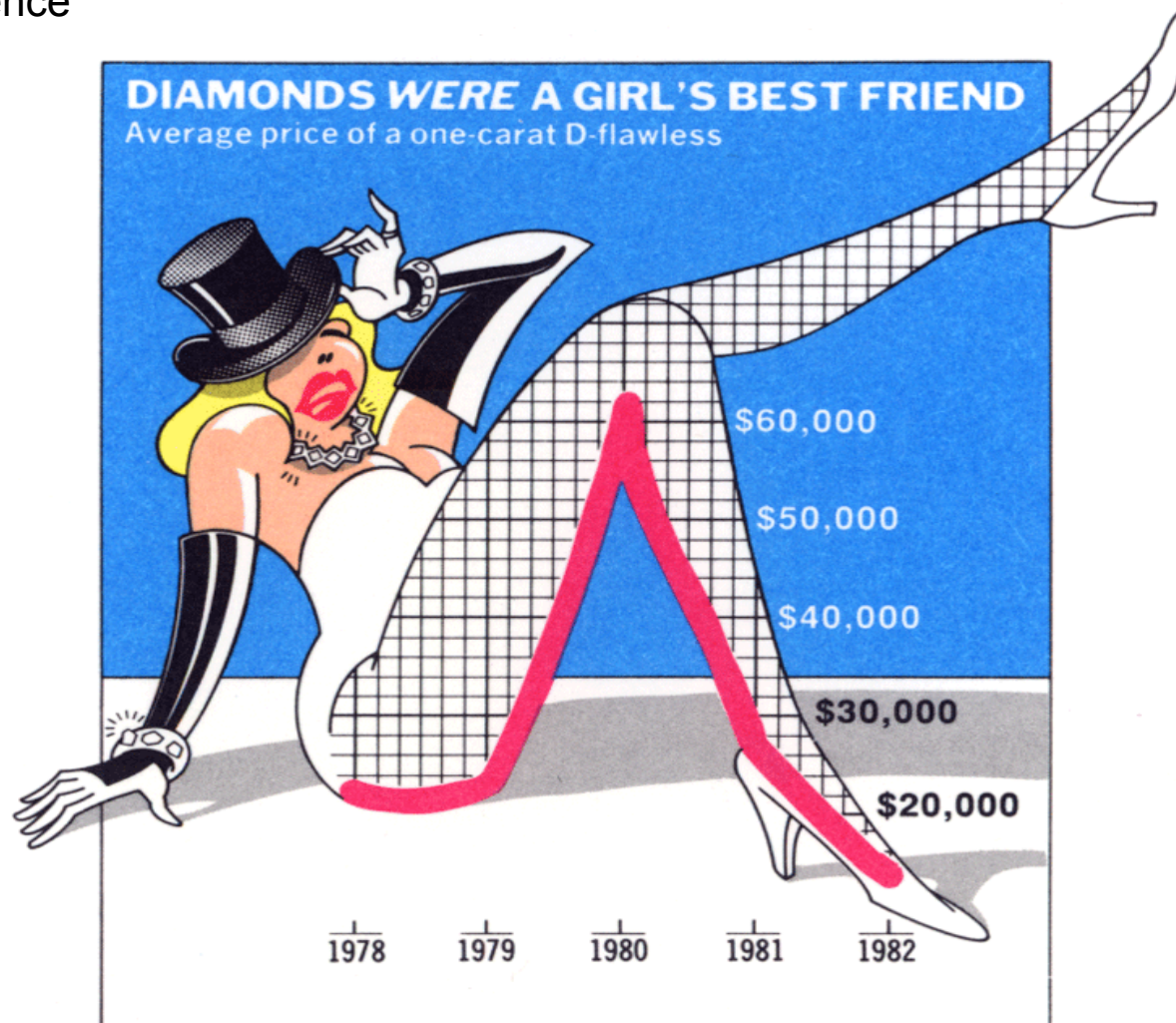
Good: Napoleon's March on Moscow

- Honest Representation of Data
- Visibility and Clarity
- Multiple Layers of Information
- Tailored for your Audience
- Avoid Chart Junk



Bad: Diamonds can be Flawed

- Honest Representation of Data
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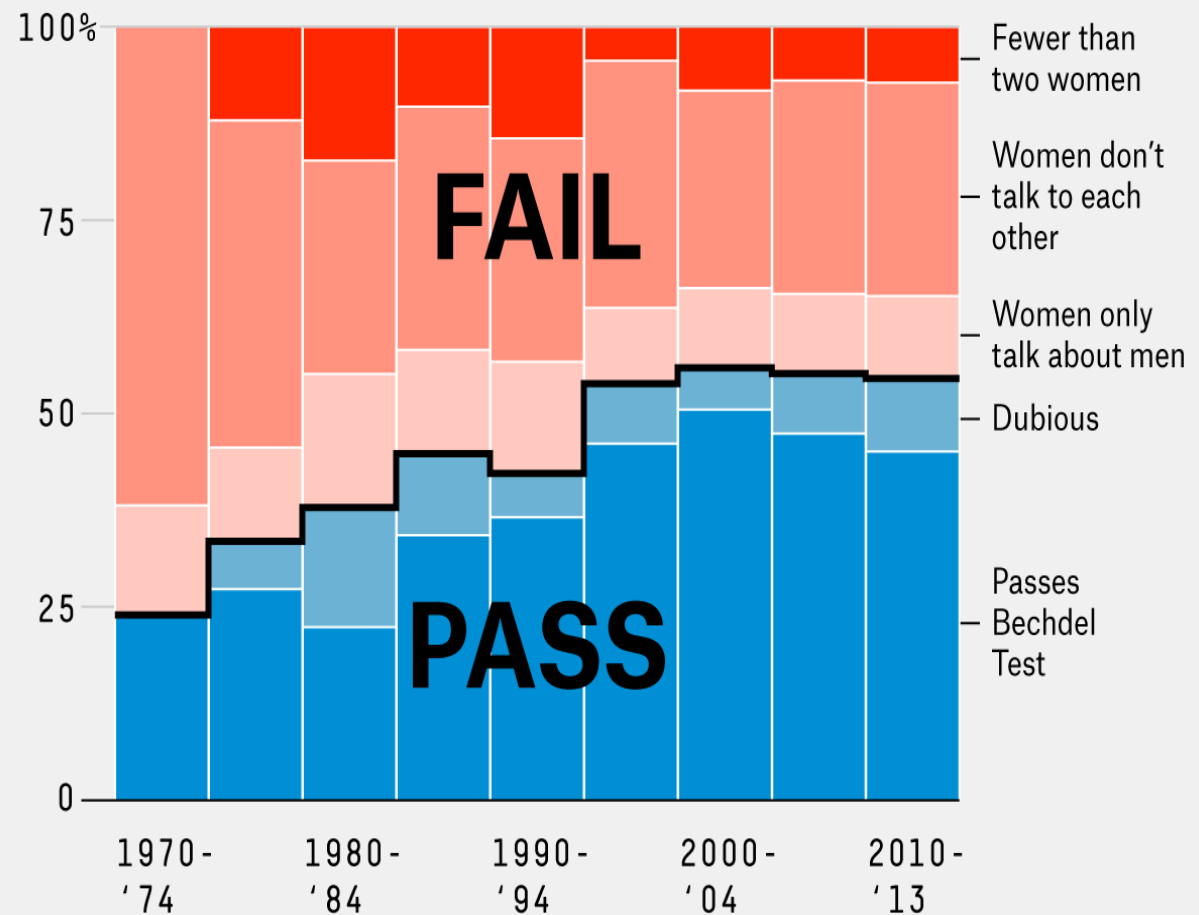


Women in the Movies

- Honest Representation of Data
- Visibility and Clarity
- Multiple Layers of Information
- Tailored for your Audience
- Avoid Chart Junk

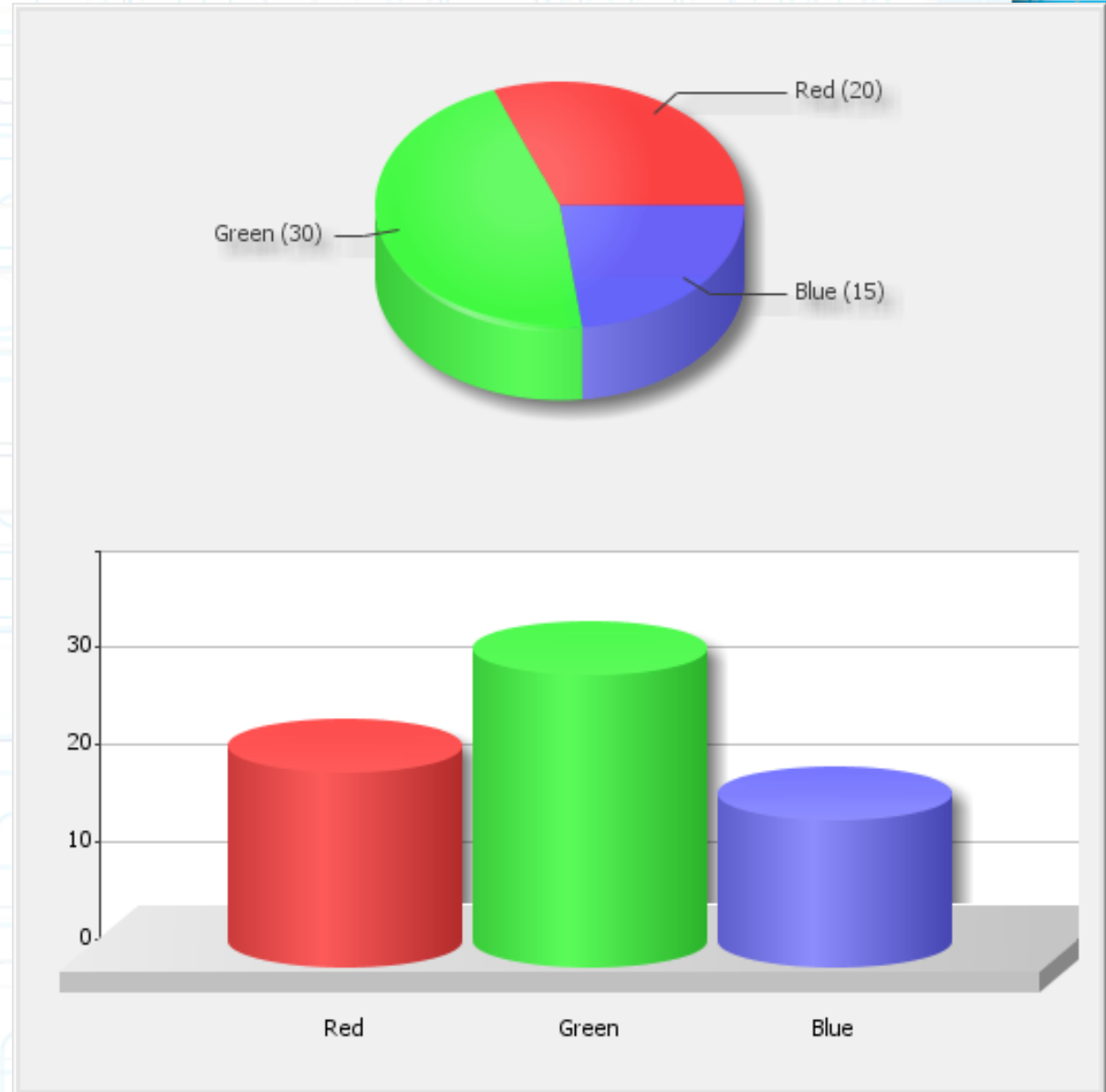
The Bechdel Test Over Time

How women are represented in movies



The 3D Bar Chart

- Honest Representation of Data
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- Avoid Chart Junk



The Caffeine Meter

- Honest Representation of Data
- Visibility and Clarity
- Multiple Layers of Information
- Tailored for your Audience
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The Caffeine Meter

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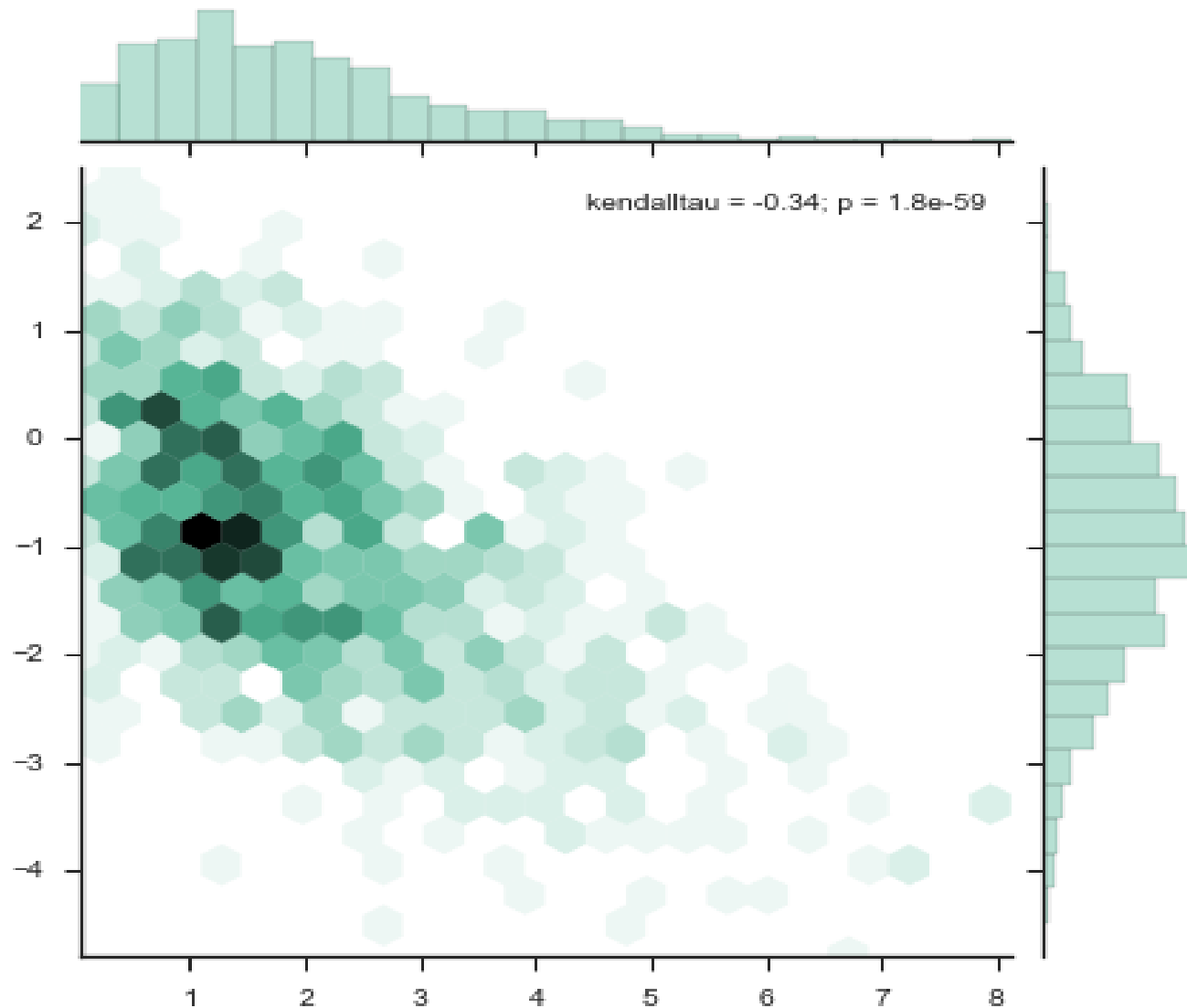
CAFF-O-METER† content per serving



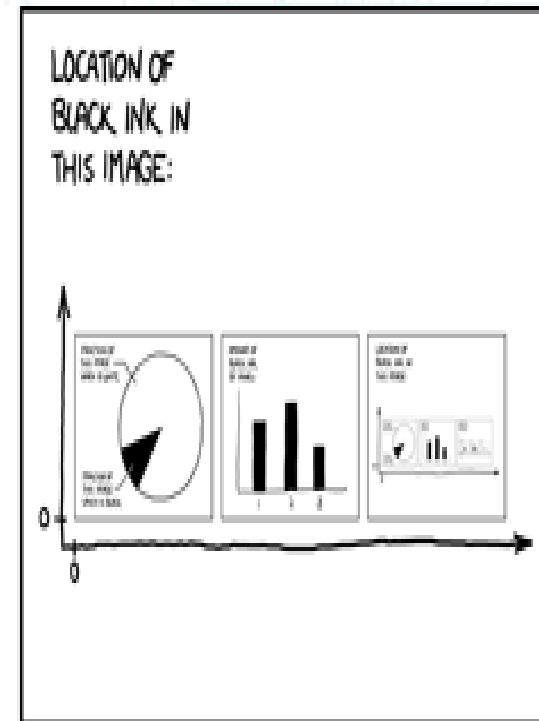
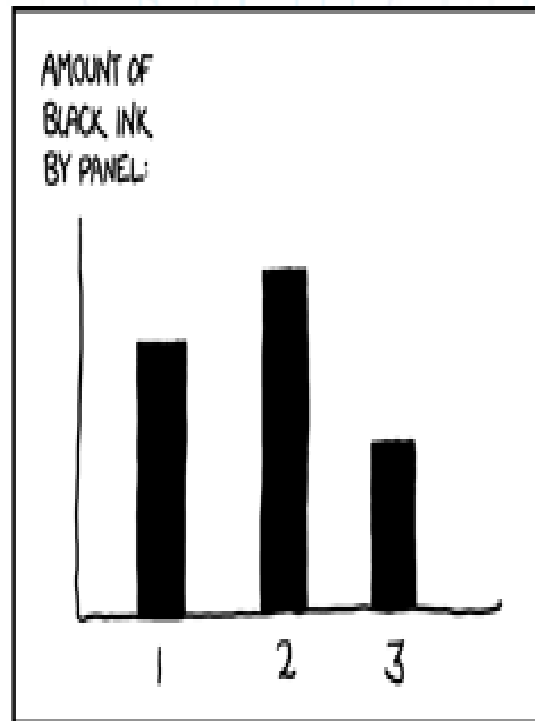
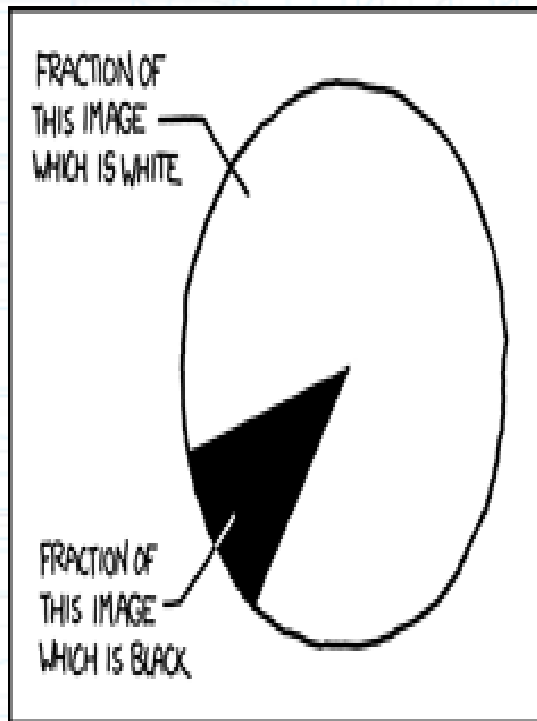
† Represents average caffeine content; individual products may vary.

Hexbin and histogram

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- Multiple Layers of Information
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- Avoid Chart Junk



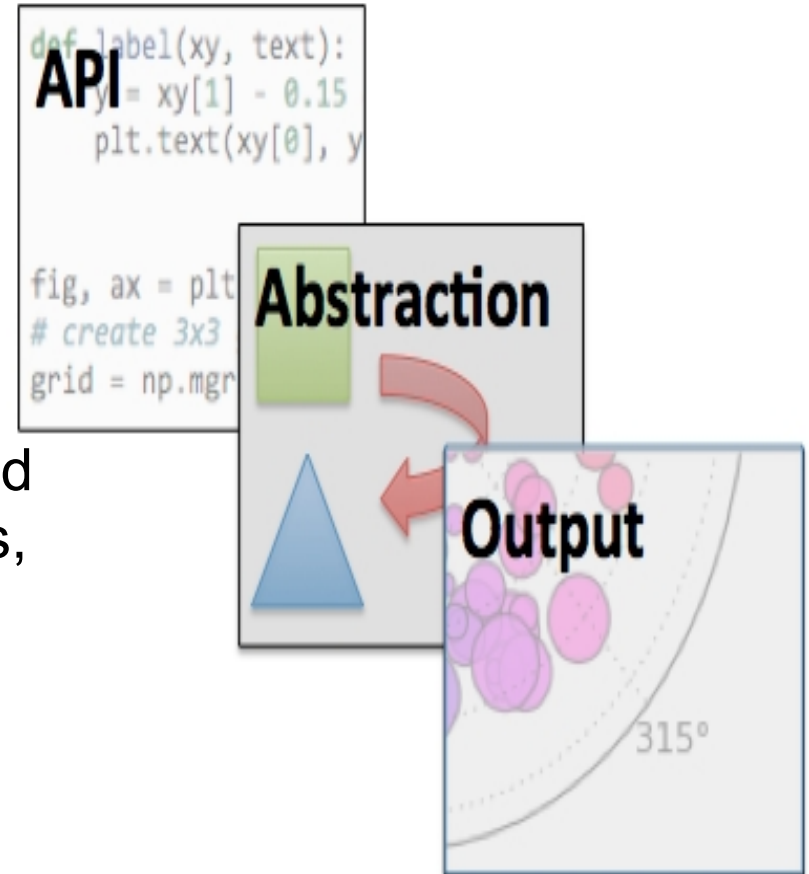
Making Graphics



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

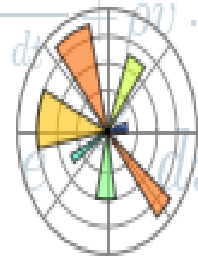
- Step to interactive portion where I do some matplotlib plotting examples

Dylan—do the thing!

matplotlib.org/gallery.html

Summary of Matplotlib

- Great for exploratory analysis
- Good for creating static content
- Use as an object-oriented, **stateless** framework
- Modularize your plot objects and parameters
- Separate your data analysis from plotting

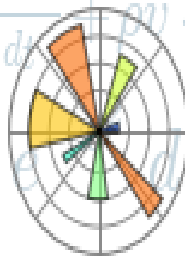


matplotlib

Pros/Cons of Matplotlib

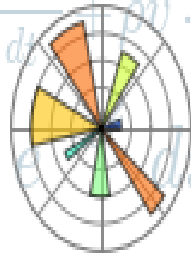
- Old and clunky
- No intermediary objects
- Bad defaults

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



matplotlib

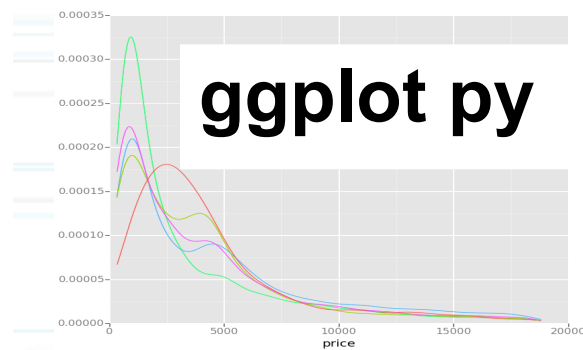
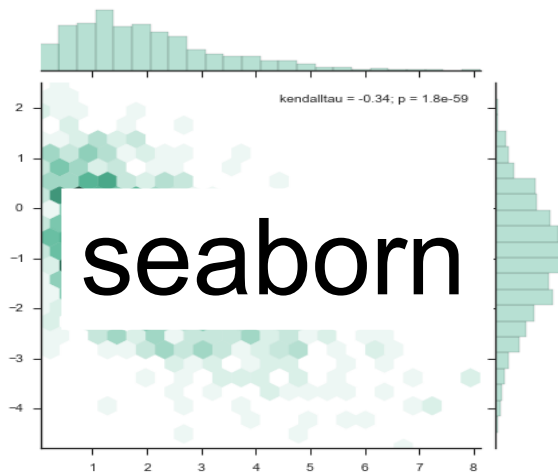
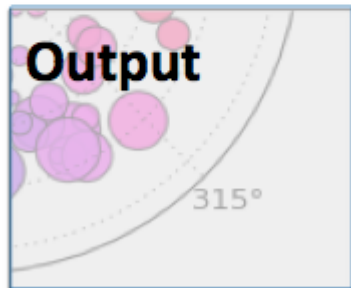
Modified



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

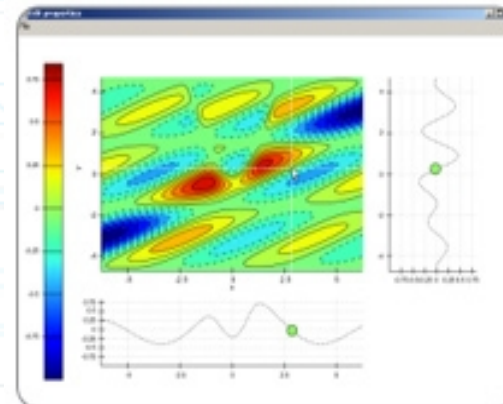


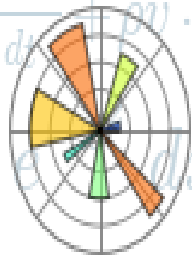
GLUMPY

OPENGL+NUMPY

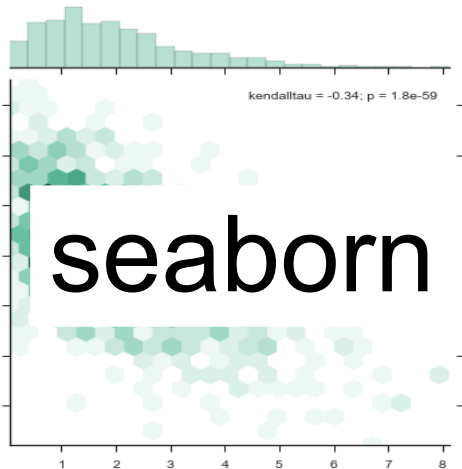
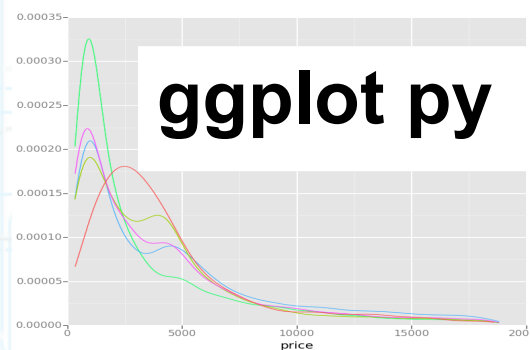
FAST NUMPY VISUALIZATION USING OPENG
[HTTP://CODE.GOOGLE.COM/P/GLUMPY](http://code.google.com/p/glumpy)
CONTACT: NICOLAS.ROUGIER@INRIA.FR

Chaco





matplotlib



Thank You!



Vispy

Interactive Scientific Visualization



Bokeh

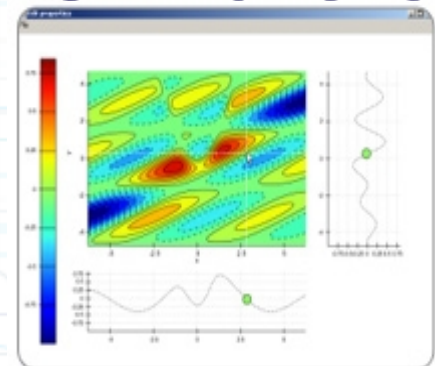
plotly



D3 + Vega + Vincent



Chaco



Extra Slides >

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

Cross Subject Citations

- Honest Representation of Data
- Visibility and Clarity
- Multiple Layers of Information
- Tailored for your Audience
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