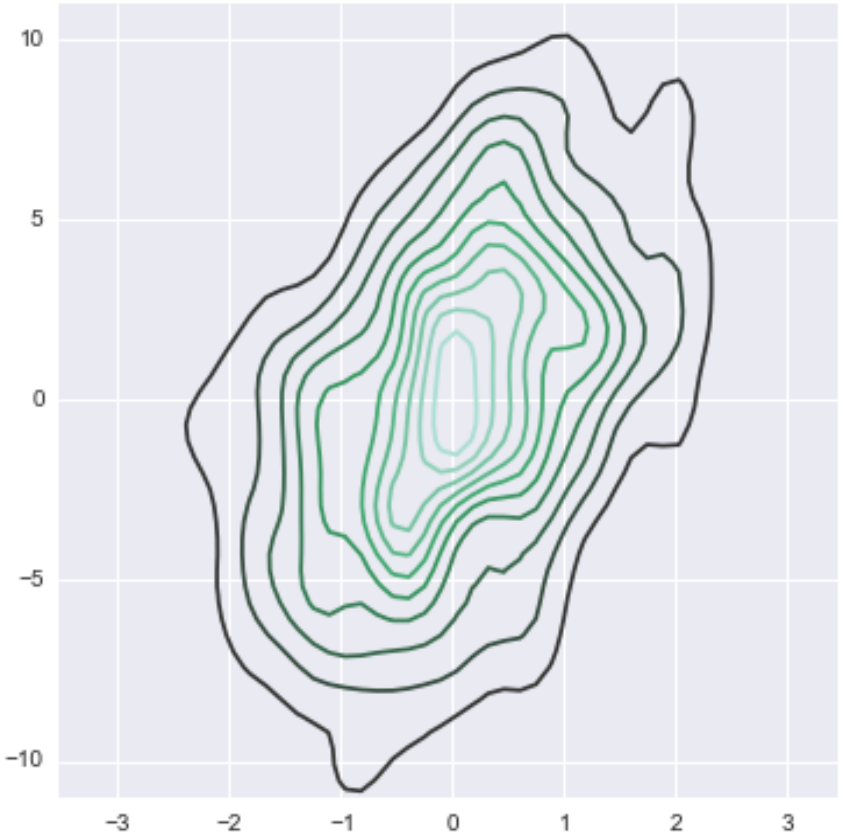
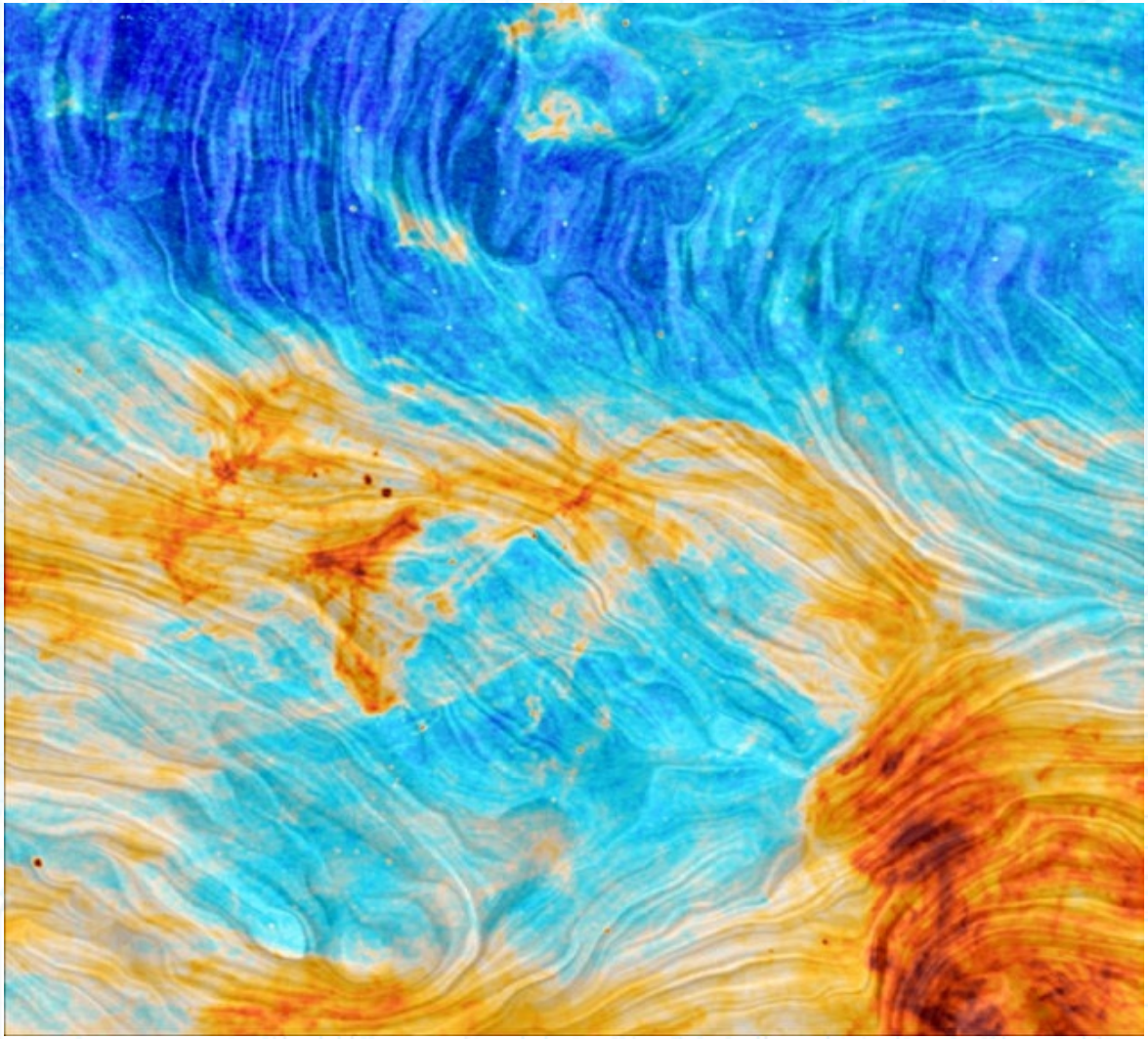
Plotting in Python



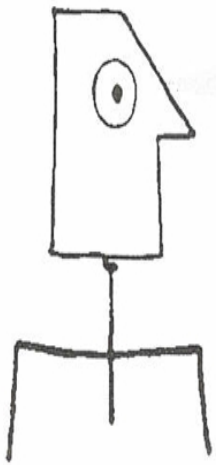
Presented by Dylan Gregersen
astrodsg.github.io

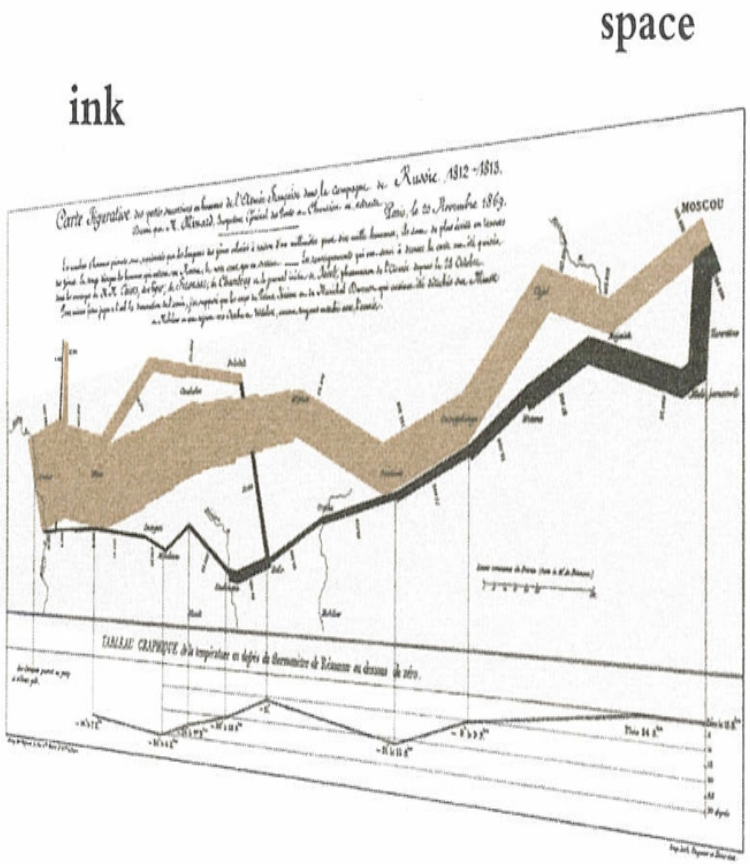
First, About Plotting
Then, About Making Plots



Graphical Excellence

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





Data

The Visual Display of Quantitative Information - Tufte

Practical Rules for Graphical Excellence

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

Good: Nepolean's March on Moscow

- Honest Representation of Data
- Visibility and Clarity
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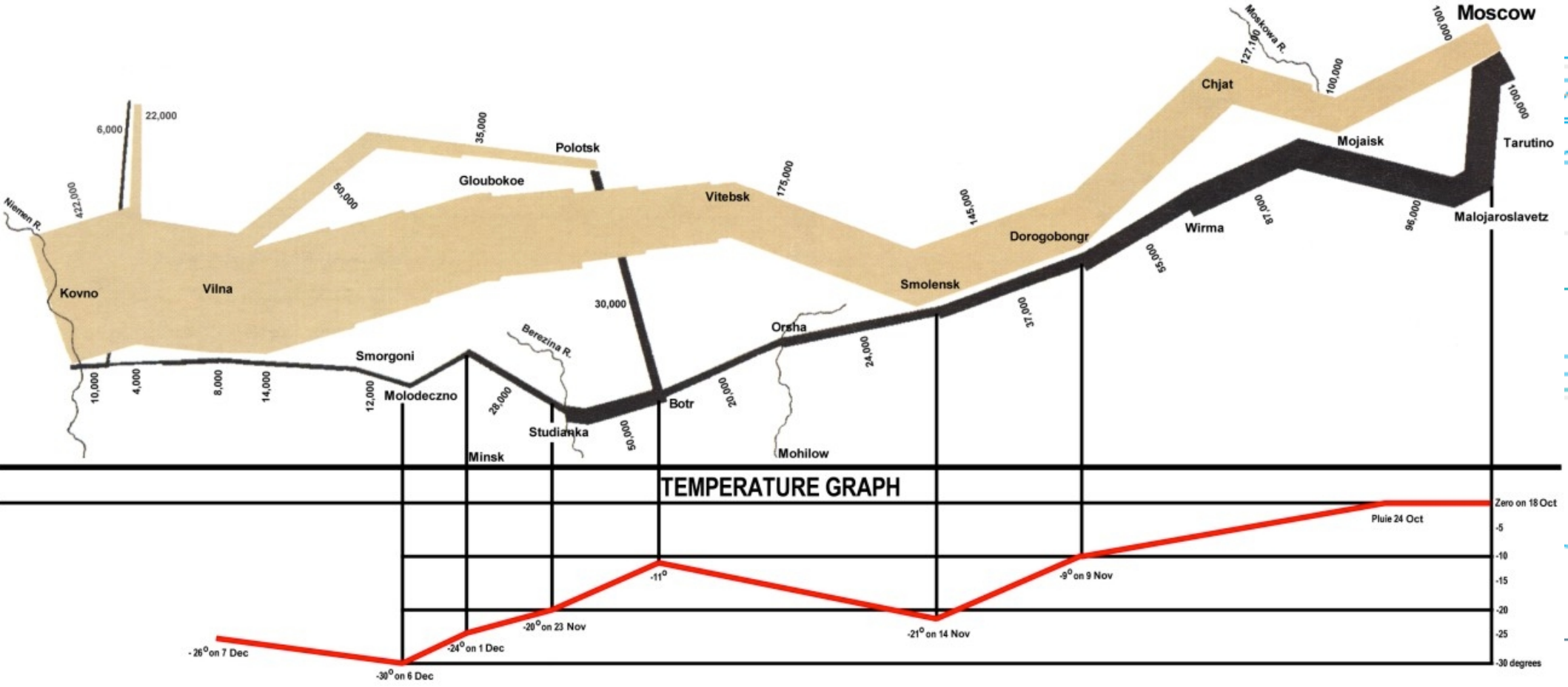

Bad: Diamonds can be Flawed

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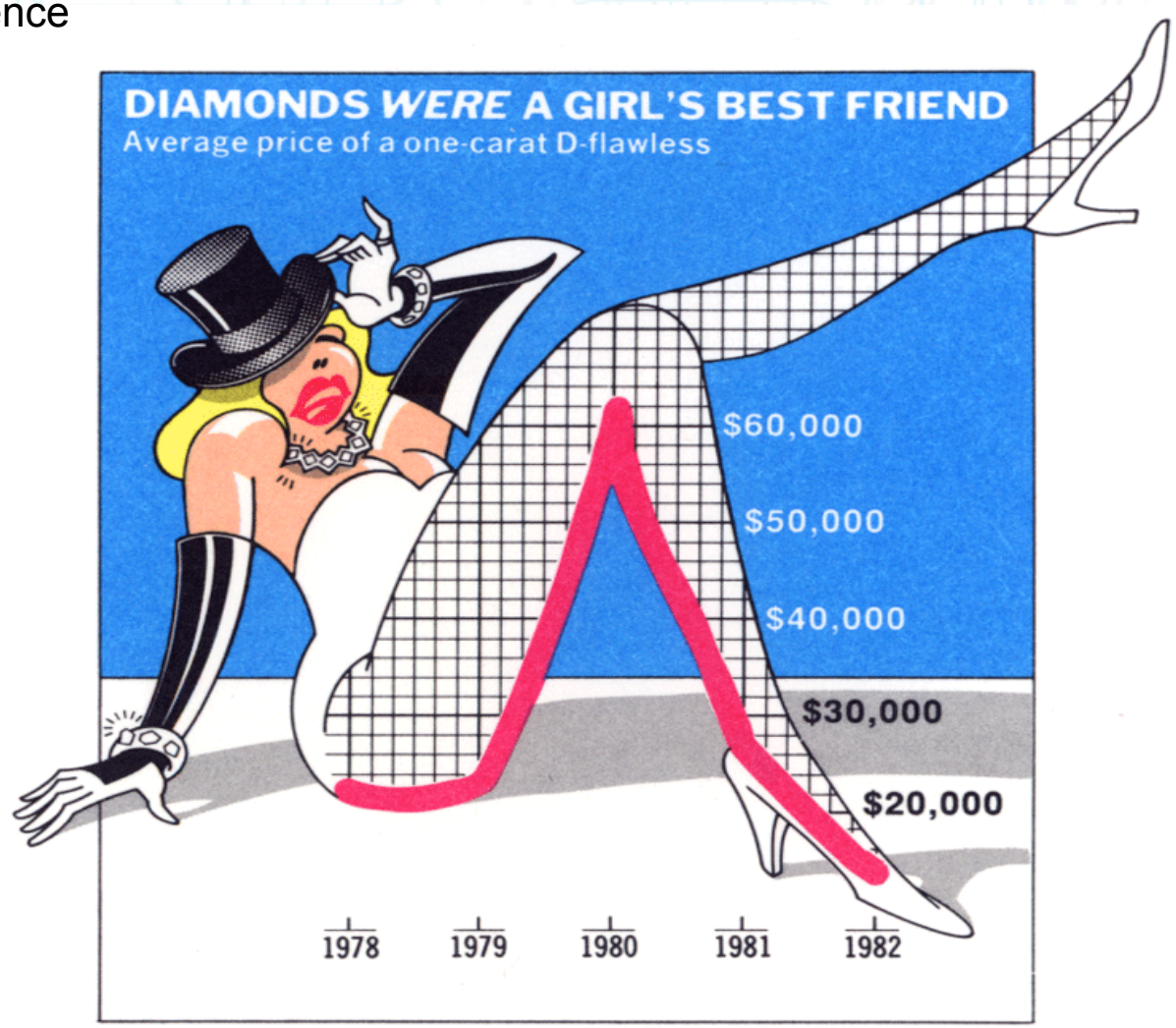

Women in the Movies

- Honest Representation of Data
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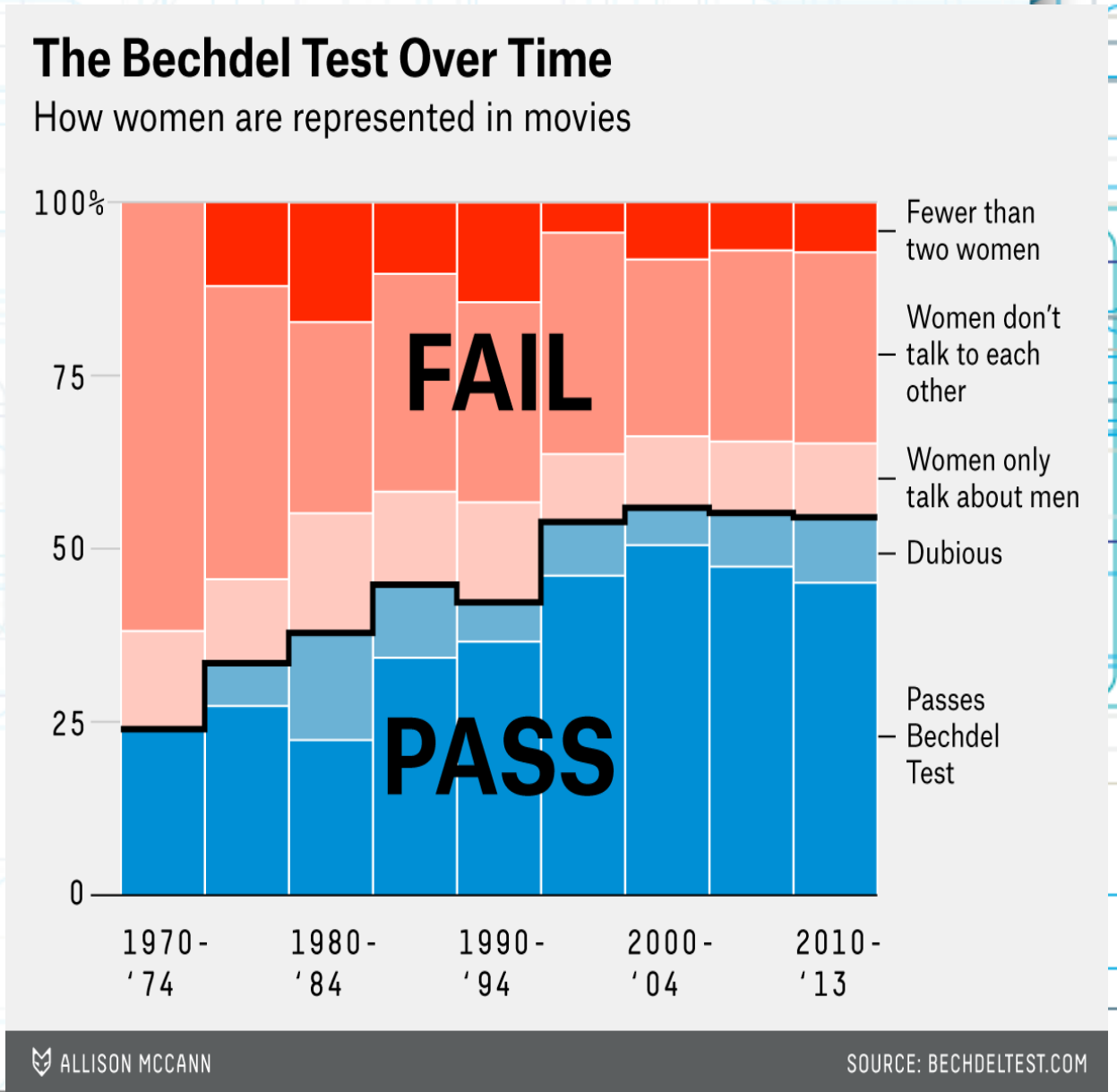
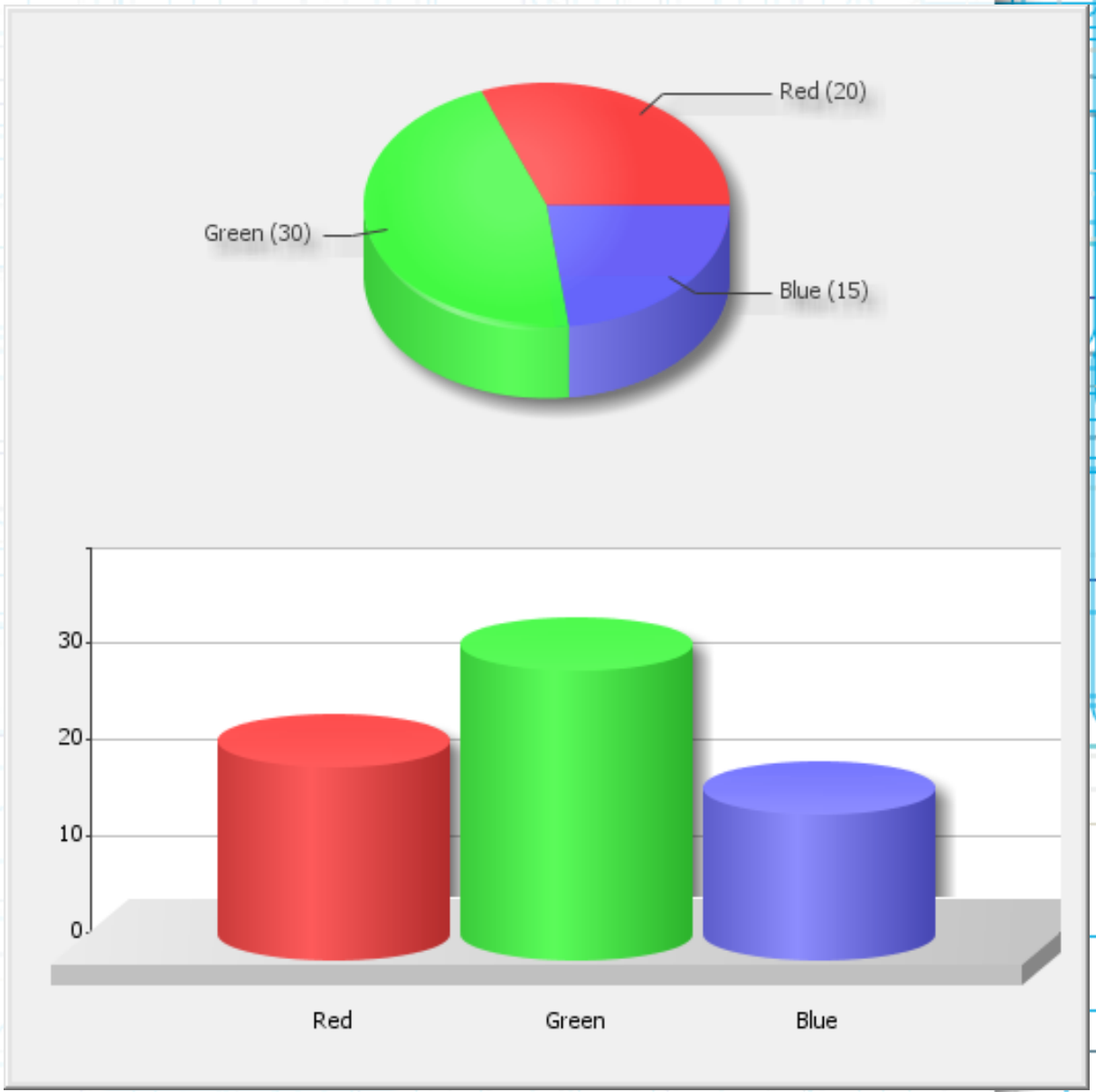


The 3D Bar Chart

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



The Caffeine Meter

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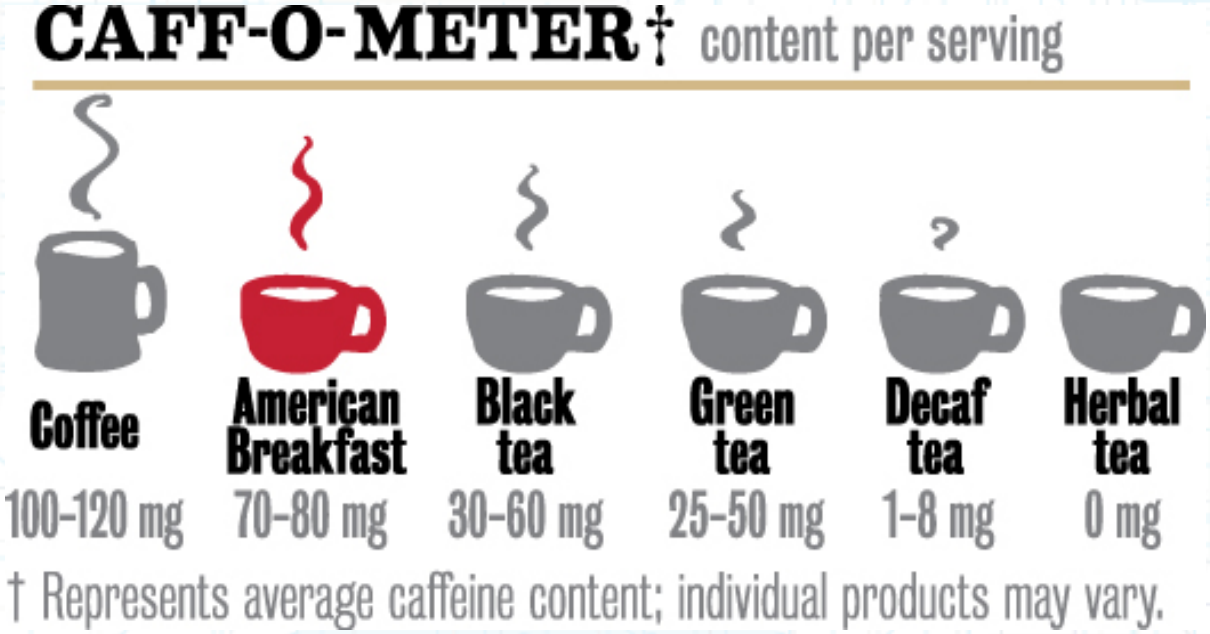
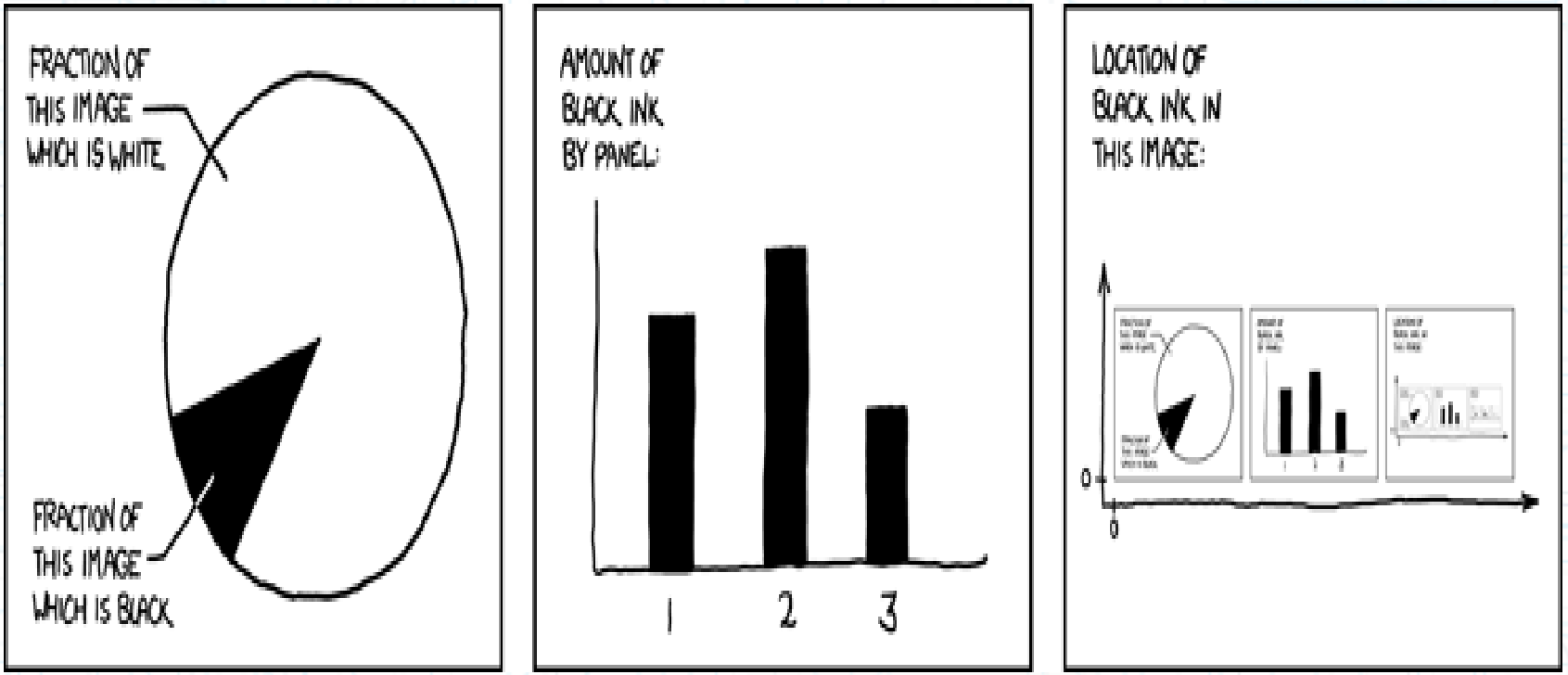
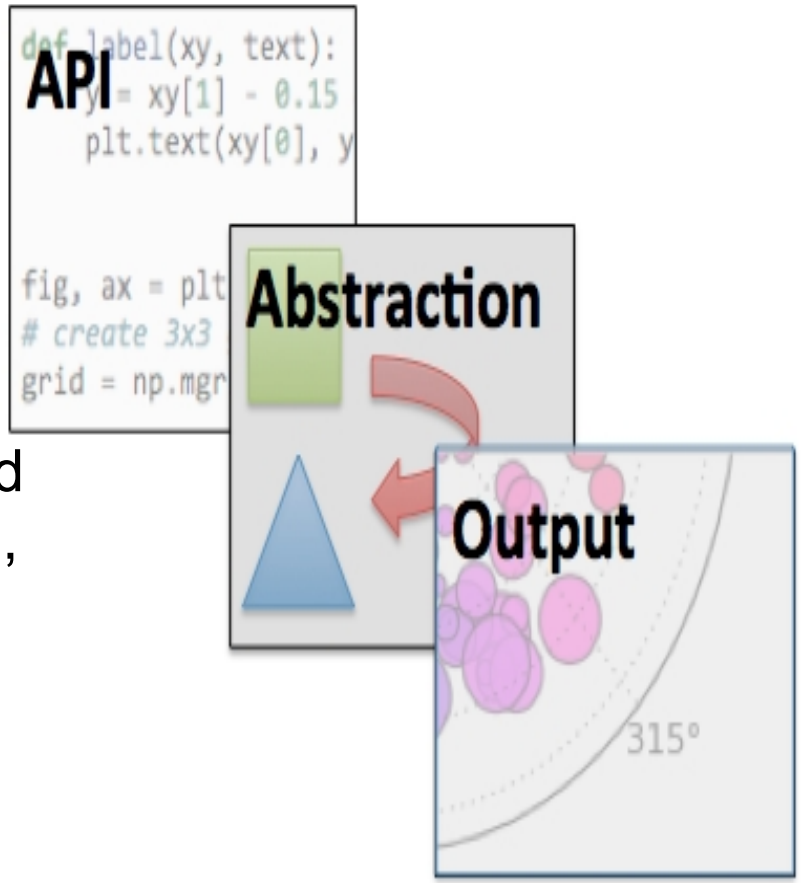


Making Graphics



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, ...



Credit: Jake Vanderplas *jakevdp*

Matplotlib Break

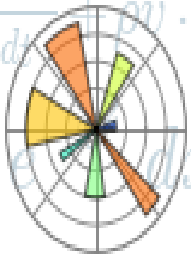
- Step to interactive portion where I do some matplotlib plotting examples

Dylan—do the thing!

matplotlib.org/gallery.html

Summary of Matplotlib

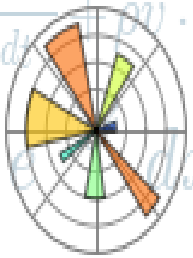
- Great for exploratory analysis
- Good for creating static content
- Try to use as an object-oriented, state**less** framework
- Modularize your plot objects and parameters



matplotlib

Pros/Cons of Matplotlib

- Old and clunky
- No intermediary objects
- Bad defaults

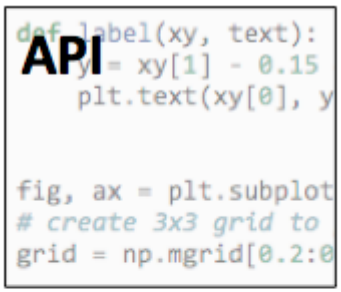


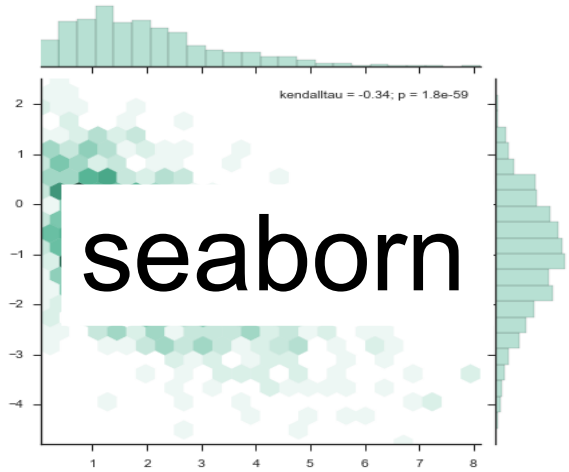
matplotlib

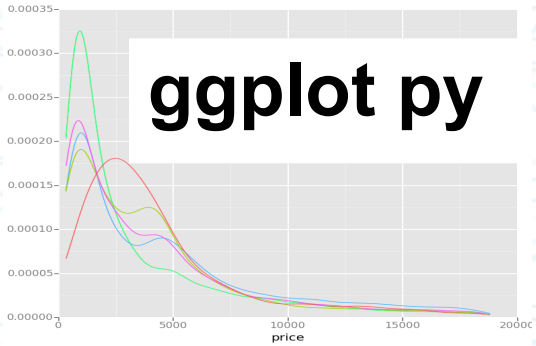
- *Large Community*
- *REALLY comprehensive*
- *REALLY battle tested*

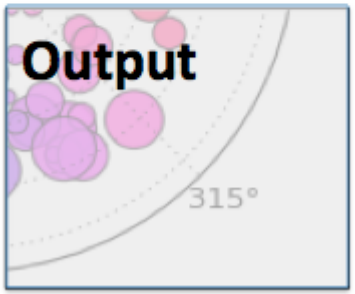
Modified matplotlib

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









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

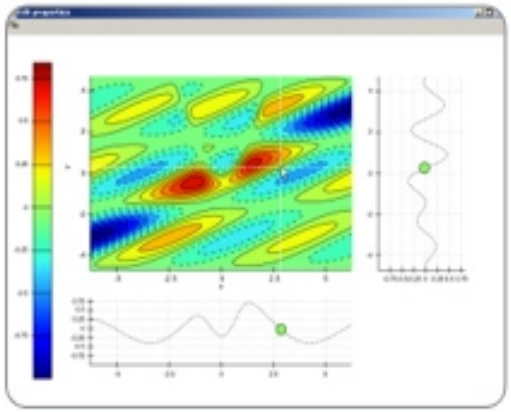
BSD LICENSED

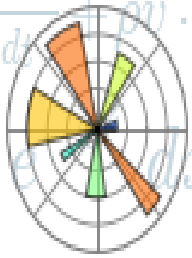
GLUMPY

OPENGL+NUMPY

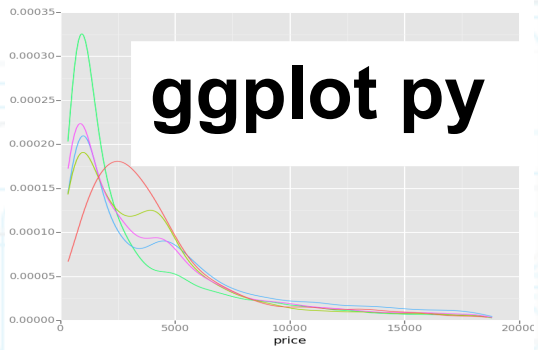
FAST NUMPY VISUALIZATION USING OPENGL
HTTP://CODE.GOOGLE.COM/P/GLUMPY
CONTACT: NICOLAS.ROUGIER@INRIA.FR

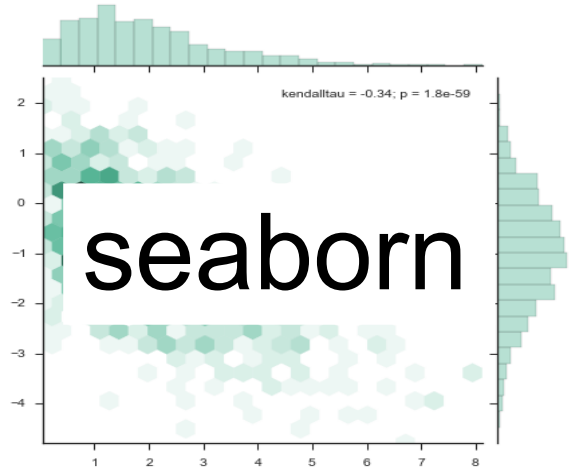
Chaco





matplotlib





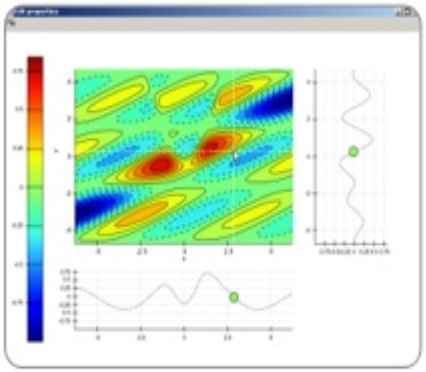
Thank You!

Vispy

Interactive Scientific Visualizati

Bokeh

Chaco



plotly

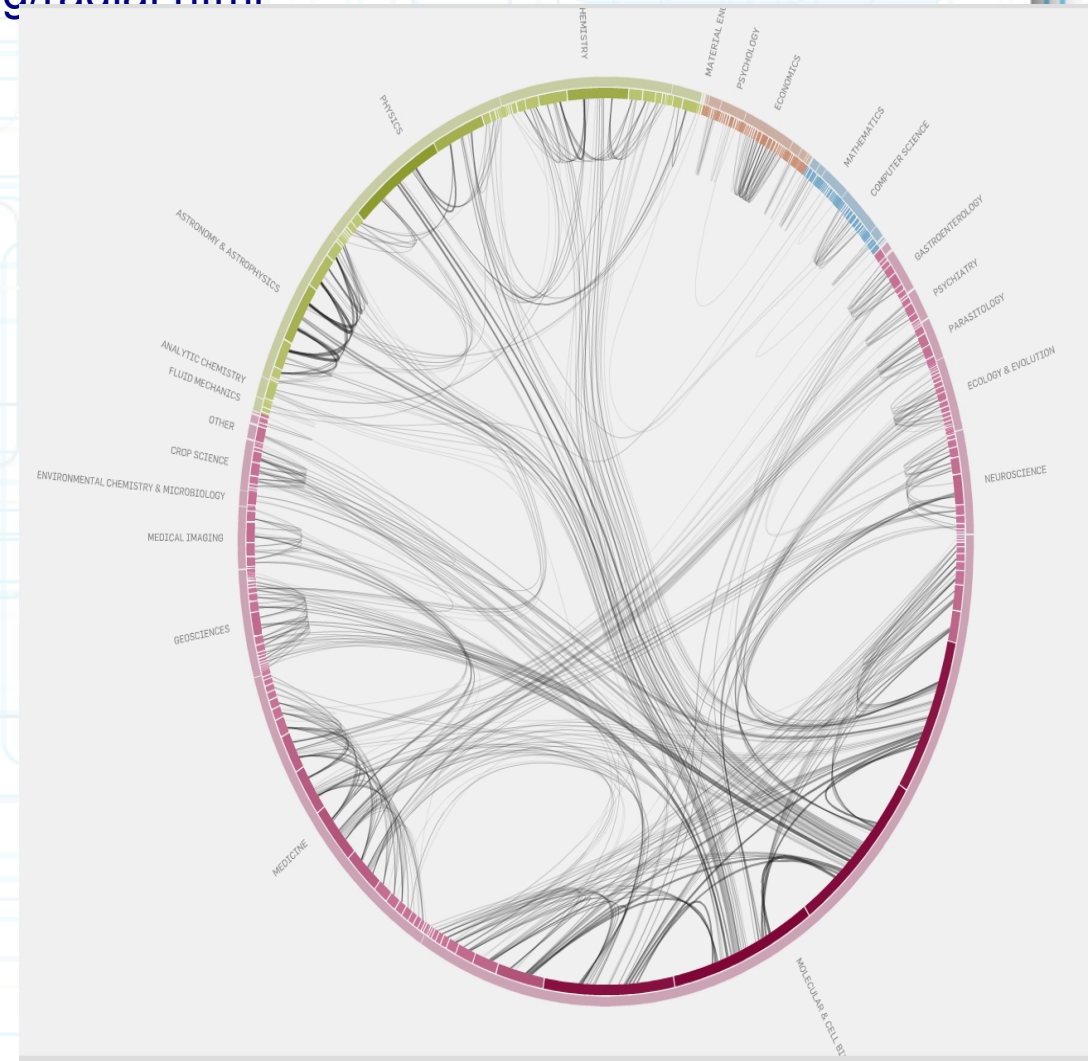
D3 + Vega + Vincent

Extra Slides >

Other Worthy Plotting Packages

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

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



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