# From Colombia to Jupyter:

## an odd path through physics, open source software and data science

Fernando Pérez

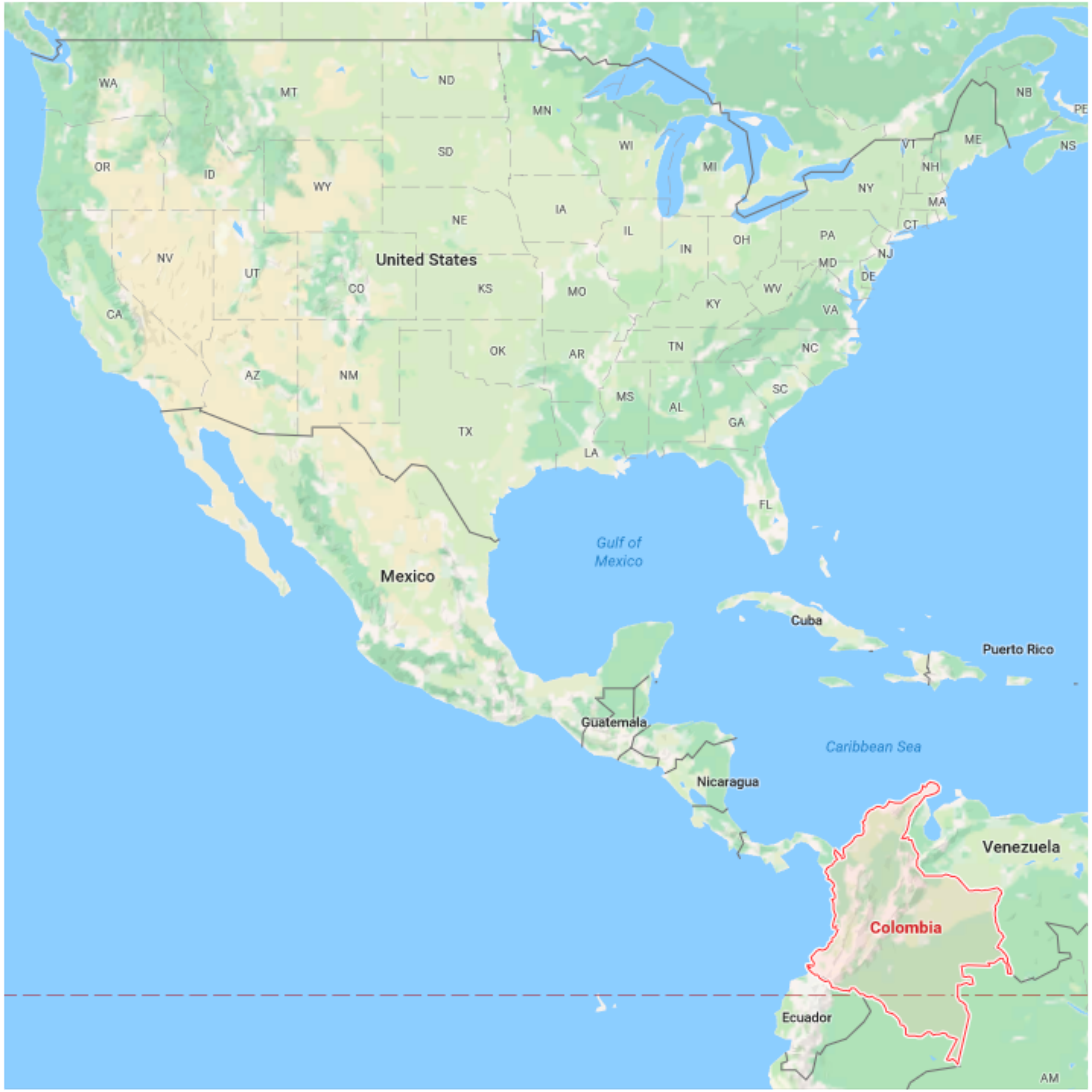
fernando.perez@berkeley.edu

BERKELEY INSTITUTE FOR DATA SCIENCE

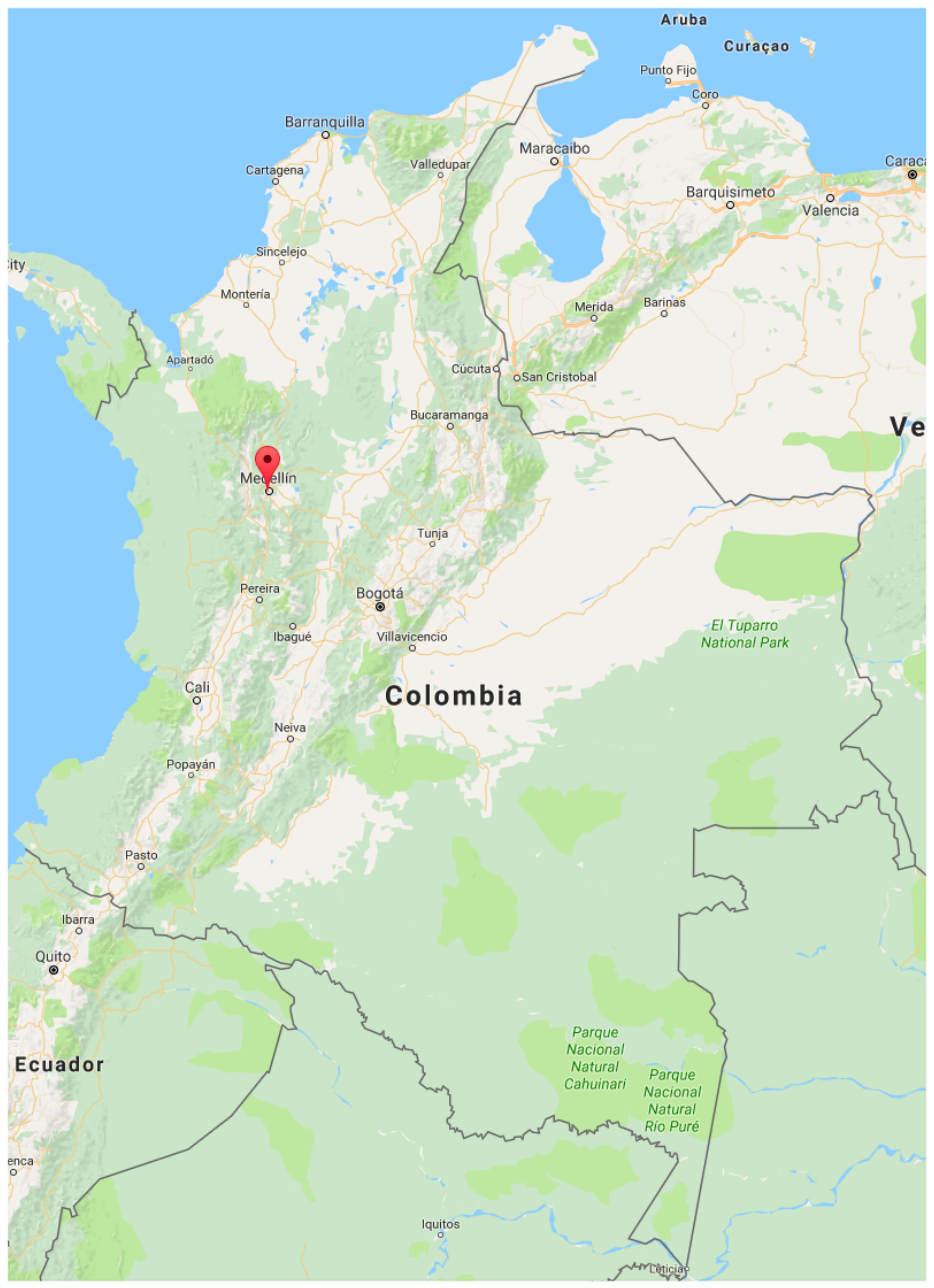
University of California, Berkeley
DEPARTMENT OF STATISTICS

BERKELEY LAB

# A bit about me…


WA
MT
ND
MN
NB
PE
WI
ME
NS
VT
OR
ID
WY
SD
MI
NH
NY
IA
MA
NE
CT
IL
PA
OH
IN
NJ
MD
NV
United States
DE
UT
CO
KS
MO
WV
KY
CA
VA
OK
TN
NC
AR
AZ
NM
SC
MS
AL
GA
TX
LA
FL
Gulf of Mexico
Mexico
Cuba
Puerto Rico
Guatemala
Caribbean Sea
Nicaragua
Venezuela
Colombia
Ecuador
AM

United States
Gulf of Mexico
Mexico
Cuba
Puerto Rico
Guatemala
Nicaragua
Caribbean Sea
Venezuela
Colombia
Ecuador


Aruba
Curaçao
Punto Fijo
Coro
Barranquilla
Cartagena
Valledupar
Maracaibo
Caracas
Barquisimeto
Valencia
Sincelejo
Montería
Merida
Barinas
Apartadó
Cúcuta
San Cristobal
Bucaramanga
Ve
Medellín
Tunja
Pereira
Bogotá
Ibagué
Villavicencio
El Tuparro National Park
Cali
Colombia
Neiva
Popayán
Pasto
Ibarra
Quito
Ecuador
Parque Nacional Natural Cahuinari
Parque Nacional Natural Río Puré
Iquitos
Leticia

# Medellín, Colombia

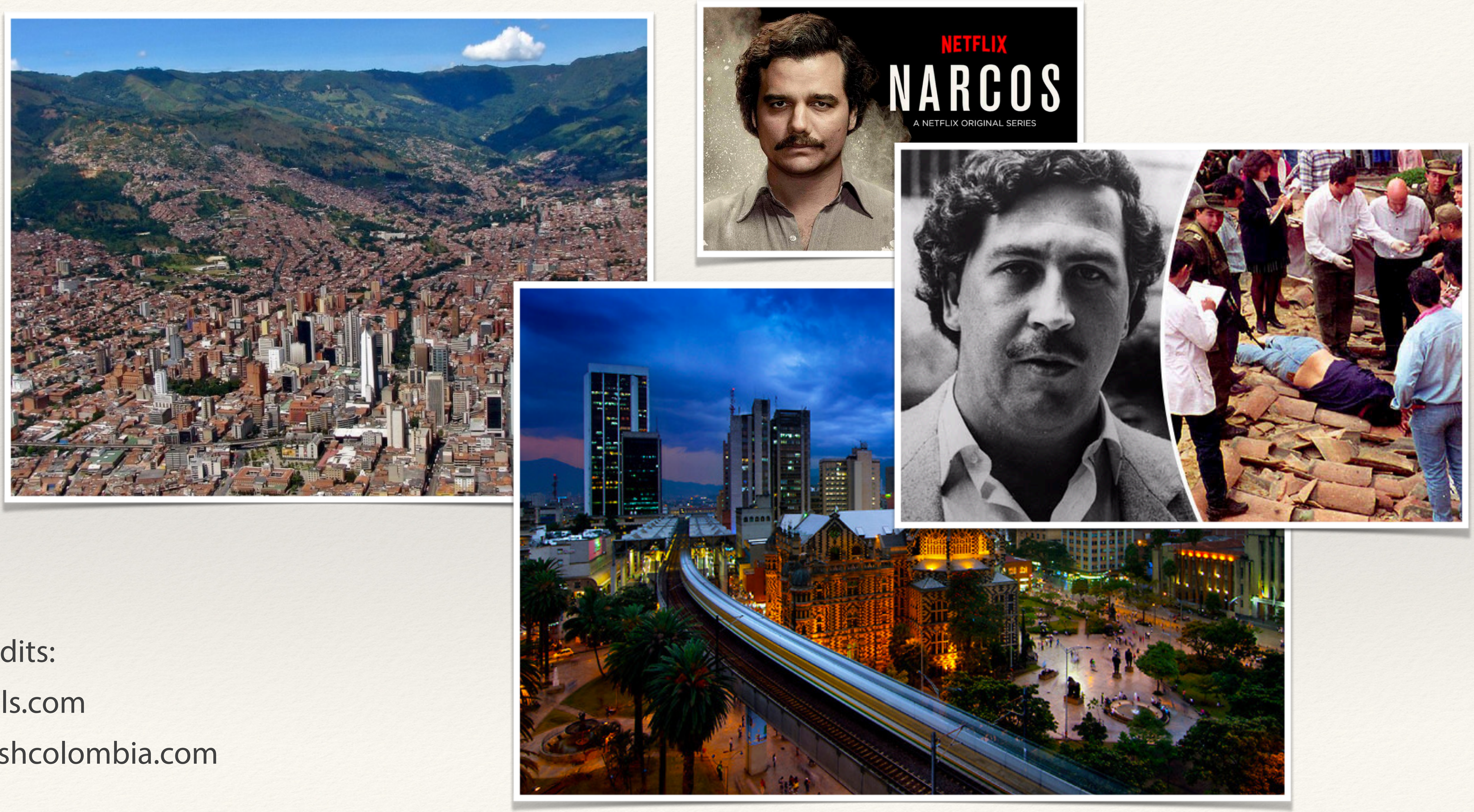


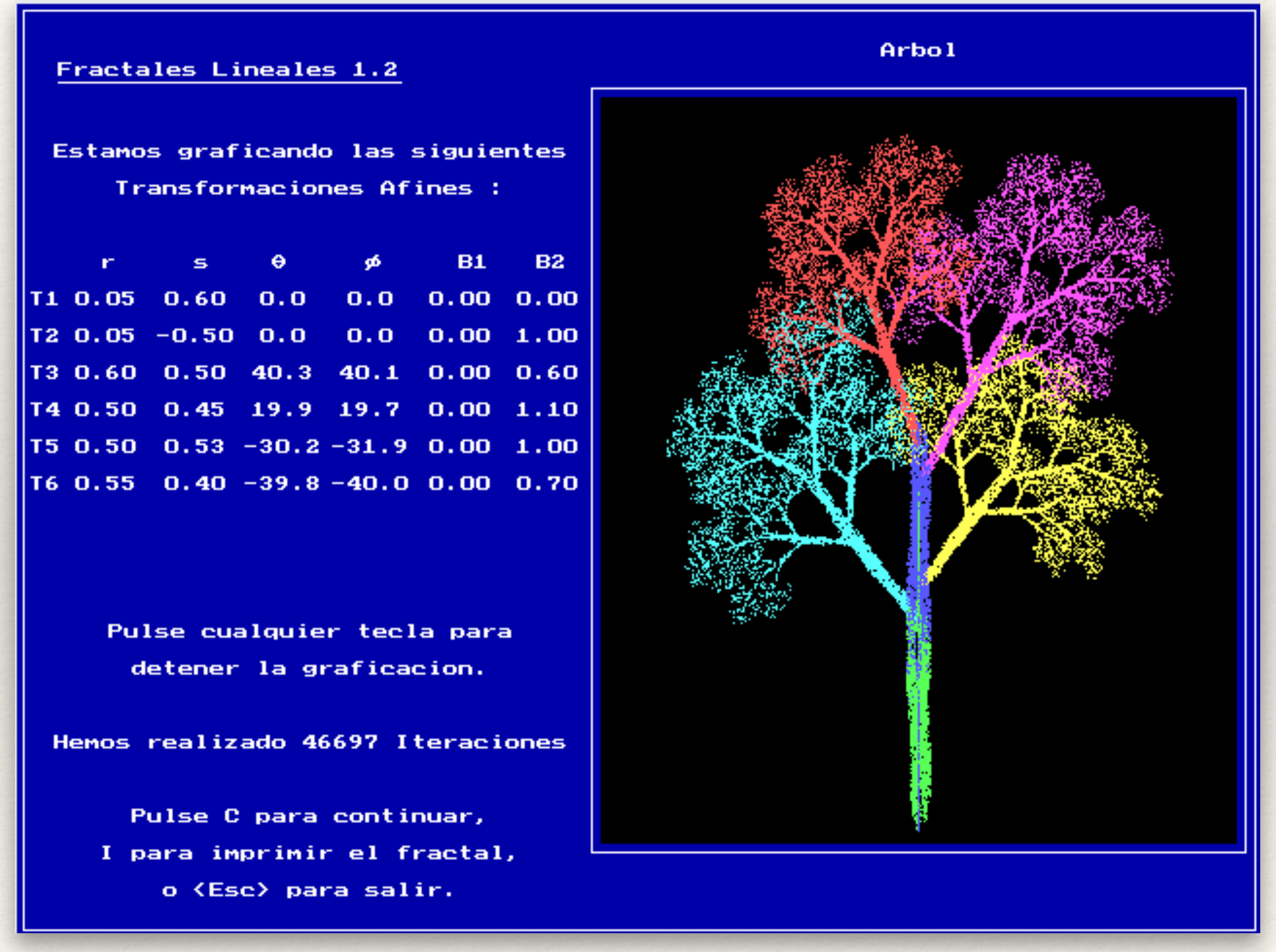
Image Credits:

latinorebels.com

totalspanishcolombia.com

# My interest at the time: physics & computing

- Simulating fractals in TurboPascal
- Program on paper, use mom's office PC on weekends
- Debug on paper. *Think a lot away from the screen*

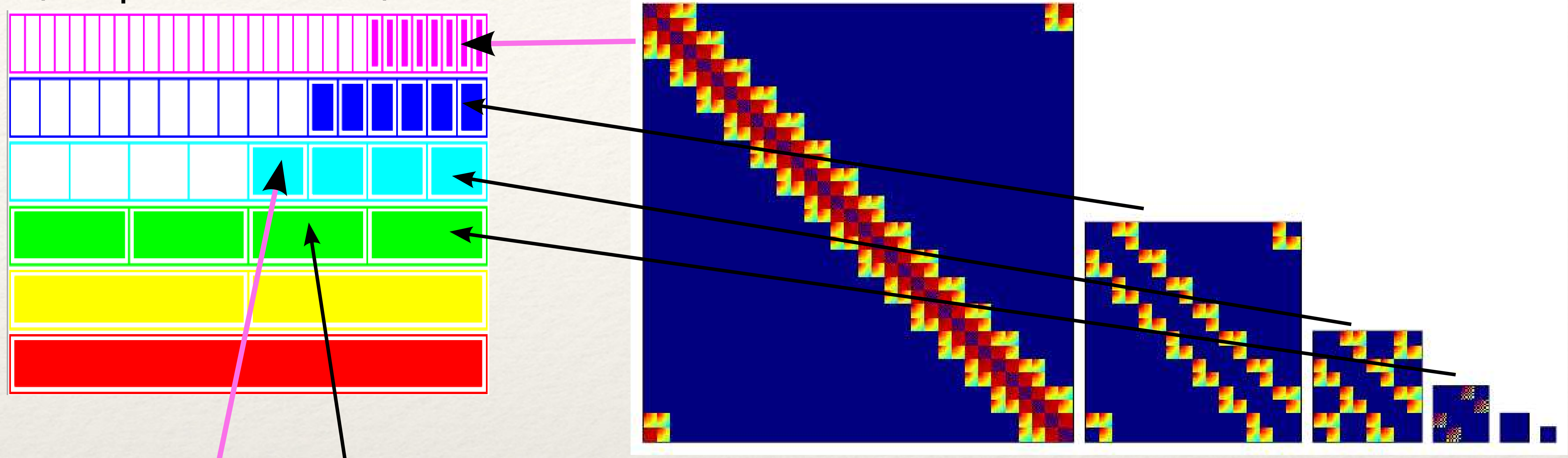


```
Fractales Lineales 1.2                                    Arbol

 Estamos graficando las siguientes
    Transformaciones Afines :

      r     s     θ      ϕ      B1    B2
T1 0.05  0.60  0.0    0.0    0.00  0.00
T2 0.05 -0.50  0.0    0.0    0.00  1.00
T3 0.60  0.50  40.3   40.1   0.00  0.60
T4 0.50  0.45  19.9   19.7   0.00  1.10
T5 0.50  0.53 -30.2  -31.9   0.00  1.00
T6 0.55  0.40 -39.8  -40.0   0.00  0.70


    Pulse cualquier tecla para
     detener la graficacion.

 Hemos realizado 46697 Iteraciones

     Pulse C para continuar,
   I para imprimir el fractal,
       o <Esc> para salir.
```

# Physics and applied math at CU Boulder

Postdoc: numerical algorithms

Redundant tree of input
(output skeleton)

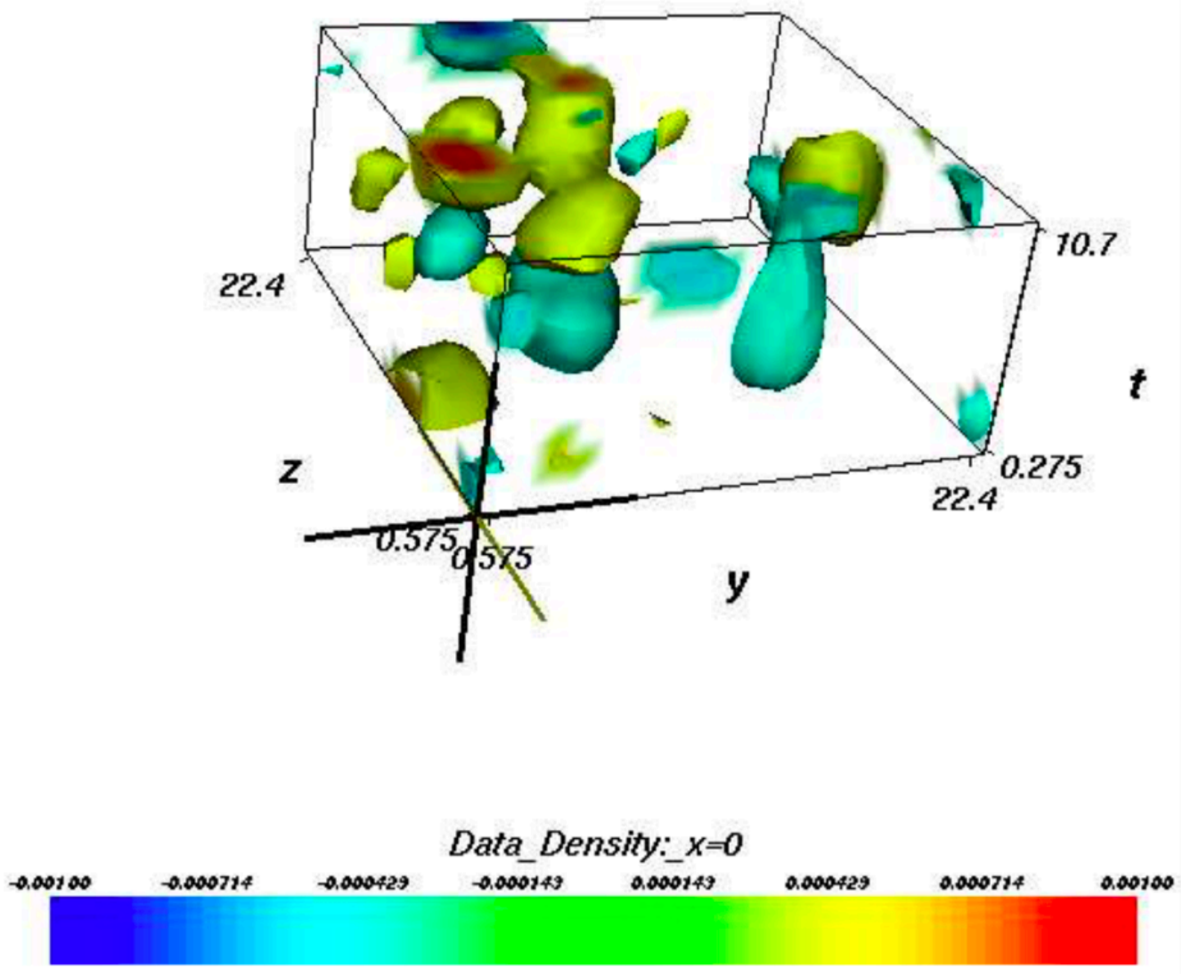


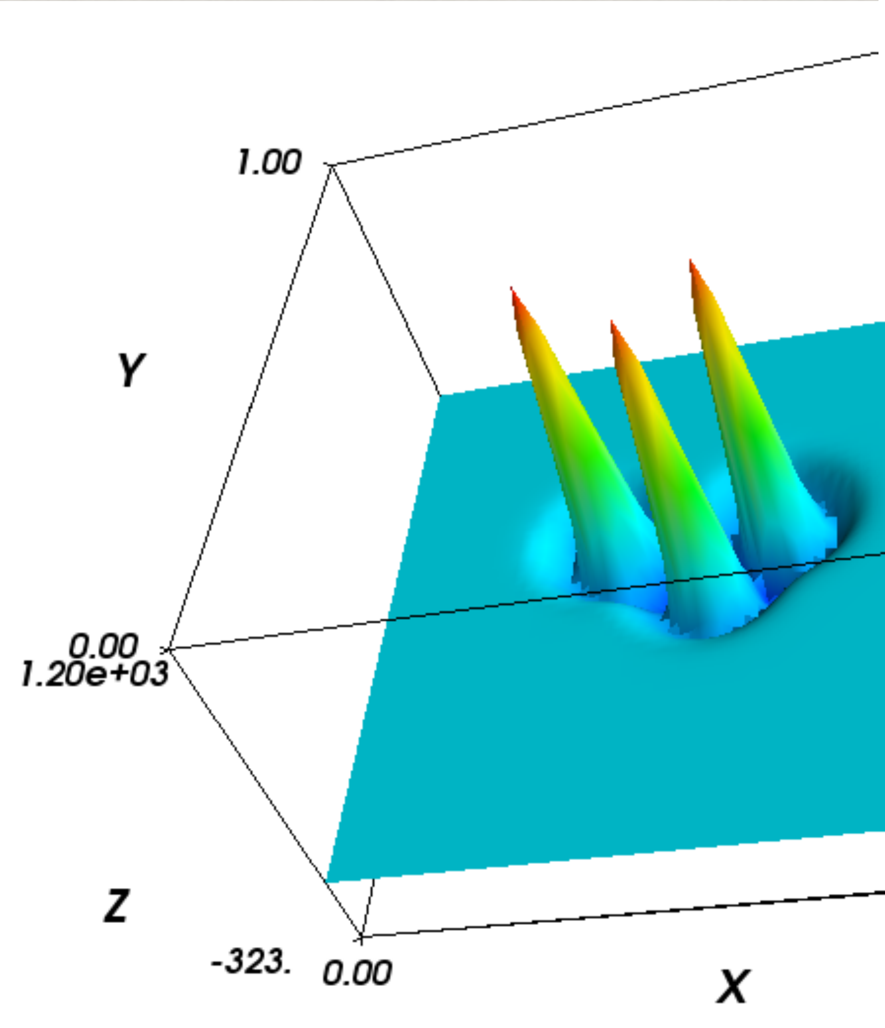
Terminal

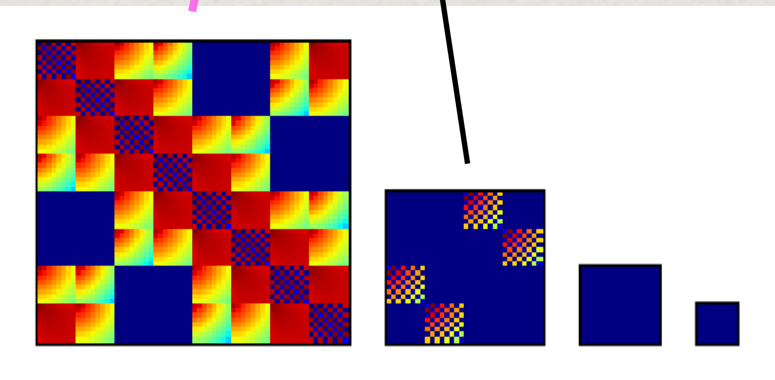
Non-terminal

PhD: Lattice QCD

Simulations







Why do I do what I do?

# Why?

- **Ethical:** openness as fairness
- **Human/social:** openness fosters collaboration.
- **Epistemological:** proprietary science is an oxymoron.
- **Technical:** Python was cool :)

# Personal: crisis, motivation and support

- A **PhD in crisis**
- **Support** from
  - An incredible **(second) advisor** - Anna Hasenfratz
  - My **wife**!!
  - A **path forward** from bad PhD to great  Postdoc - Gregory Beylkin.

# What?

“The purpose of computing is insight, not numbers”

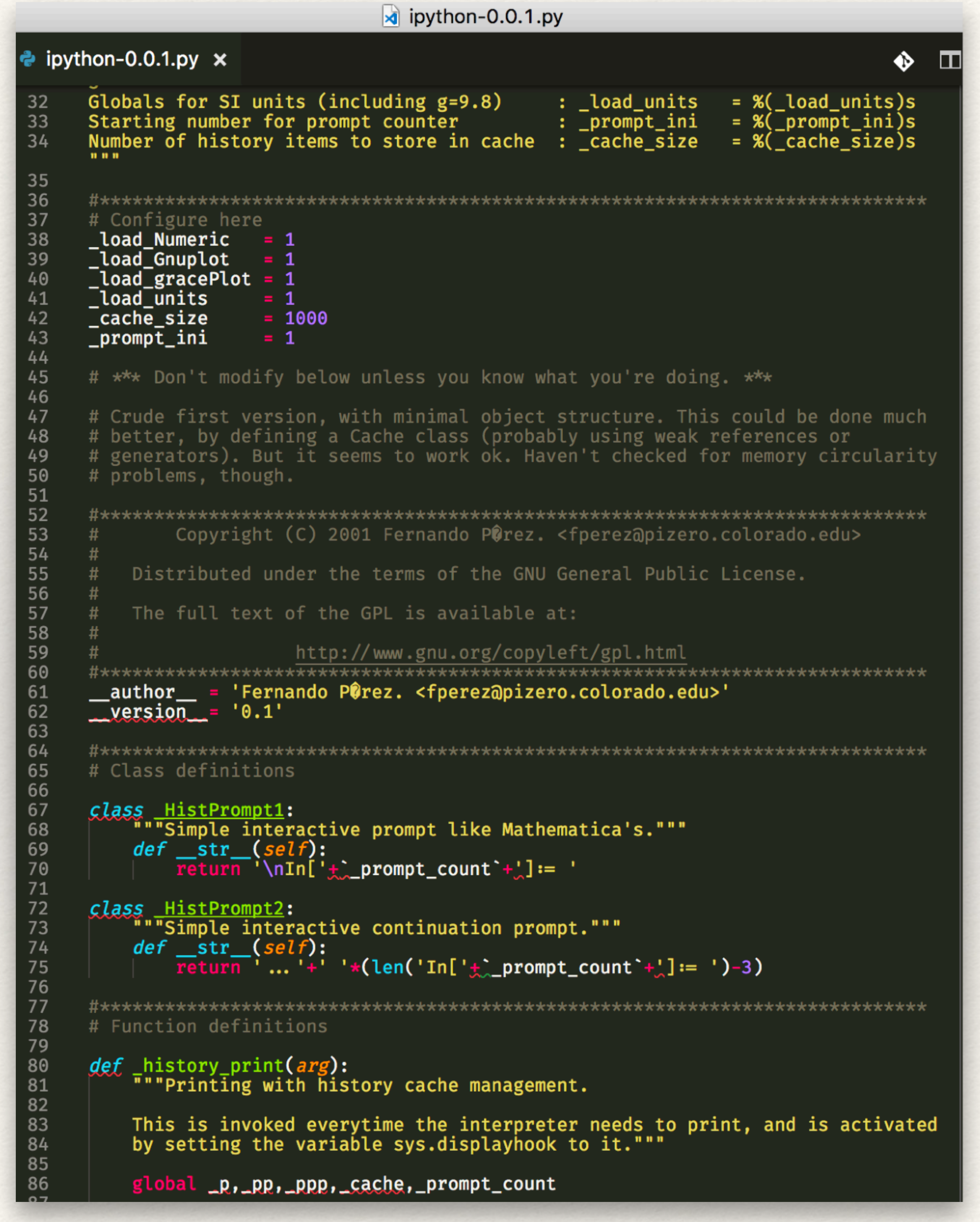
*–Hamming’62*

# IPython: Interactive Python, 2001

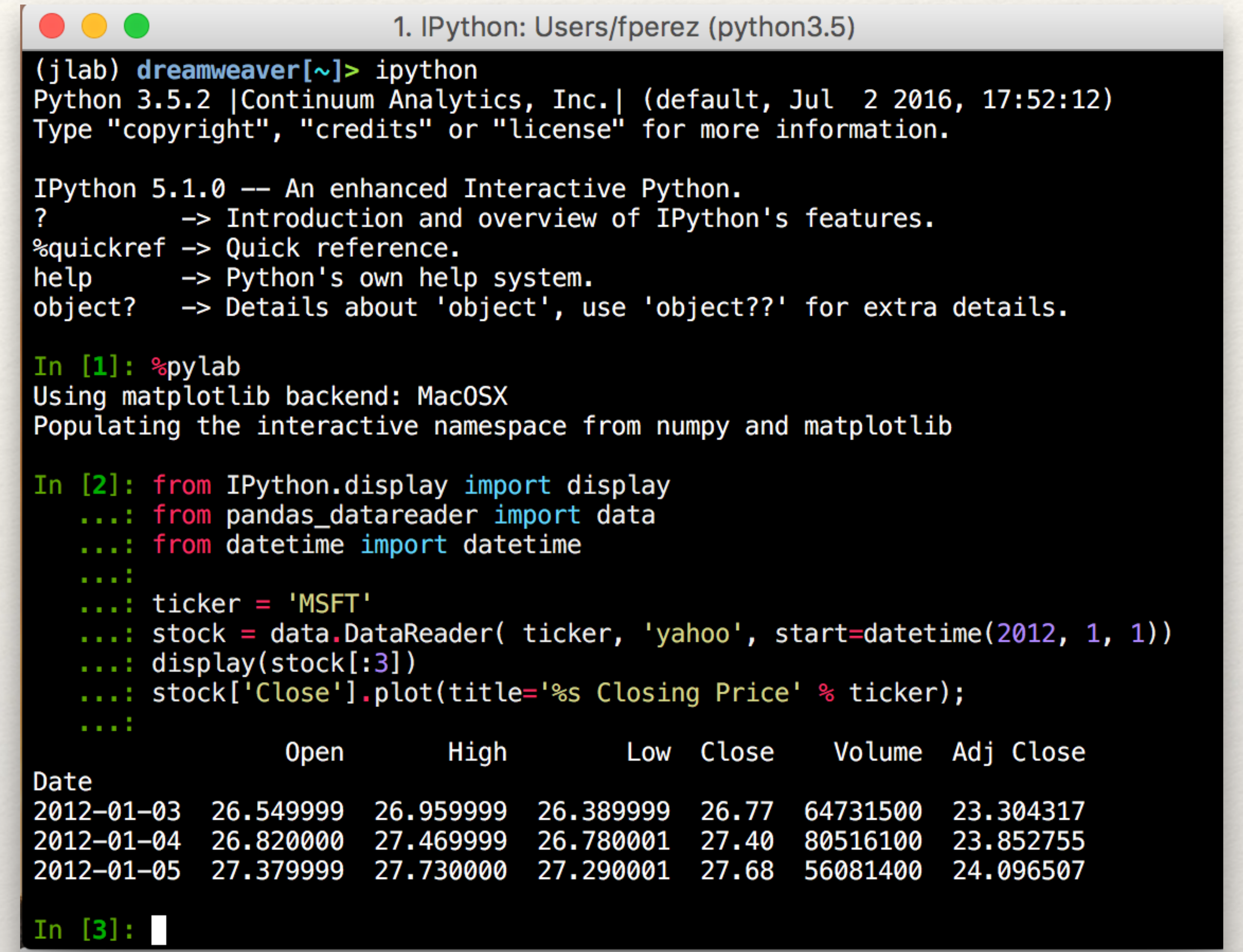
A humble start:

IPython 0.0.1, 259 LOC

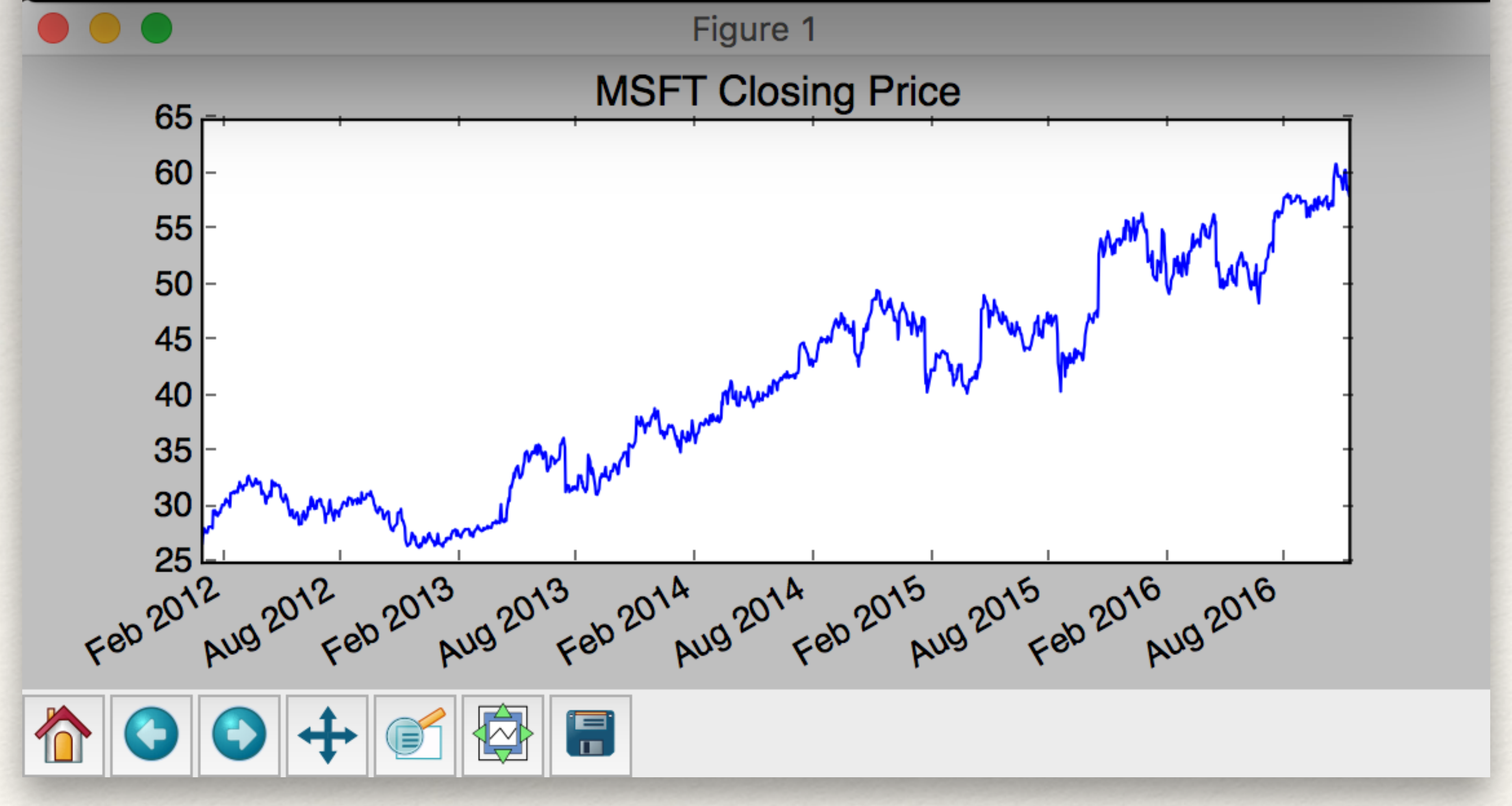
“Just an afternoon hack”



```python
Globals for SI units (including g=9.8)      : _load_units    = %(_load_units)s
Starting number for prompt counter          : _prompt_ini    = %(_prompt_ini)s
Number of history items to store in cache   : _cache_size    = %(_cache_size)s
"""

#****************************************************************************
# Configure here
_load_Numeric   = 1
_load_Gnuplot   = 1
_load_gracePlot = 1
_load_units     = 1
_cache_size     = 1000
_prompt_ini     = 1

# *** Don't modify below unless you know what you're doing. ***

# Crude first version, with minimal object structure. This could be done much
# better, by defining a Cache class (probably using weak references or
# generators). But it seems to work ok. Haven't checked for memory circularity
# problems, though.

#****************************************************************************
#       Copyright (C) 2001 Fernando P�rez. <fperez@pizero.colorado.edu>
#
#   Distributed under the terms of the GNU General Public License.
#
#   The full text of the GPL is available at:
#
#                   http://www.gnu.org/copyleft/gpl.html
#****************************************************************************
__author__ = 'Fernando P�rez. <fperez@pizero.colorado.edu>'
__version__= '0.1'

#****************************************************************************
# Class definitions

class _HistPrompt1:
    """Simple interactive prompt like Mathematica's."""
    def __str__(self):
        return '\nIn['+`_prompt_count`+']:= '

class _HistPrompt2:
    """Simple interactive continuation prompt."""
    def __str__(self):
        return ' ... '+' '*(len('In['+`_prompt_count`+']:= ')-3)

#****************************************************************************
# Function definitions

def _history_print(arg):
    """Printing with history cache management.

    This is invoked everytime the interpreter needs to print, and is activated
    by setting the variable sys.displayhook to it."""

    global _p,_pp,_ppp,_cache,_prompt_count
```



```
(jlab) dreamweaver[~]> ipython
Python 3.5.2 |Continuum Analytics, Inc.| (default, Jul  2 2016, 17:52:12)
Type "copyright", "credits" or "license" for more information.

IPython 5.1.0 -- An enhanced Interactive Python.
?         -> Introduction and overview of IPython's features.
%quickref -> Quick reference.
help      -> Python's own help system.
object?   -> Details about 'object', use 'object??' for extra details.

In [1]: %pylab
Using matplotlib backend: MacOSX
Populating the interactive namespace from numpy and matplotlib

In [2]: from IPython.display import display
   ...: from pandas_datareader import data
   ...: from datetime import datetime
   ...:
   ...: ticker = 'MSFT'
   ...: stock = data.DataReader( ticker, 'yahoo', start=datetime(2012, 1, 1))
   ...: display(stock[:3])
   ...: stock['Close'].plot(title='%s Closing Price' % ticker);
   ...:
                 Open       High        Low  Close    Volume  Adj Close
Date
2012-01-03  26.549999  26.959999  26.389999  26.77  64731500  23.304317
2012-01-04  26.820000  27.469999  26.780001  27.40  80516100  23.852755
2012-01-05  27.379999  27.730000  27.290001  27.68  56081400  24.096507

In [3]:
```



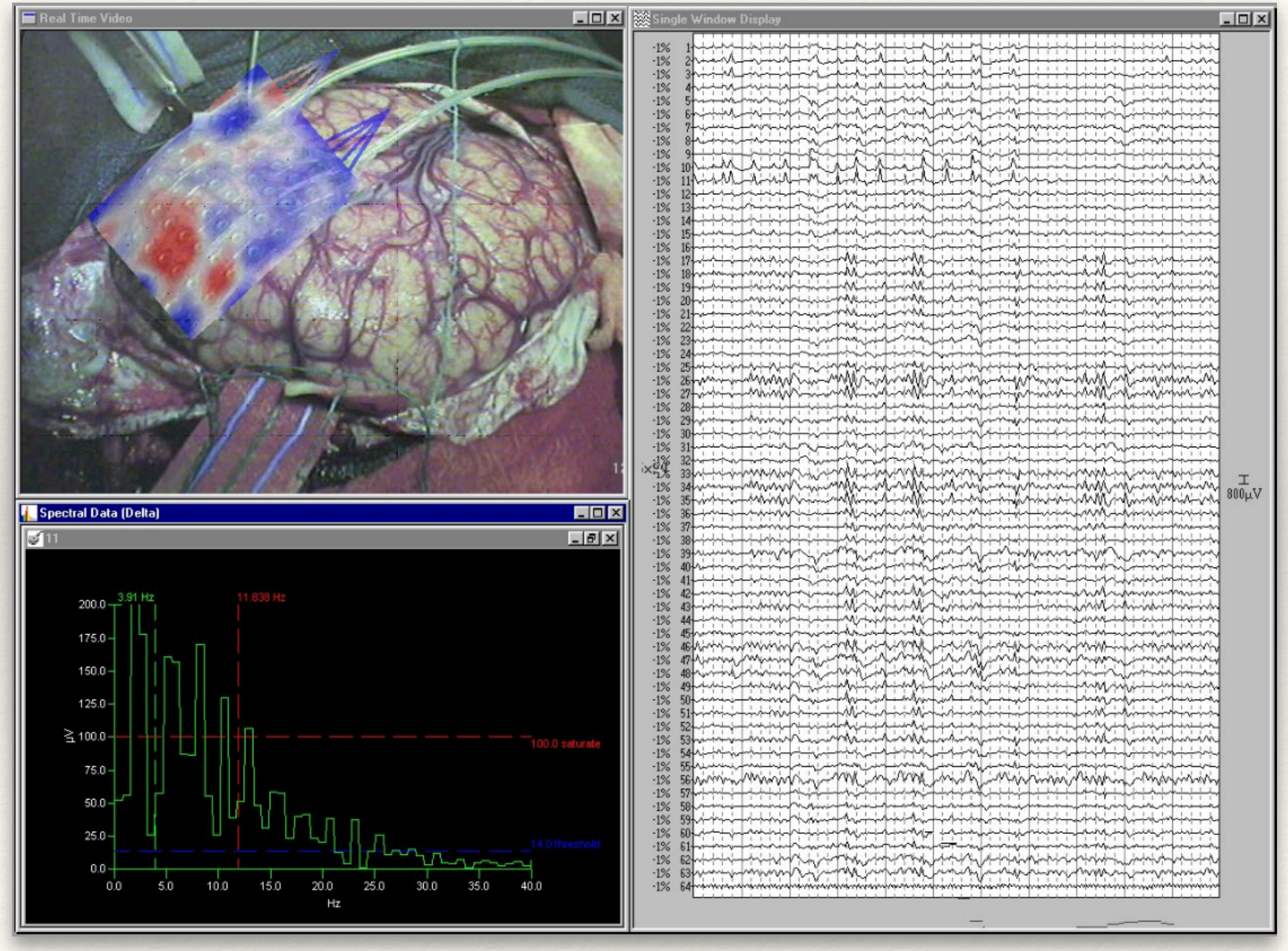
https://gist.github.com/fperez/1579699

**First outcome: I was good for *something***

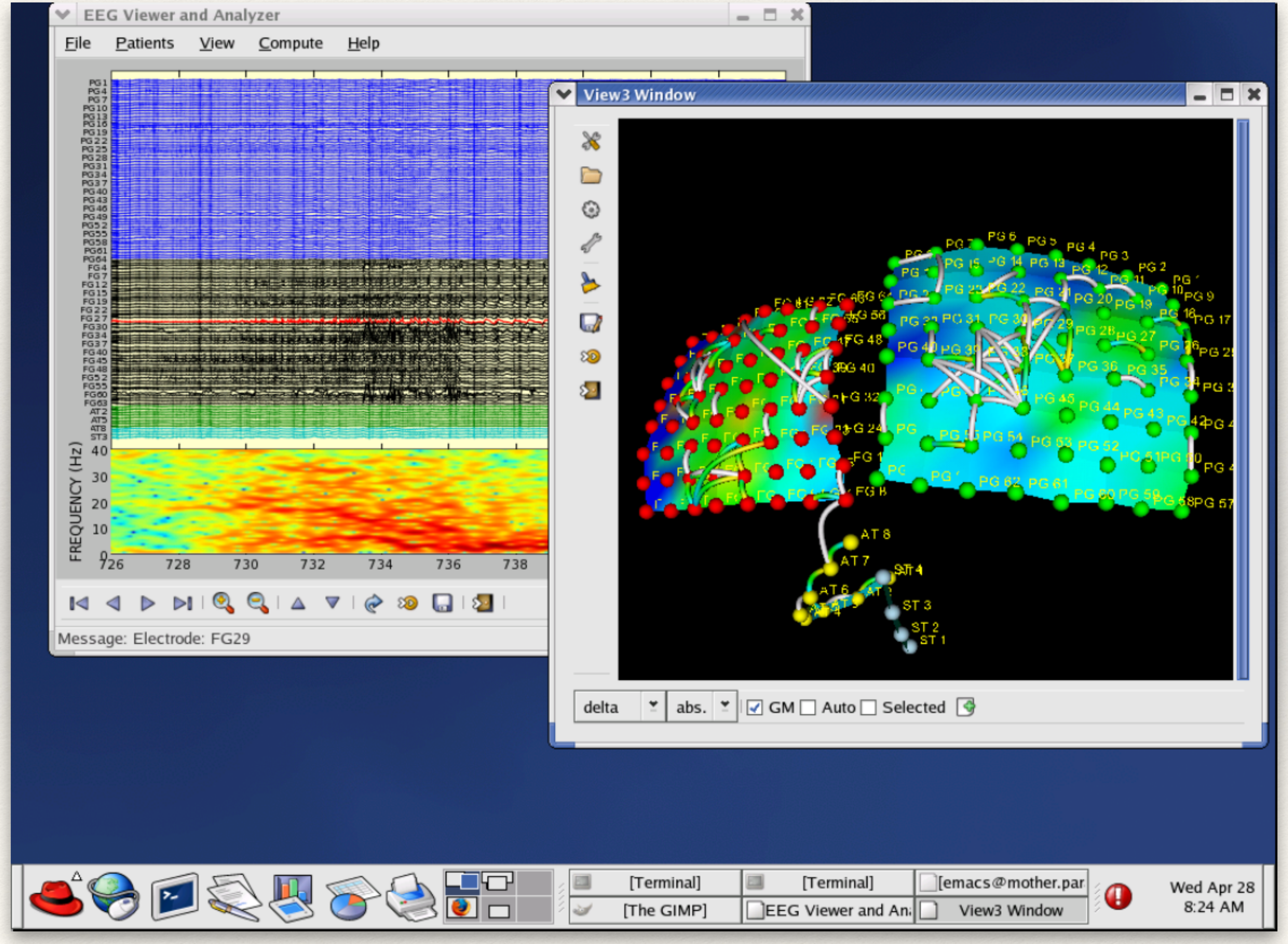
# Second outcome: finding a *community*

# Built by regular individuals

John Hunter, Department of Pediatric Neurology, University of Chicago.



# matplotlib: open replacement for proprietary tools

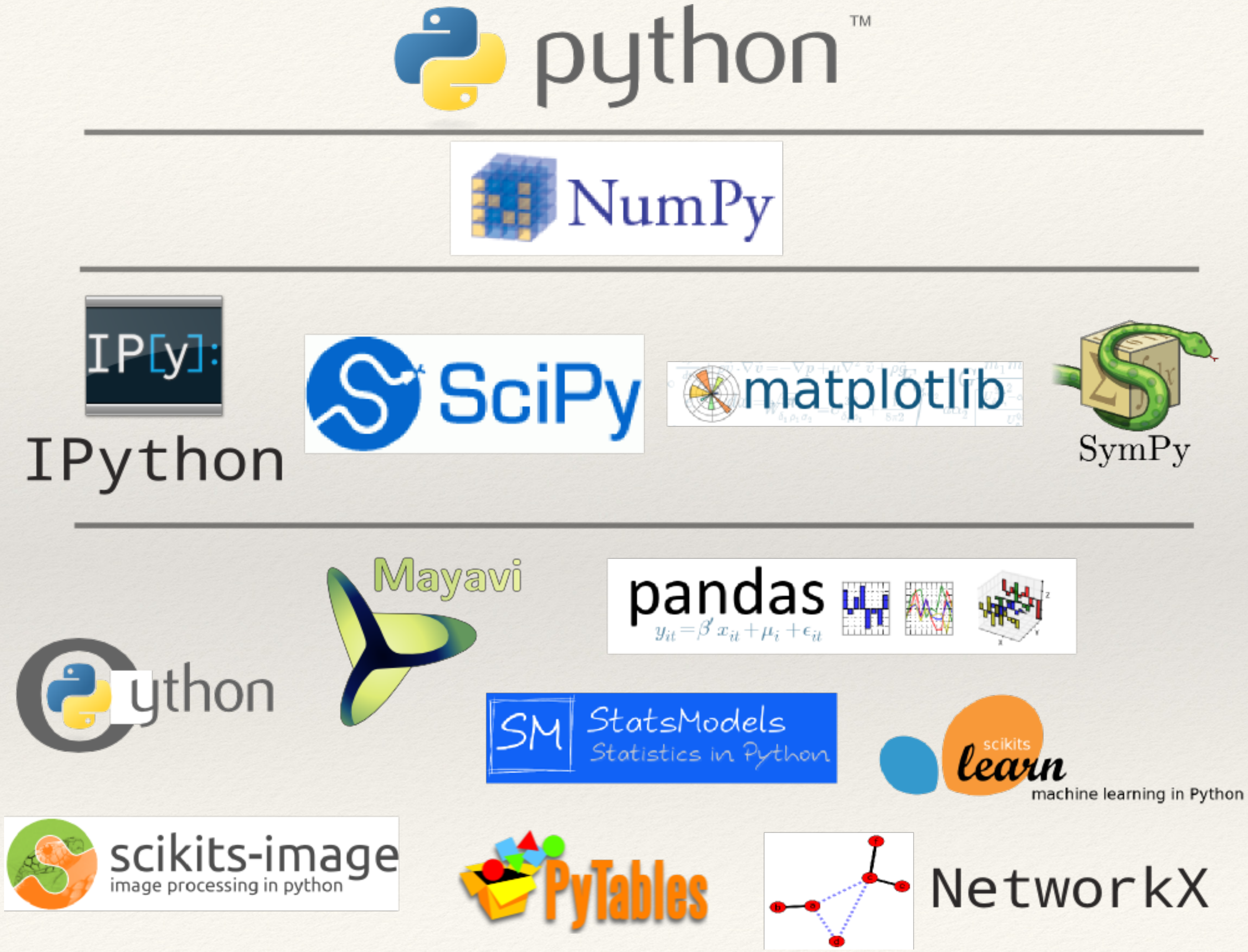


Message: Electrode: FG29

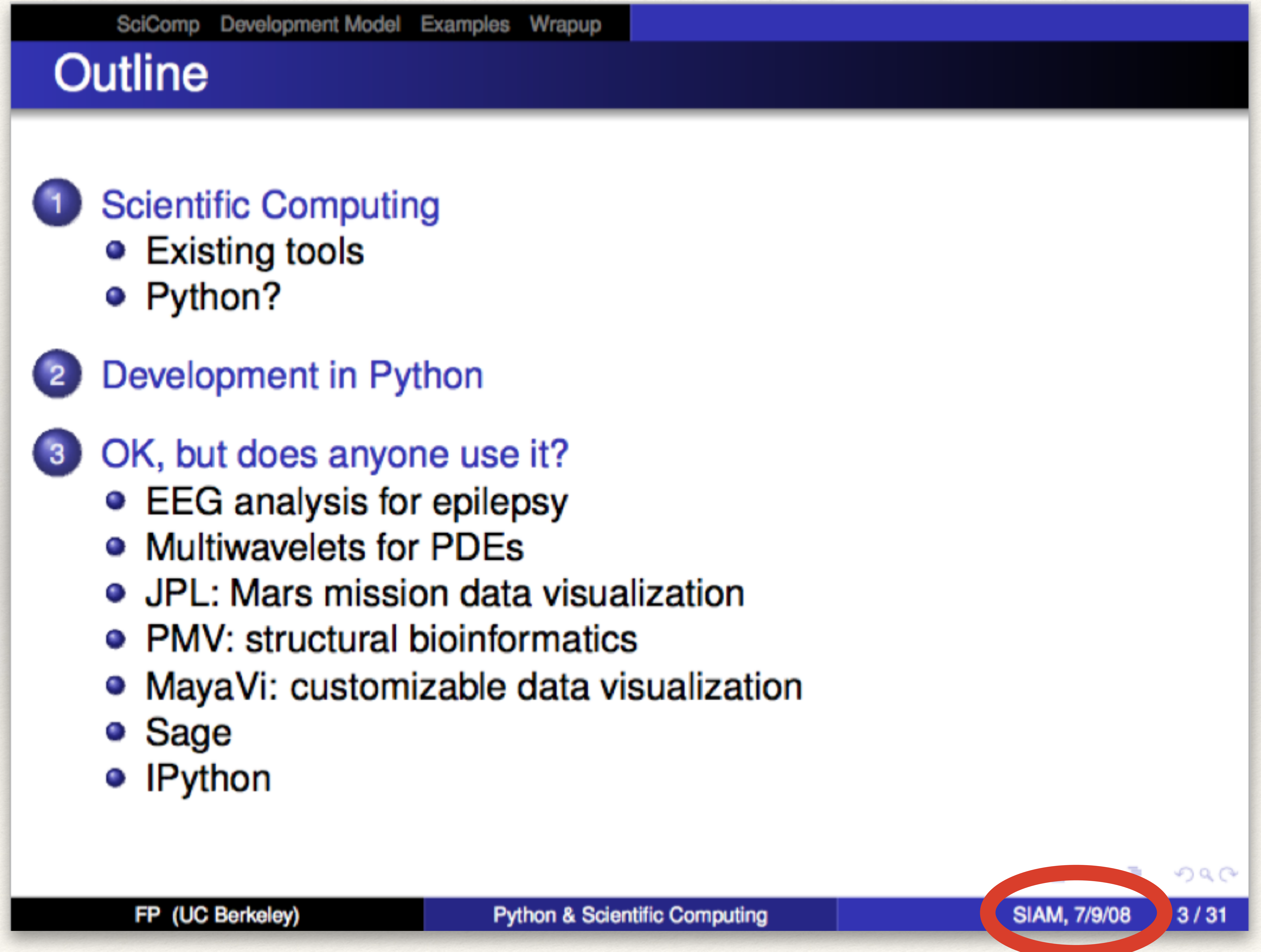
delta abs. ☑ GM □ Auto □ Selected

# John D. Hunter, 1968-2012

# Not just IPython: an entire ecosystem



# Having to justify our existence



SciComp Development Model Examples Wrapup

## Outline

1. Scientific Computing
   - Existing tools
   - Python?
2. Development in Python
3. OK, but does anyone use it?
   - EEG analysis for epilepsy
   - Multiwavelets for PDEs
   - JPL: Mars mission data visualization
   - PMV: structural bioinformatics
   - MayaVi: customizable data visualization
   - Sage
   - IPython

FP (UC Berkeley) Python & Scientific Computing SIAM, 7/9/08 3 / 31

# Jupyter team today: where *all the credit* goes

Plus ~ 1500 more Open source contributors!

# Jupyter - funding and resources

SLOAN FOUNDATION 1934 ALFRED P. SLOAN FOUNDATION

GORDON AND BETTY MOORE FOUNDATION

THE LEONA M. AND HARRY B. HELMSLEY CHARITABLE TRUST

U.S. DEPARTMENT OF ENERGY

O'REILLY

SIMONS FOUNDATION

NETFLIX

ANACONDA

POWERED BY rackspace the open cloud company

IBM

Microsoft

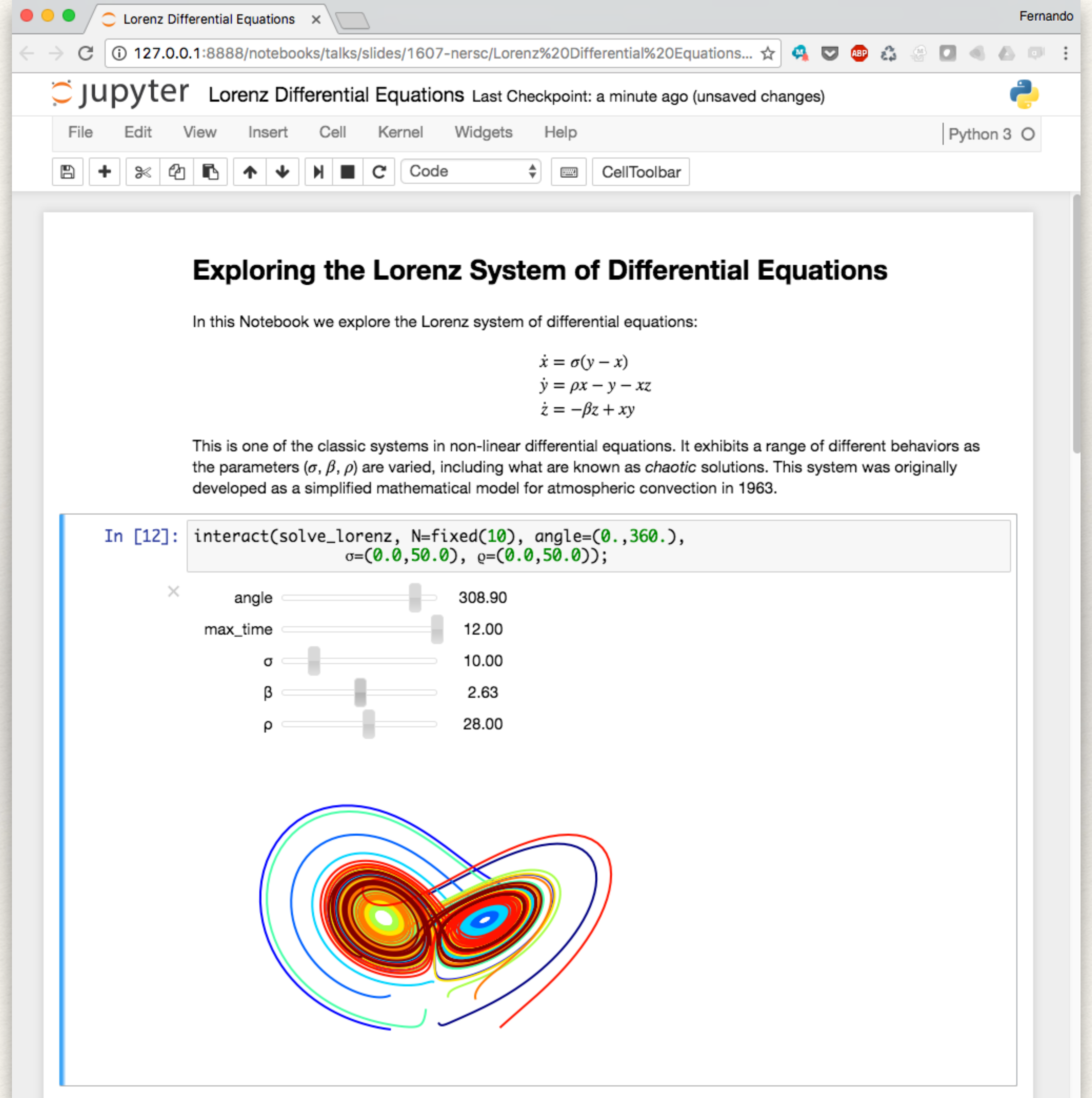
ENTHOUGHT SCIENTIFIC COMPUTING SOLUTIONS

Google

Bloomberg

# The IPython/Jupyter Notebook

- Rich web client
- Text & math
- Code
- Results
- Share, reproduce.


Lorenz Differential Equations
Fernando
127.0.0.1:8888/notebooks/talks/slides/1607-nersc/Lorenz%20Differential%20Equations...
jupyter
Lorenz Differential Equations Last Checkpoint: a minute ago (unsaved changes)
File
Edit
View
Insert
Cell
Kernel
Widgets
Help
Python 3 ○
Code
CellToolbar

### Exploring the Lorenz System of Differential Equations

In this Notebook we explore the Lorenz system of differential equations:

$$\dot{x} = \sigma(y - x)$$
$$\dot{y} = \rho x - y - xz$$
$$\dot{z} = -\beta z + xy$$

This is one of the classic systems in non-linear differential equations. It exhibits a range of different behaviors as the parameters ($\sigma$, $\beta$, $\rho$) are varied, including what are known as *chaotic* solutions. This system was originally developed as a simplified mathematical model for atmospheric convection in 1963.

```
In [12]: interact(solve_lorenz, N=fixed(10), angle=(0.,360.),
                  σ=(0.0,50.0), ϱ=(0.0,50.0));
```

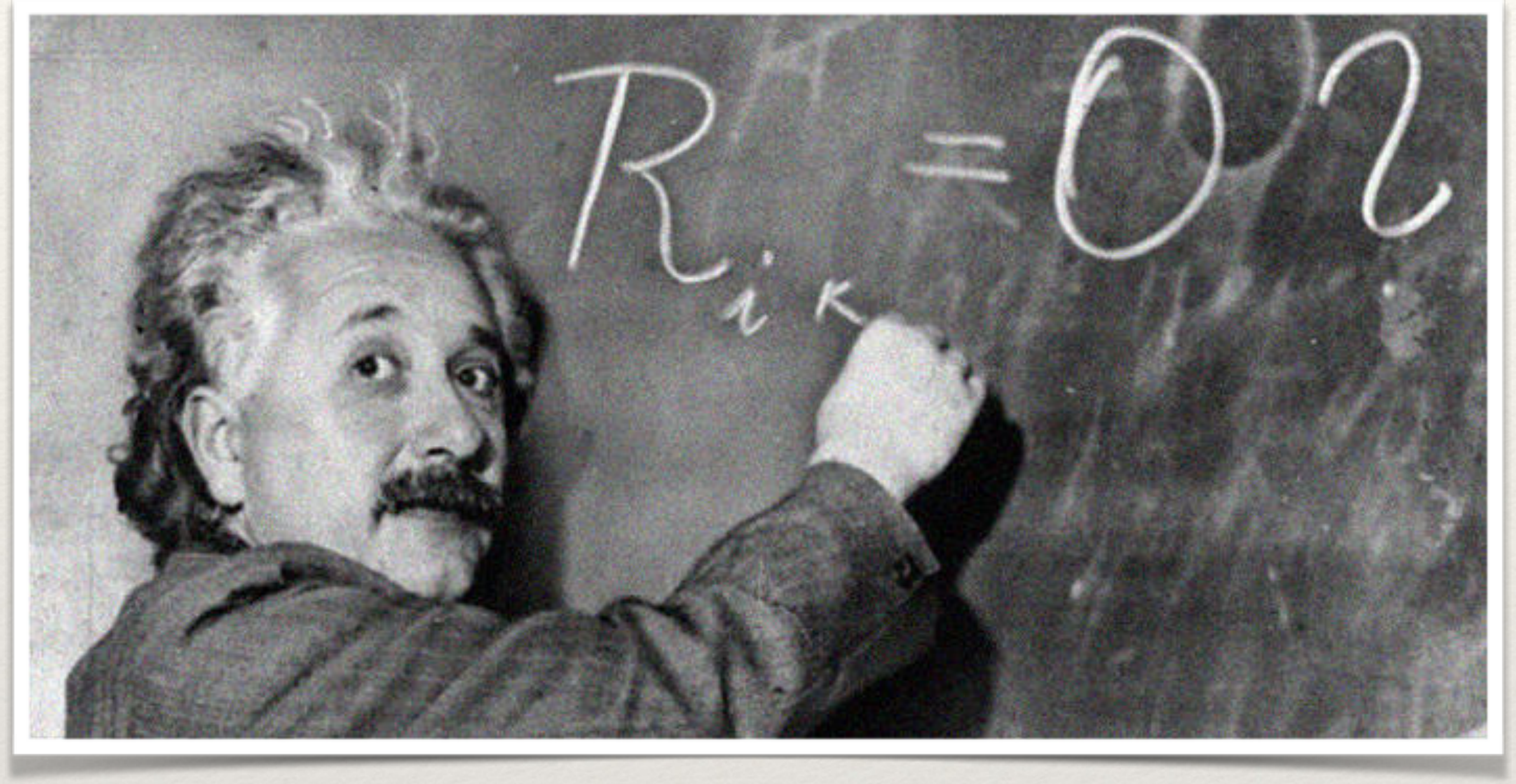
angle 308.90
max_time 12.00
σ 10.00
β 2.63
ρ 28.00

## Jupyter Protocol
## is language agnostic

Scala
perl
R
jupyter
julia
ERLANG
Spark
python™
IP[y]:
IPython

~100 different kernels: https://github.com/jupyter/jupyter/wiki/Jupyter-kernels

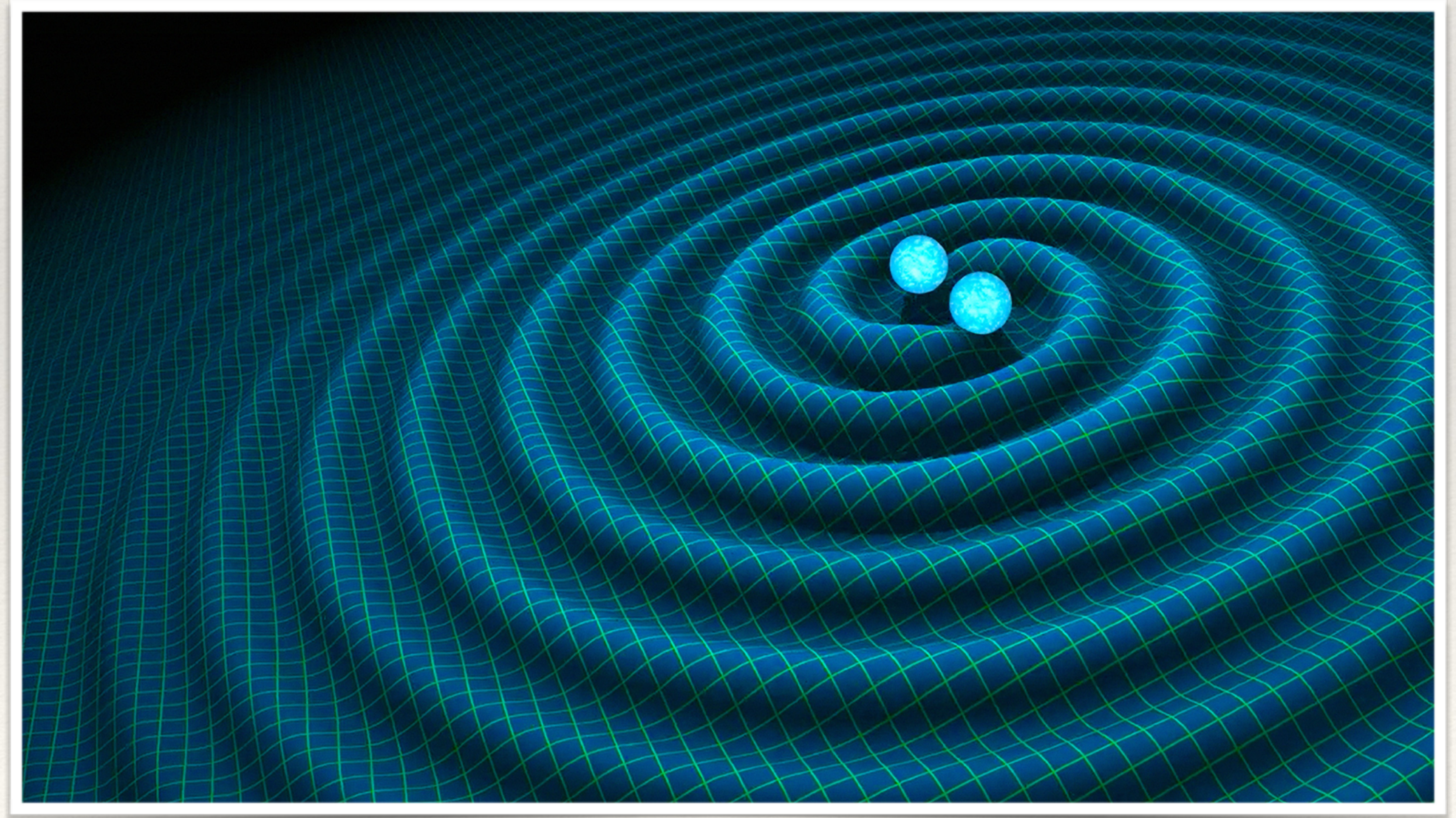
# A long time ago in a galaxy far, far away…



$$R_{\mu\nu} - \frac{1}{2}R\,g_{\mu\nu} + \Lambda g_{\mu\nu} = \frac{8\pi G}{c^4}T_{\mu\nu}$$

Einstein's Field Equations of General Relativity

Annalen der Physik, 1916



# September 14, 2015

NumPy

SciPy

matplotlib

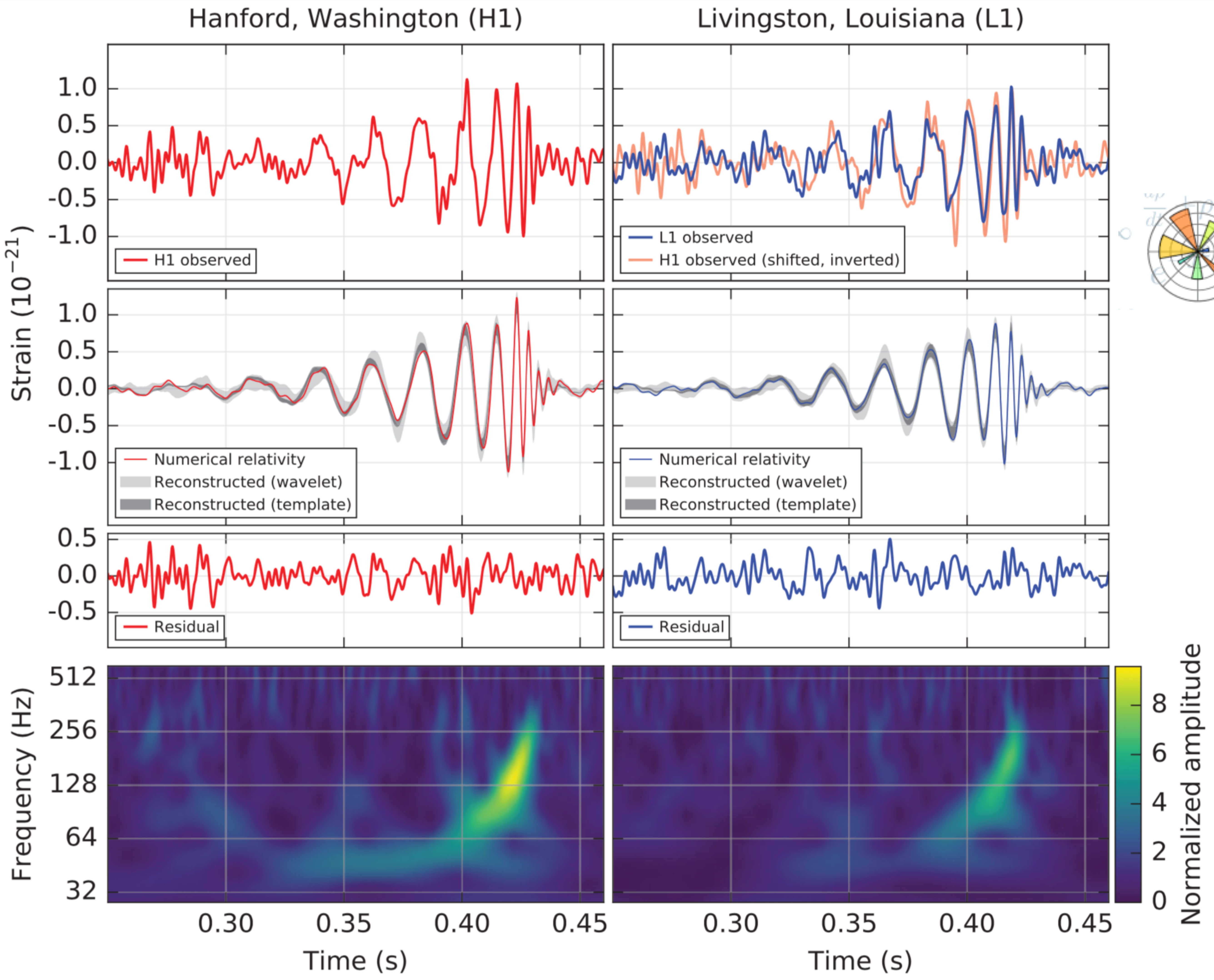
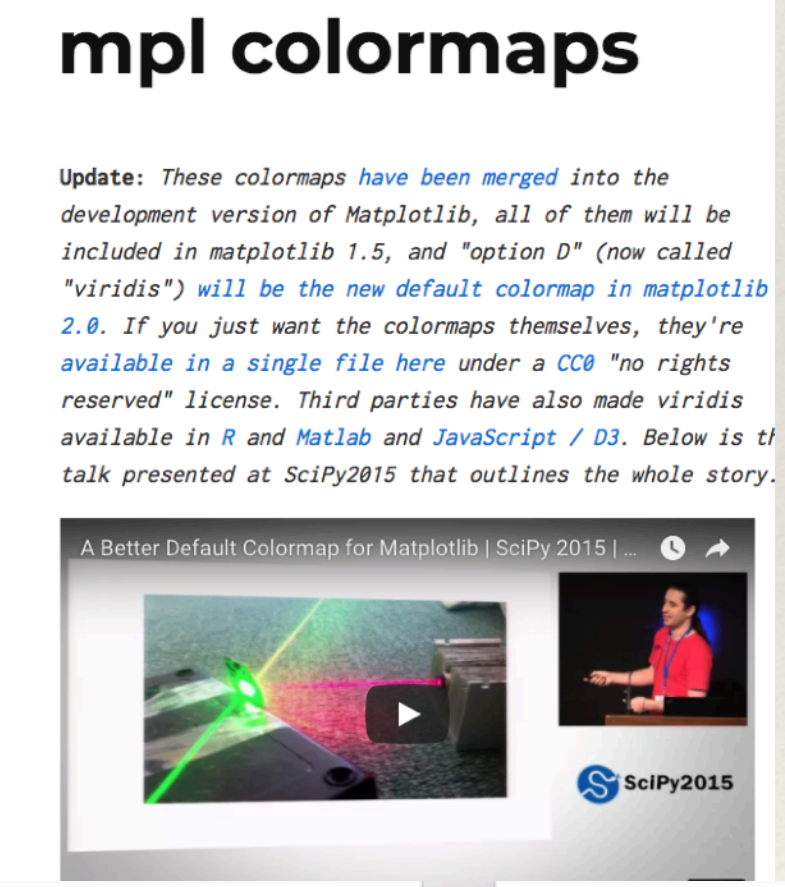


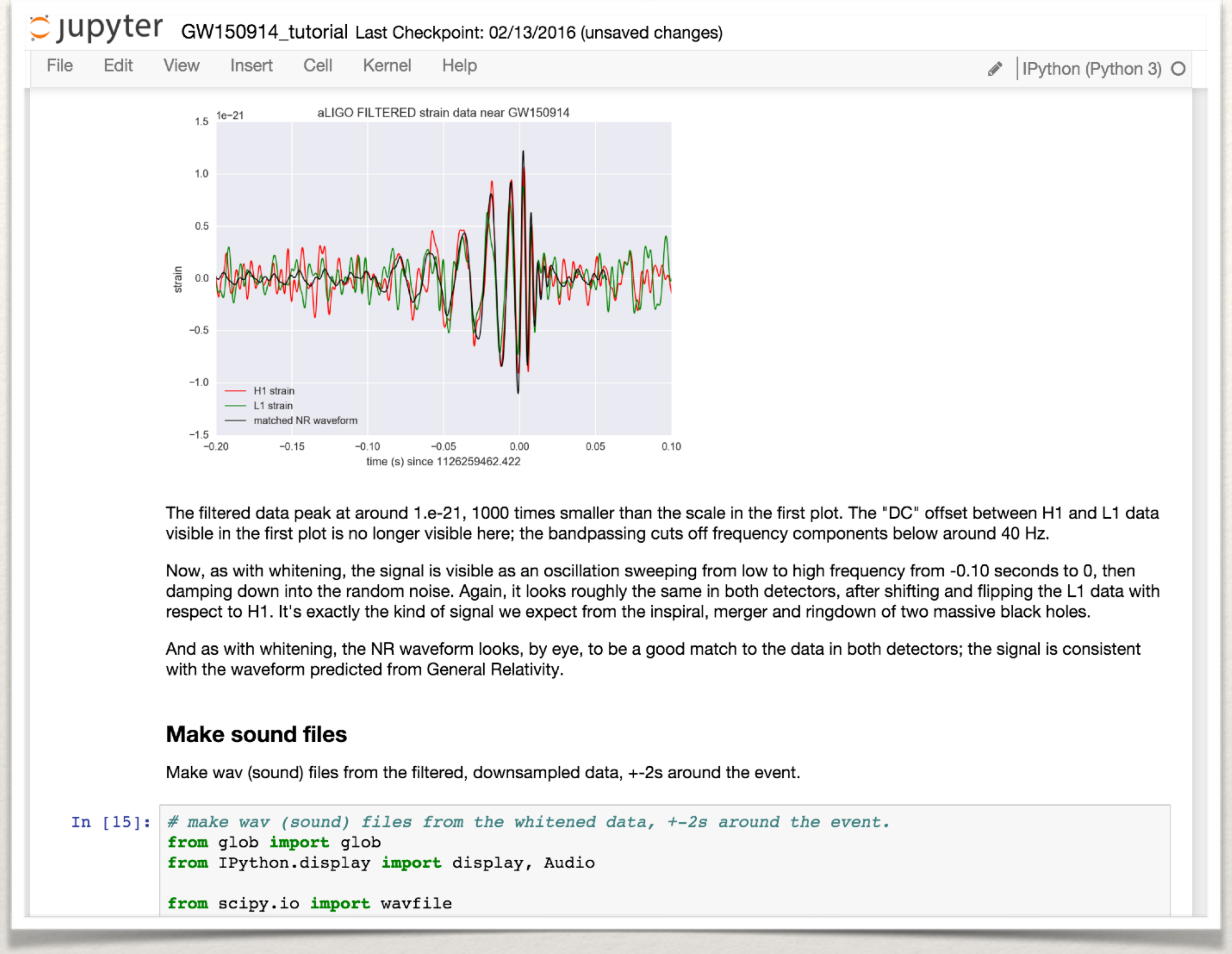
FIG. 1. The gravitational-wave event GW150914 observed by the LIGO Hanford (H1, left column panels) and Livingston (L1, right column panels) detectors. Times are shown relative to September 14, 2015 at 09:50:45 UTC. For visualization, all time series are filtered with a 35–350 Hz bandpass filter to suppress large fluctuations outside the detectors' most sensitive frequency band, and band-reject



## mpl colormaps

**Update:** *These colormaps have been merged into the development version of Matplotlib, all of them will be included in matplotlib 1.5, and "option D" (now called "viridis") will be the new default colormap in matplotlib 2.0. If you just want the colormaps themselves, they're available in a single file here under a CC0 "no rights reserved" license. Third parties have also made viridis available in R and Matlab and JavaScript / D3. Below is t talk presented at SciPy2015 that outlines the whole story.*

# The song of the universe



The filtered data peak at around 1.e-21, 1000 times smaller than the scale in the first plot. The "DC" offset between H1 and L1 data visible in the first plot is no longer visible here; the bandpassing cuts off frequency components below around 40 Hz.

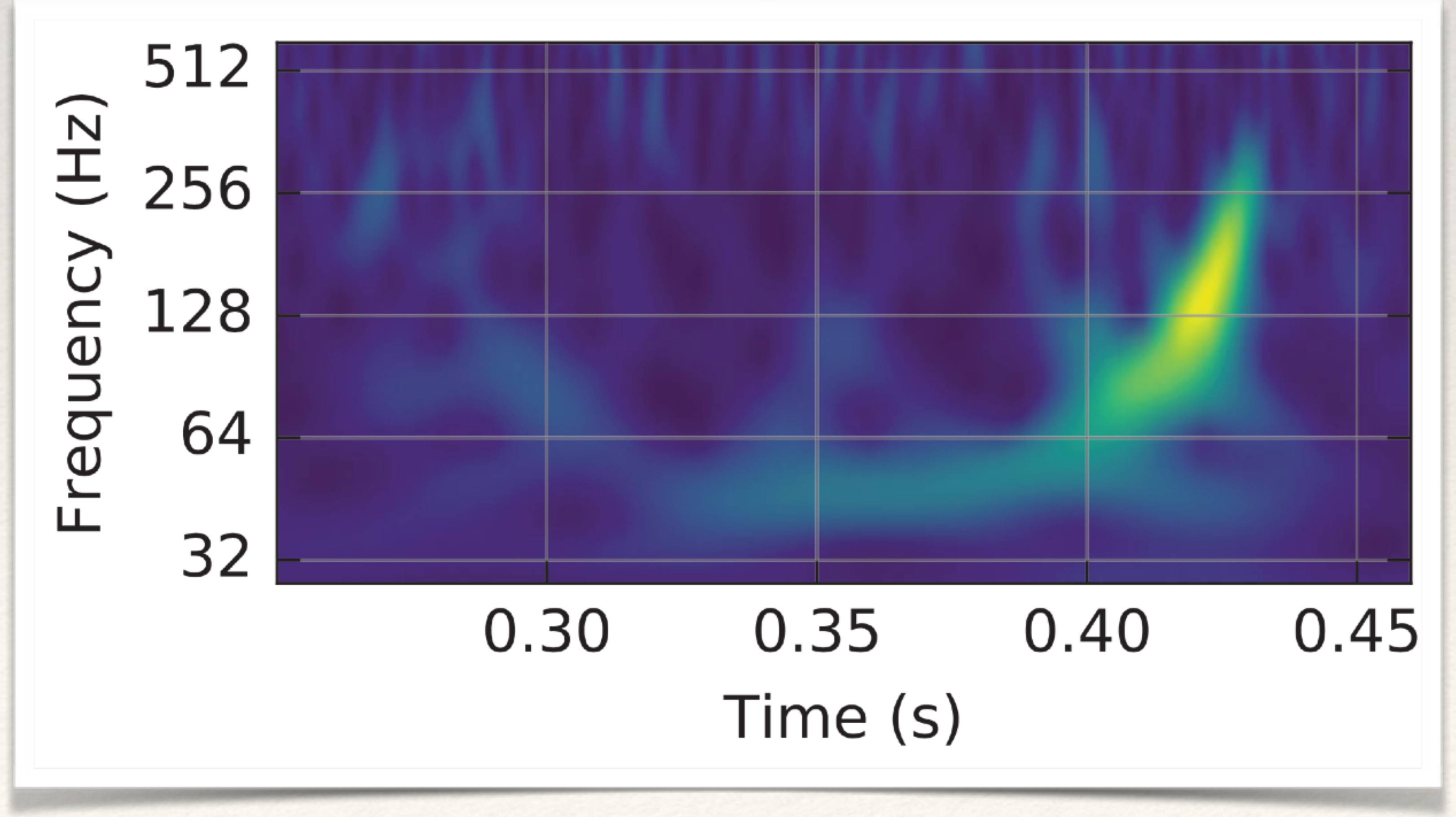
Now, as with whitening, the signal is visible as an oscillation sweeping from low to high frequency from -0.10 seconds to 0, then damping down into the random noise. Again, it looks roughly the same in both detectors, after shifting and flipping the L1 data with respect to H1. It's exactly the kind of signal we expect from the inspiral, merger and ringdown of two massive black holes.

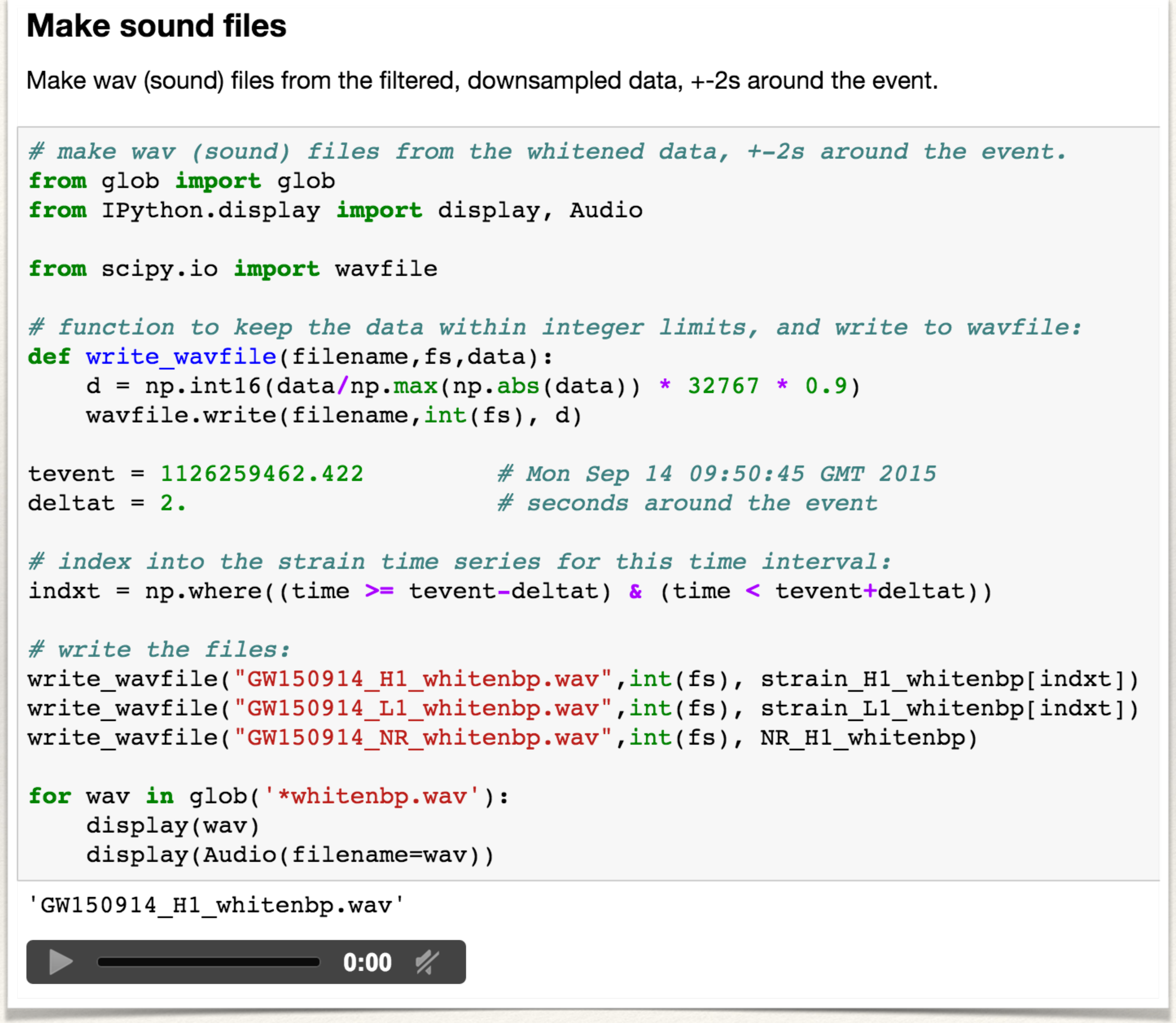
And as with whitening, the NR waveform looks, by eye, to be a good match to the data in both detectors; the signal is consistent with the waveform predicted from General Relativity.

### Make sound files

Make wav (sound) files from the filtered, downsampled data, +-2s around the event.

```
In [15]: # make wav (sound) files from the whitened data, +-2s around the event.
         from glob import glob
         from IPython.display import display, Audio

         from scipy.io import wavfile
```





## Make sound files

Make wav (sound) files from the filtered, downsampled data, +-2s around the event.

```
# make wav (sound) files from the whitened data, +-2s around the event.
from glob import glob
from IPython.display import display, Audio

from scipy.io import wavfile

# function to keep the data within integer limits, and write to wavfile:
def write_wavfile(filename,fs,data):
    d = np.int16(data/np.max(np.abs(data)) * 32767 * 0.9)
    wavfile.write(filename,int(fs), d)

tevent = 1126259462.422          # Mon Sep 14 09:50:45 GMT 2015
deltat = 2.                      # seconds around the event

# index into the strain time series for this time interval:
indxt = np.where((time >= tevent-deltat) & (time < tevent+deltat))

# write the files:
write_wavfile("GW150914_H1_whitenbp.wav",int(fs), strain_H1_whitenbp[indxt])
write_wavfile("GW150914_L1_whitenbp.wav",int(fs), strain_L1_whitenbp[indxt])
write_wavfile("GW150914_NR_whitenbp.wav",int(fs), NR_H1_whitenbp)

for wav in glob('*whitenbp.wav'):
    display(wav)
    display(Audio(filename=wav))
```

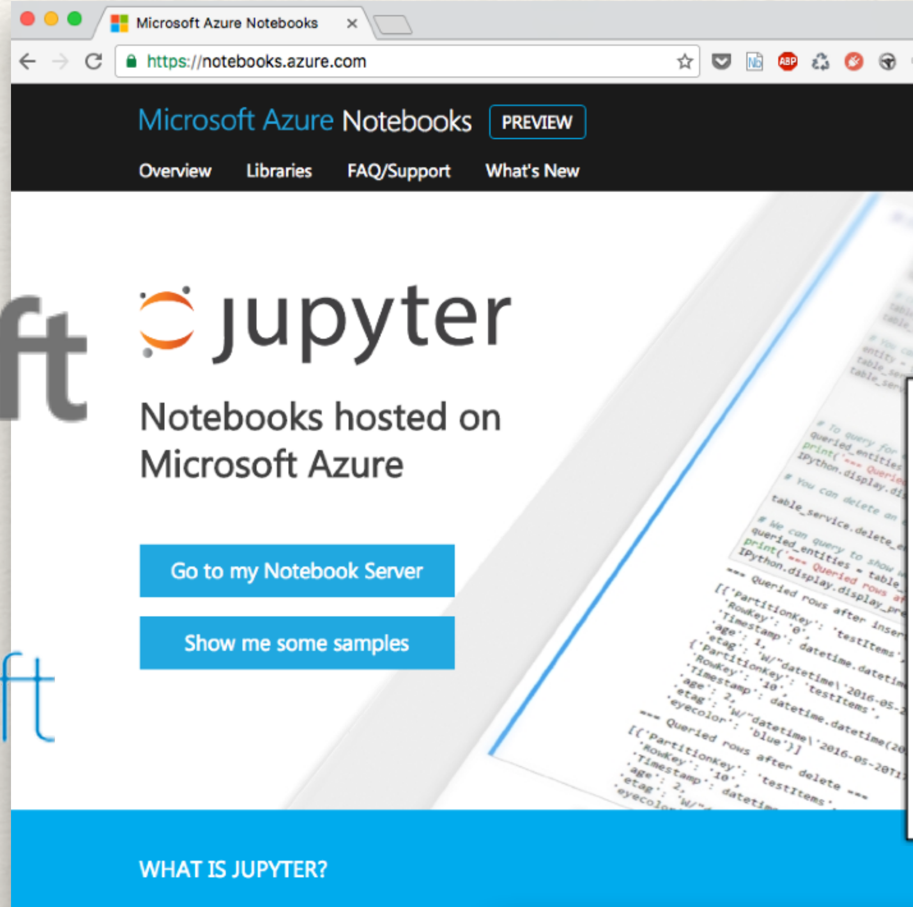
```
'GW150914_H1_whitenbp.wav'
```

Using the IPython.display.Audio object

# Wide industrial adoption

Microsoft

Microsoft Azure



https://notebooks.azure.com

jupyter

Notebooks hosted on Microsoft Azure

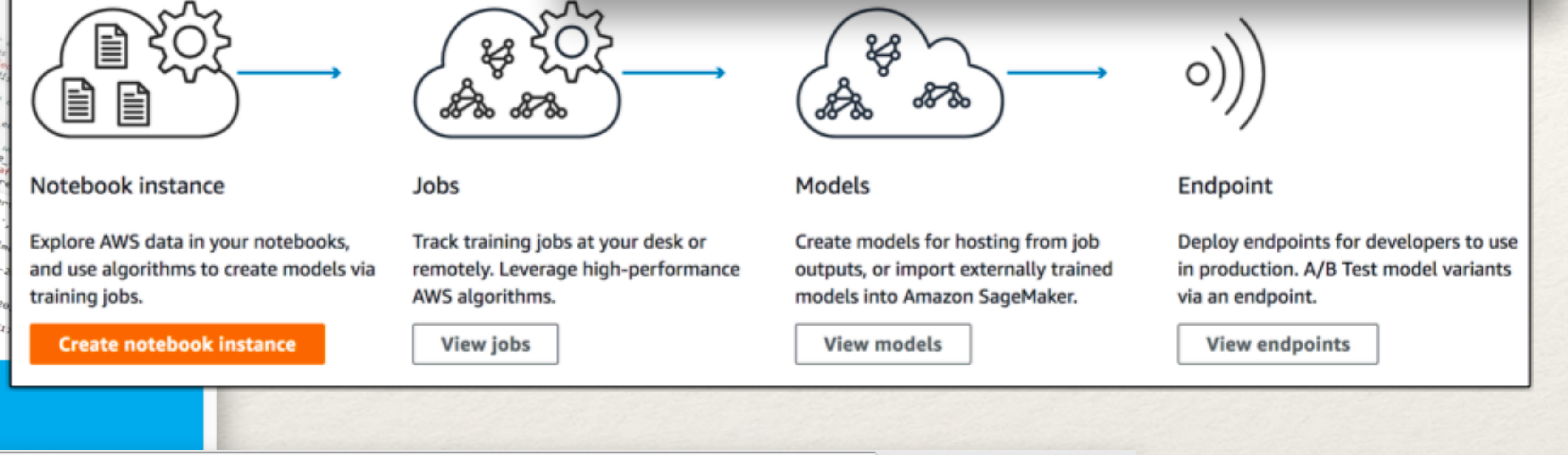
WHAT IS JUPYTER?

- Interactive Notebooks for Data S
- Browser-based REPL with Markd
- Support for Python 2, Python 3 a

ABOUT THIS SERVICE

- This notebook service is provided the Azure Data Group
- Your notebooks are stored in Azu
- Enjoy some free cycles on us

Amazon SageMaker



**Notebook instance**

Explore AWS data in your notebooks, and use algorithms to create models via training jobs.

**Jobs**

Track training jobs at your desk or remotely. Leverage high-performance AWS algorithms.

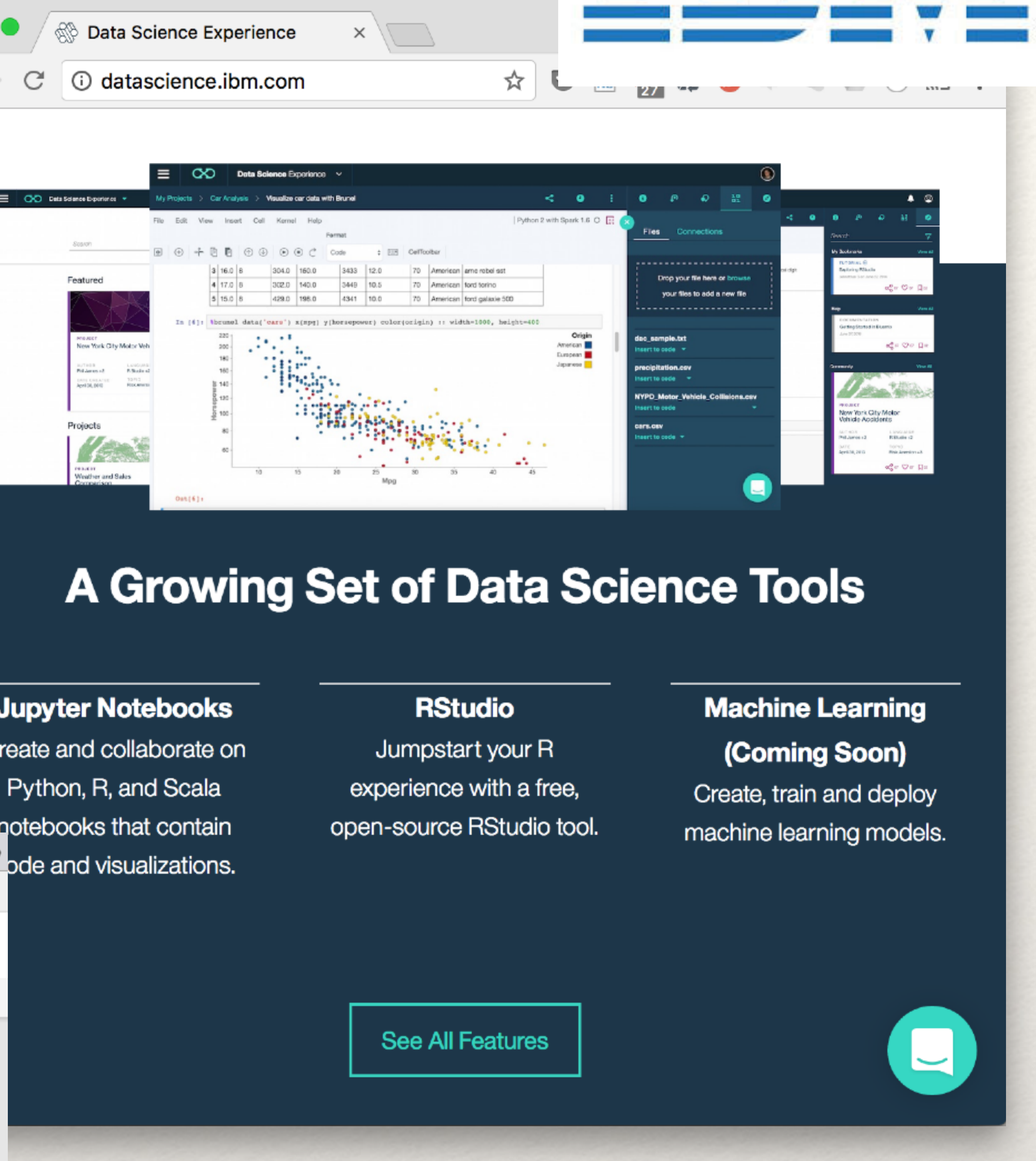
**Models**

Create models for hosting from job outputs, or import externally trained models into Amazon SageMaker.

**Endpoint**

Deploy endpoints for developers to use in production. A/B Test model variants via an endpoint.

IBM



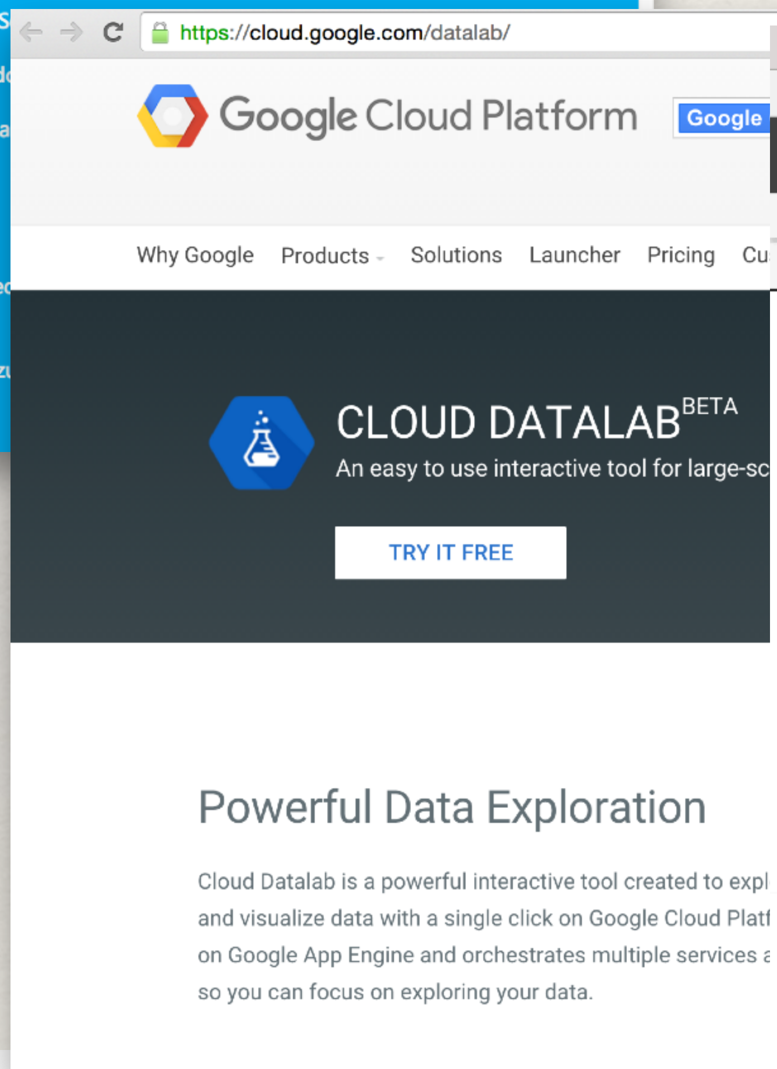
datascience.ibm.com

## A Growing Set of Data Science Tools

**Jupyter Notebooks**
Create and collaborate on Python, R, and Scala notebooks that contain code and visualizations.

**RStudio**
Jumpstart your R experience with a free, open-source RStudio tool.

**Machine Learning (Coming Soon)**
Create, train and deploy machine learning models.



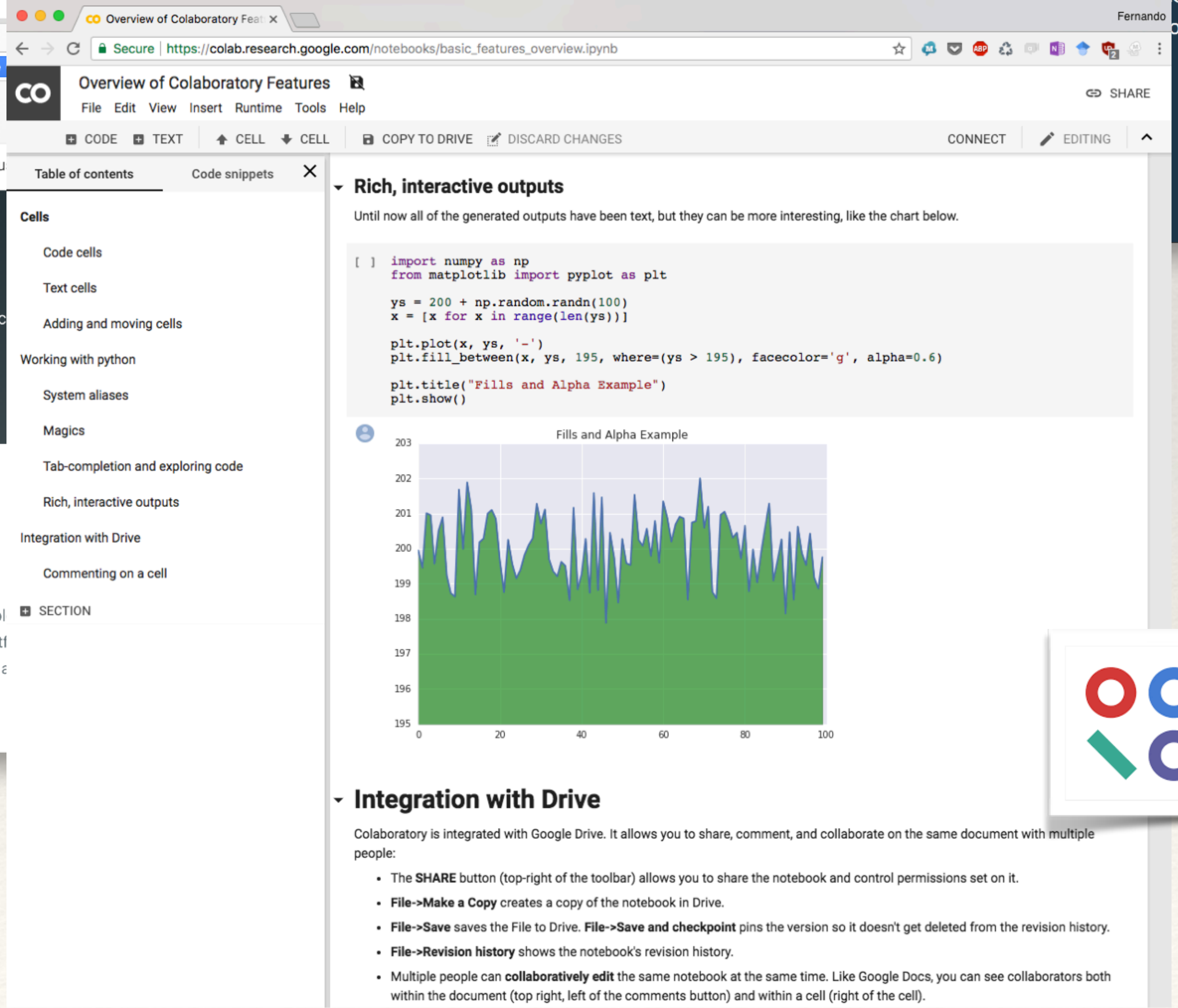
https://cloud.google.com/datalab/

CLOUD DATALAB BETA

An easy to use interactive tool for large-sc

Powerful Data Exploration

Cloud Datalab is a powerful interactive tool created to expl and visualize data with a single click on Google Cloud Platf on Google App Engine and orchestrates multiple services a so you can focus on exploring your data.



https://colab.research.google.com/notebooks/basic_features_overview.ipynb

Overview of Colaboratory Features

Cells
- Code cells
- Text cells
- Adding and moving cells

Working with python
- System aliases
- Magics
- Tab-completion and exploring code
- Rich, interactive outputs

Integration with Drive
- Commenting on a cell

### Rich, interactive outputs

Until now all of the generated outputs have been text, but they can be more interesting, like the chart below.

```
[ ] import numpy as np
    from matplotlib import pyplot as plt

    ys = 200 + np.random.randn(100)
    x = [x for x in range(len(ys))]

    plt.plot(x, ys, '-')
    plt.fill_between(x, ys, 195, where=(ys > 195), facecolor='g', alpha=0.6)

    plt.title("Fills and Alpha Example")
    plt.show()
```

### Integration with Drive

Colaboratory is integrated with Google Drive. It allows you to share, comment, and collaborate on the same document with multiple people:

- The **SHARE** button (top-right of the toolbar) allows you to share the notebook and control permissions set on it.
- **File->Make a Copy** creates a copy of the notebook in Drive.
- **File->Save** saves the File to Drive. **File->Save and checkpoint** pins the version so it doesn't get deleted from the revision history.
- **File->Revision history** shows the notebook's revision history.
- Multiple people can **collaboratively edit** the same notebook at the same time. Like Google Docs, you can see collaborators both within the document (top right, left of the comments button) and within a cell (right of the cell).

COCALC

CODE OCEAN

Google

GRYD

R-Brain

ANACONDA

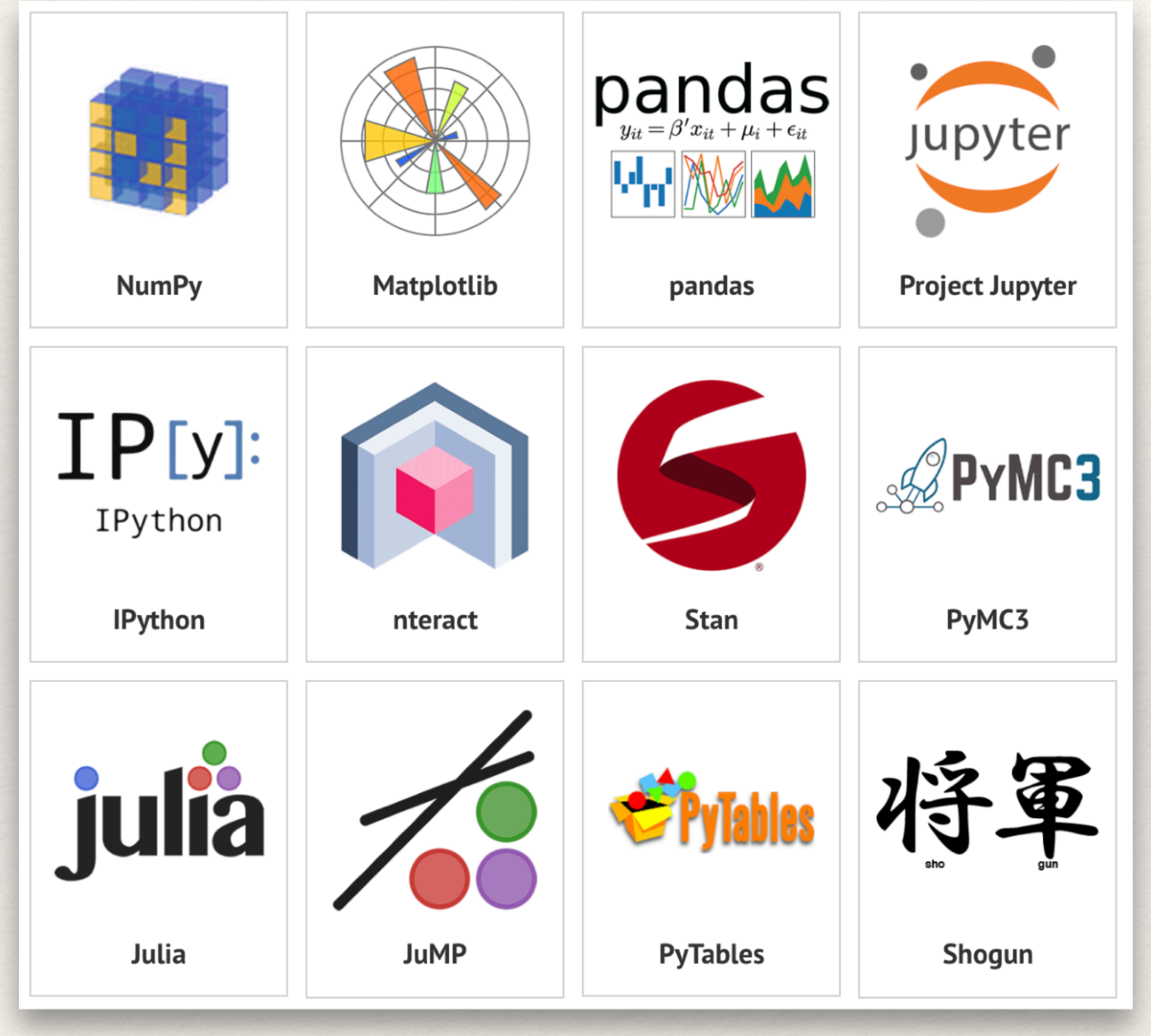
jupytercon
THE OFFICIAL JUPYTER CONFERENCE
AUG 21-22, 2018: TRAINING
AUG 22-24, 2018: TUTORIALS & CONFERENCE
NEW YORK, NY
Leverage the power of Jupyter for collaborative, extensible, scalable, and reproducible data science.
O'REILLY
jupytercon
Brought to you by NumFOCUS Foundation and O'Reilly Media Inc.
Julia Meinwald
Two Sigma Investments
@JuliaEve
OPEN CODE = BETTER SCIENCE
Job & Message Board
PipelineAI
NSF
Tweet #JupyterCon
Leidos is hiring!
Jupyter
Outcome Health is hiring!
indeed.com
jupytercon
Reproducible Research
Python
Media
Big Data Innovation Hubs
Spark and Scala
jupyter
New York
August 21-24, 2018
Save the date

jupytercon.com @JupyterCon, photos by @triciaphoto

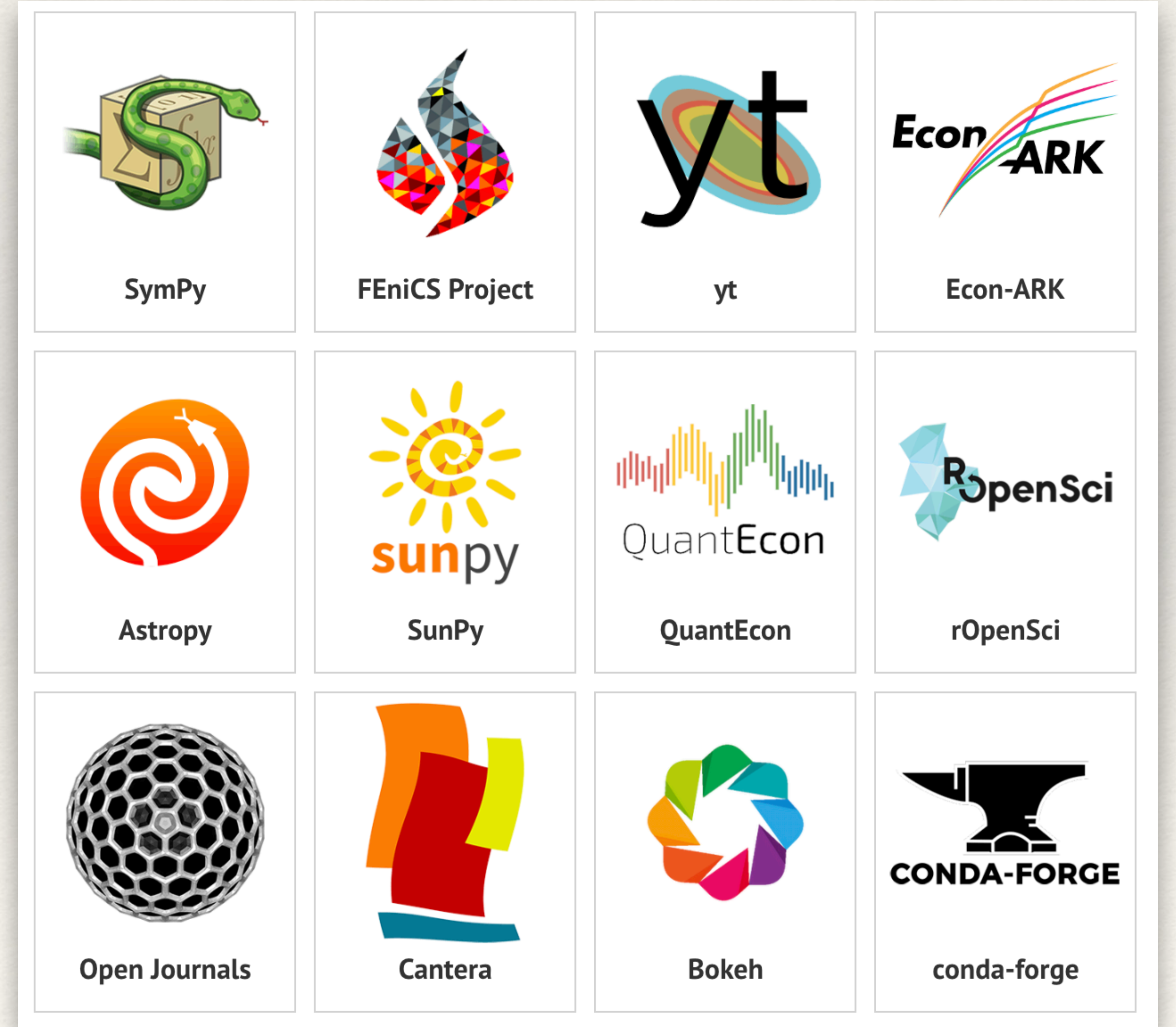
**If the world doesn’t give you a space, you’ll need to create it**

# 2012 NUMFOCUS

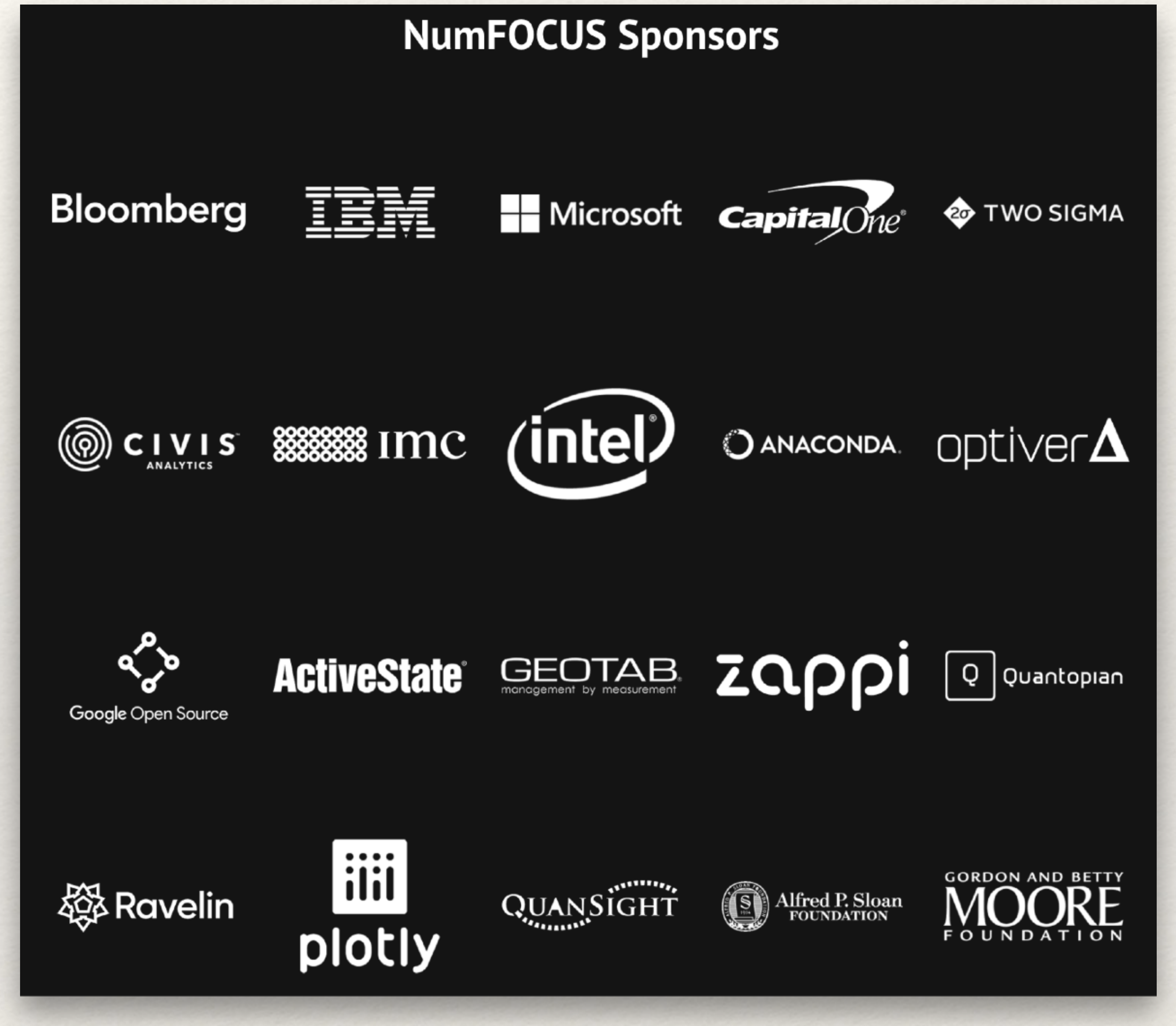
## OPEN CODE = BETTER SCIENCE



| | | | |
|---|---|---|---|
| NumPy | Matplotlib | pandas | Project Jupyter |
| IPython | nteract | Stan | PyMC3 |
| Julia | JuMP | PyTables | Shogun |

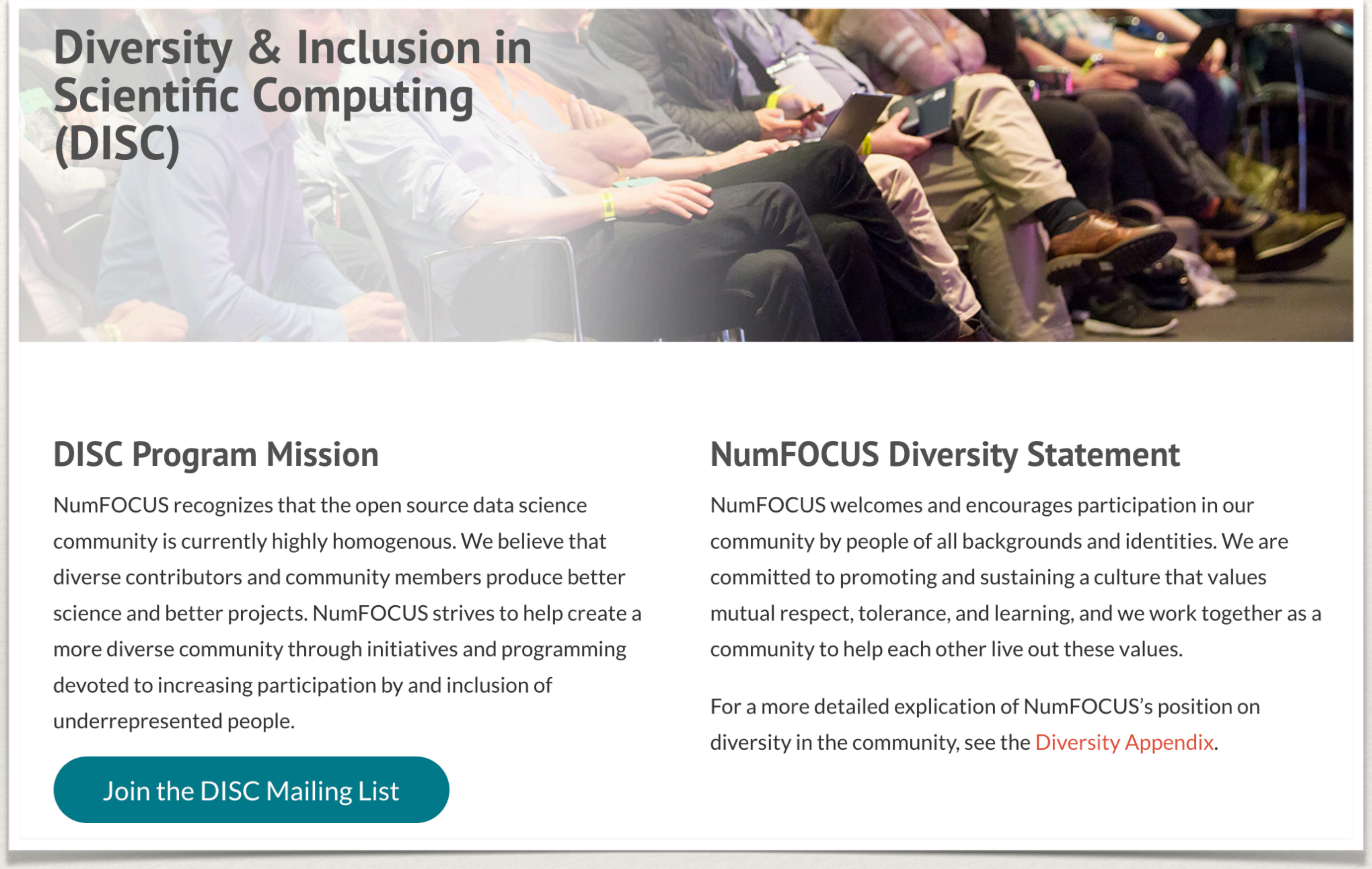


| | | | |
|---|---|---|---|
| SymPy | FEniCS Project | yt | Econ-ARK |
| Astropy | SunPy | QuantEcon | rOpenSci |
| Open Journals | Cantera | Bokeh | conda-forge |



NumFOCUS Sponsors

# NumFOCUS: beyond code, communities



## Diversity & Inclusion in Scientific Computing (DISC)

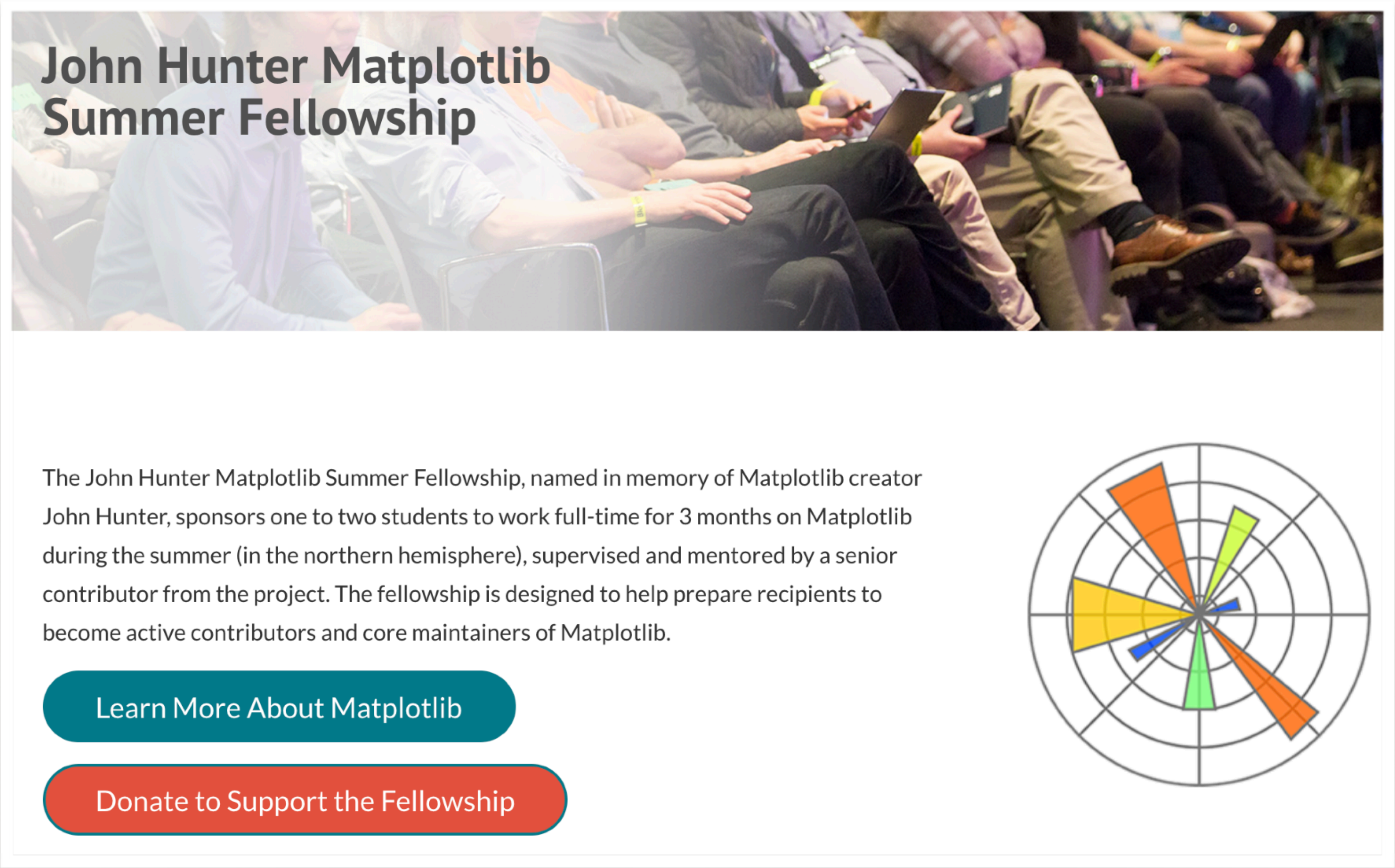
### DISC Program Mission

NumFOCUS recognizes that the open source data science community is currently highly homogenous. We believe that diverse contributors and community members produce better science and better projects. NumFOCUS strives to help create a more diverse community through initiatives and programming devoted to increasing participation by and inclusion of underrepresented people.

### NumFOCUS Diversity Statement

NumFOCUS welcomes and encourages participation in our community by people of all backgrounds and identities. We are committed to promoting and sustaining a culture that values mutual respect, tolerance, and learning, and we work together as a community to help each other live out these values.

For a more detailed explication of NumFOCUS's position on diversity in the community, see the Diversity Appendix.



## John Hunter Matplotlib Summer Fellowship

The John Hunter Matplotlib Summer Fellowship, named in memory of Matplotlib creator John Hunter, sponsors one to two students to work full-time for 3 months on Matplotlib during the summer (in the northern hemisphere), supervised and mentored by a senior contributor from the project. The fellowship is designed to help prepare recipients to become active contributors and core maintainers of Matplotlib.

# 2013: Berkeley Institute for Data Science

Join us for the launch of the
Berkeley Institute for Data Science
December 12, 2013, 11:00 - 3:00 pm
Banatao Auditorium, Sutardja Dai Hall

GORDON AND BETTY MOORE FOUNDATION

NYU — Berkeley UNIVERSITY OF CALIFORNIA — W UNIVERSITY of WASHINGTON

ALFRED P. SLOAN FOUNDATION

# Creating good institutional spaces is hard, but critical!

University of California, Berkeley

DEPARTMENT OF STATISTICS

THE UNIVERSITY OF CALIFORNIA · BERKELEY · LET THERE BE LIGHT · 1868

# Reproducible Research

An article about computational science in a scientific publication is **not** the scholarship itself, it is merely **advertising** of the scholarship. The actual scholarship is the complete software development environment and the complete set of instructions which generated the figures.

*Buckheit and Donoho, WaveLab and Reproducible Research,* ***1995***

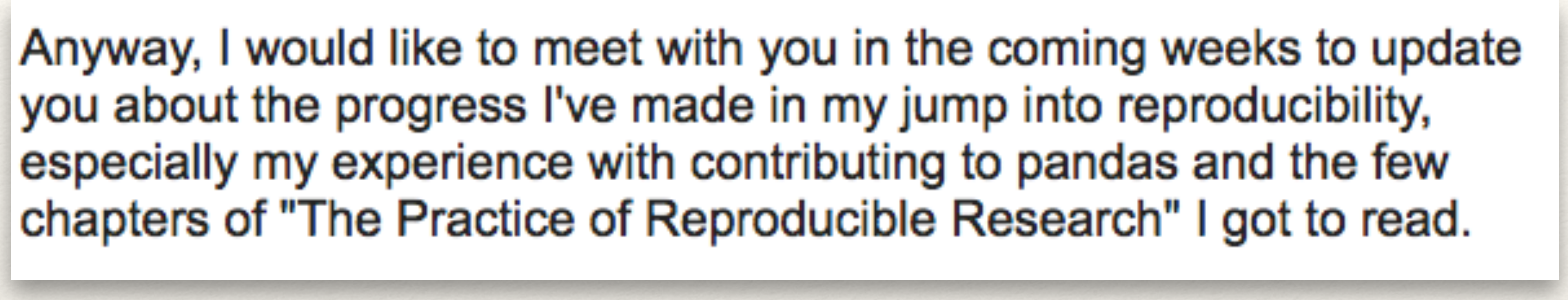
# Collaborative and Reproducible Data Science

## STAT 159 @ Berkeley, Fall 2017

- **Version control:** Git and GitHub
- **Programming:** Python
- **Process automation:** Make
- **Data analysis:** Numpy, Pandas, Matplotlib, NLTK, Scikit-Learn, …
- **Documentation:** Sphinx
- **Software testing:** PyTest
- **Continuous Integration:** Travis
- **Reproducible containers:** Binder

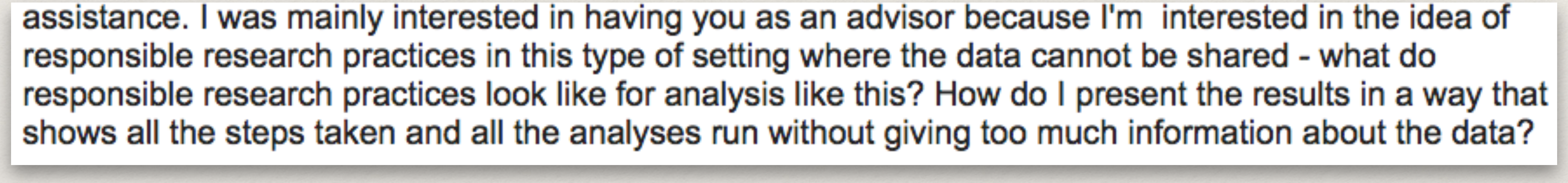
http://bit.ly/stat159-f17

# Student feedback



Anyway, I would like to meet with you in the coming weeks to update you about the progress I've made in my jump into reproducibility, especially my experience with contributing to pandas and the few chapters of "The Practice of Reproducible Research" I got to read.

**New open source contributor**

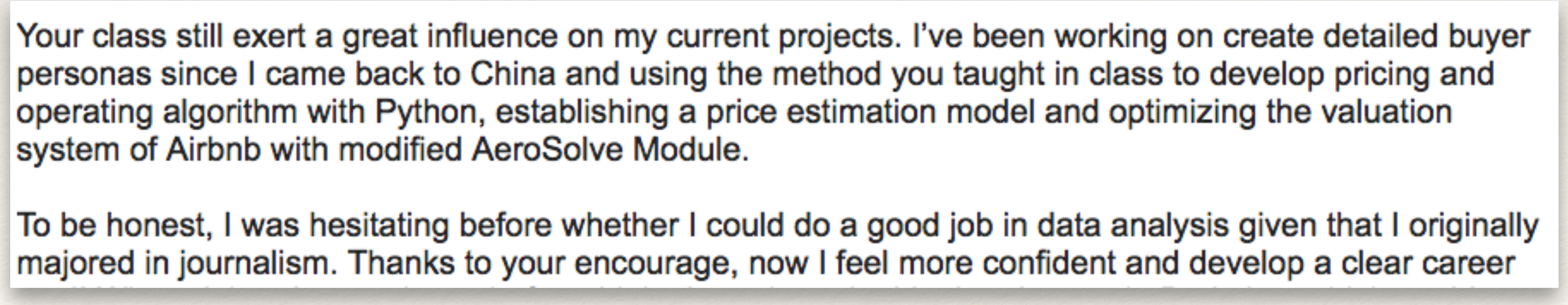


assistance. I was mainly interested in having you as an advisor because I'm interested in the idea of responsible research practices in this type of setting where the data cannot be shared - what do responsible research practices look like for analysis like this? How do I present the results in a way that shows all the steps taken and all the analyses run without giving too much information about the data?

**Undergraduate research project**

**Journalist who now is applying to Data Science graduate programs**

**(admitted to Columbia, JH, …)**



Your class still exert a great influence on my current projects. I've been working on create detailed buyer personas since I came back to China and using the method you taught in class to develop pricing and operating algorithm with Python, establishing a price estimation model and optimizing the valuation system of Airbnb with modified AeroSolve Module.

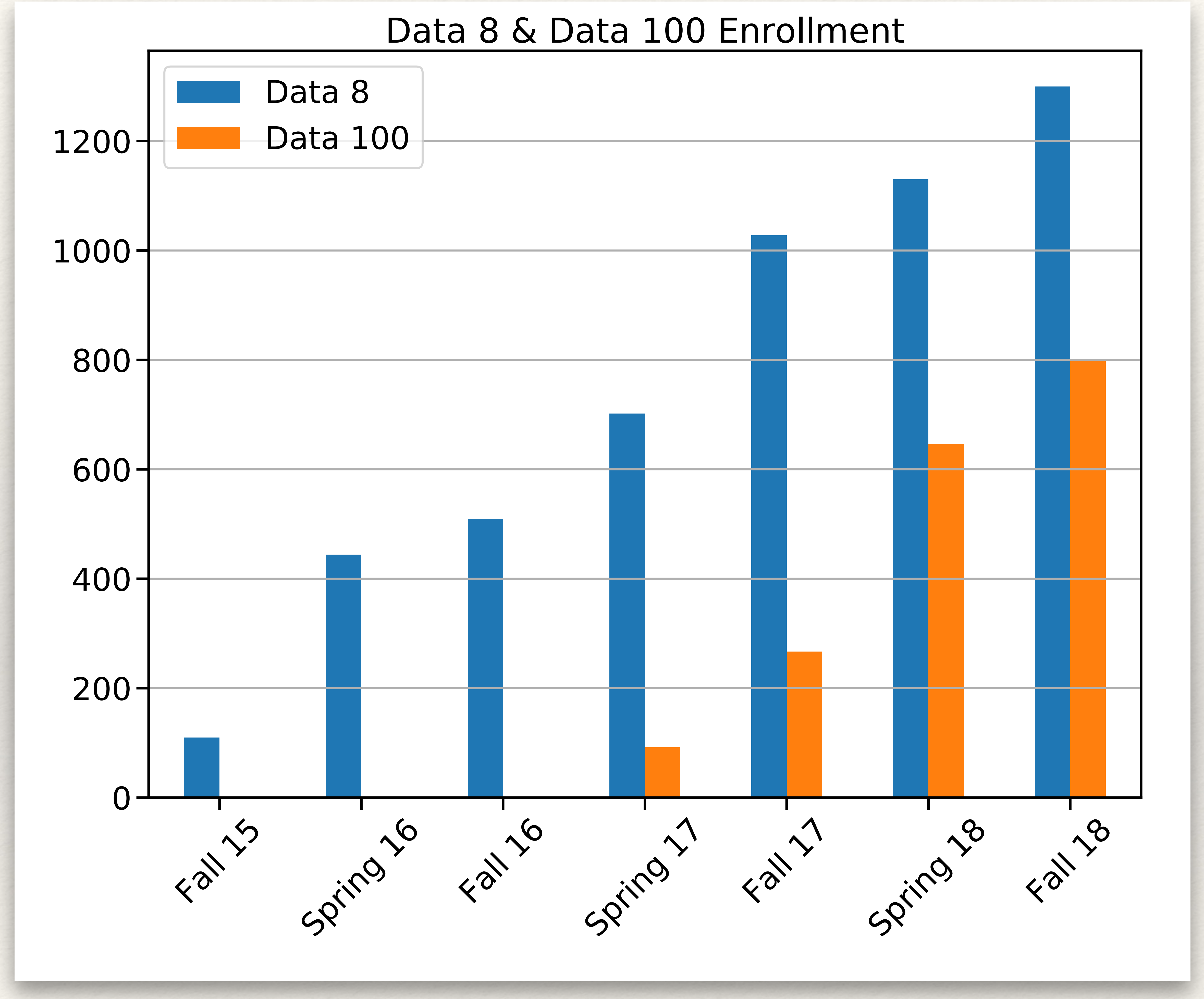
To be honest, I was hesitating before whether I could do a good job in data analysis given that I originally majored in journalism. Thanks to your encourage, now I feel more confident and develop a clear career

# Data 8 & Data100: massive uptake

D8: ~1,300 students

D100: ~800 students

# Fastest growing courses in Berkeley history



http://data8.org - http://ds100.org

**Data 8 in Fall 2018**

- ~ 1,300 enrolled students
- ~ 200 waitlisted

**Annual combined numbers**

- Data 8: ~ 3,000 students
- UC Berkeley: ~ 7,500

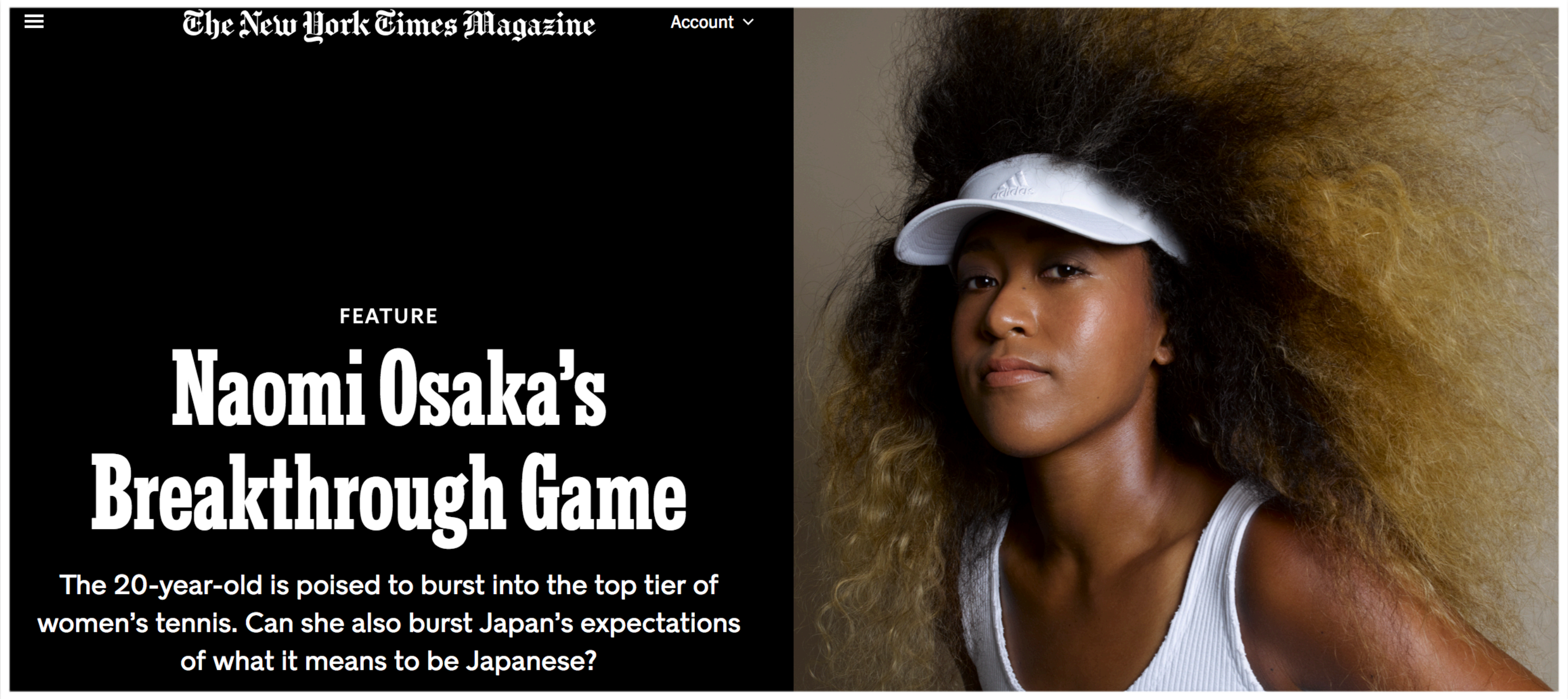
**At steady state, will easily reach ~50% of campus!**

# Last two points: representation…

# Fair participation of all, across

- Gender
- Ethnic
- Religious
- National
- Economic
- … boundaries, with support, opportunity and respect.

# Representation does matter!



FEATURE

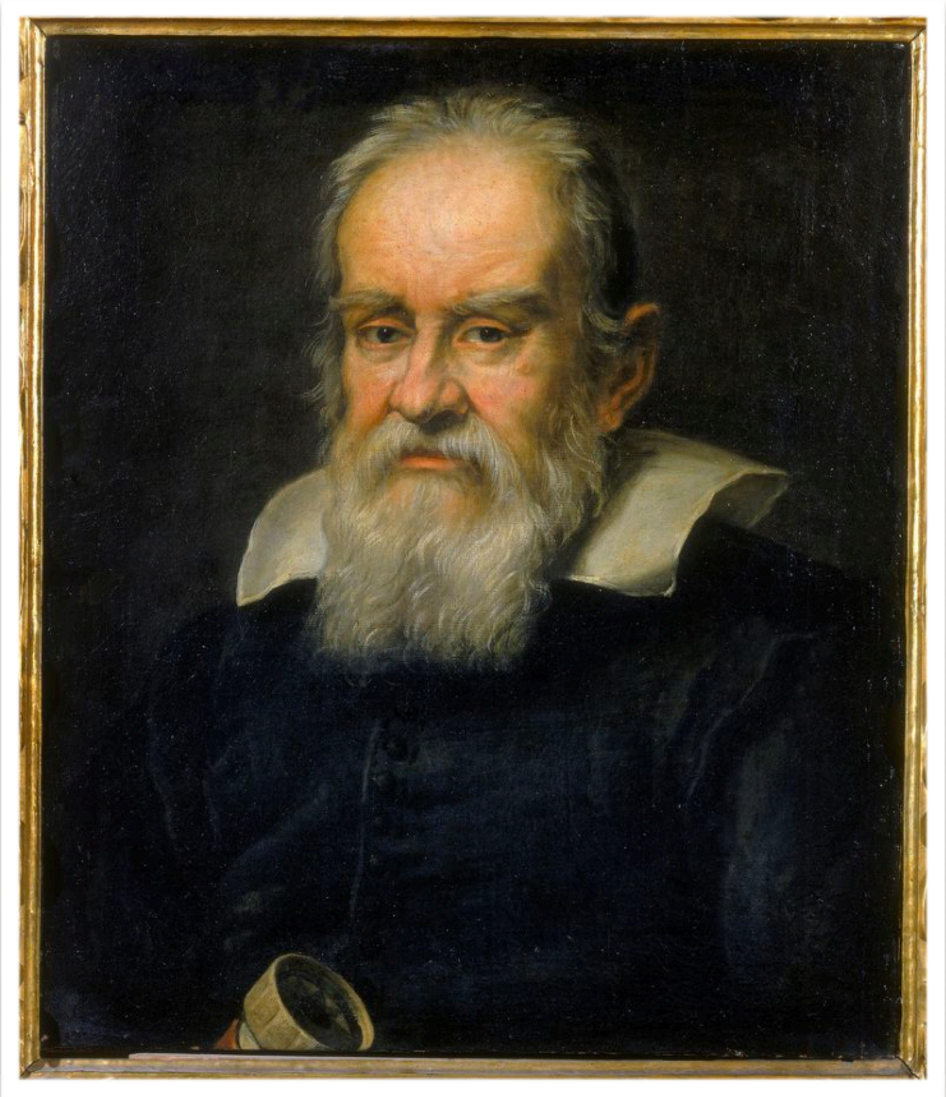
## Naomi Osaka's Breakthrough Game

The 20-year-old is poised to burst into the top tier of women's tennis. Can she also burst Japan's expectations of what it means to be Japanese?

Williams [Venus/Serena's father] had created a plan to turn his daughters into champions

"The blueprint was already there," Francois [Naomi's father] told me. "I just had to follow it."

# But… a teenager in Colombia…

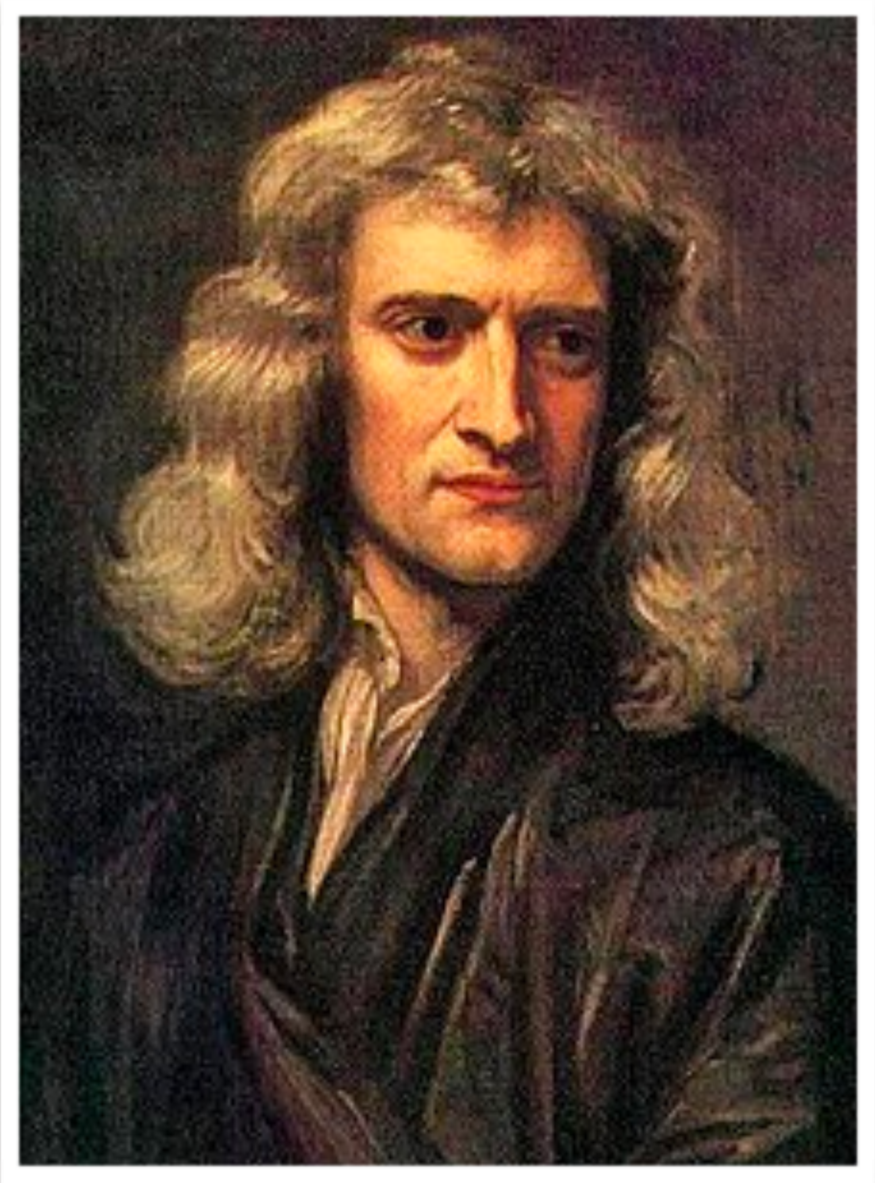


Galileo Galilei

1564-1642

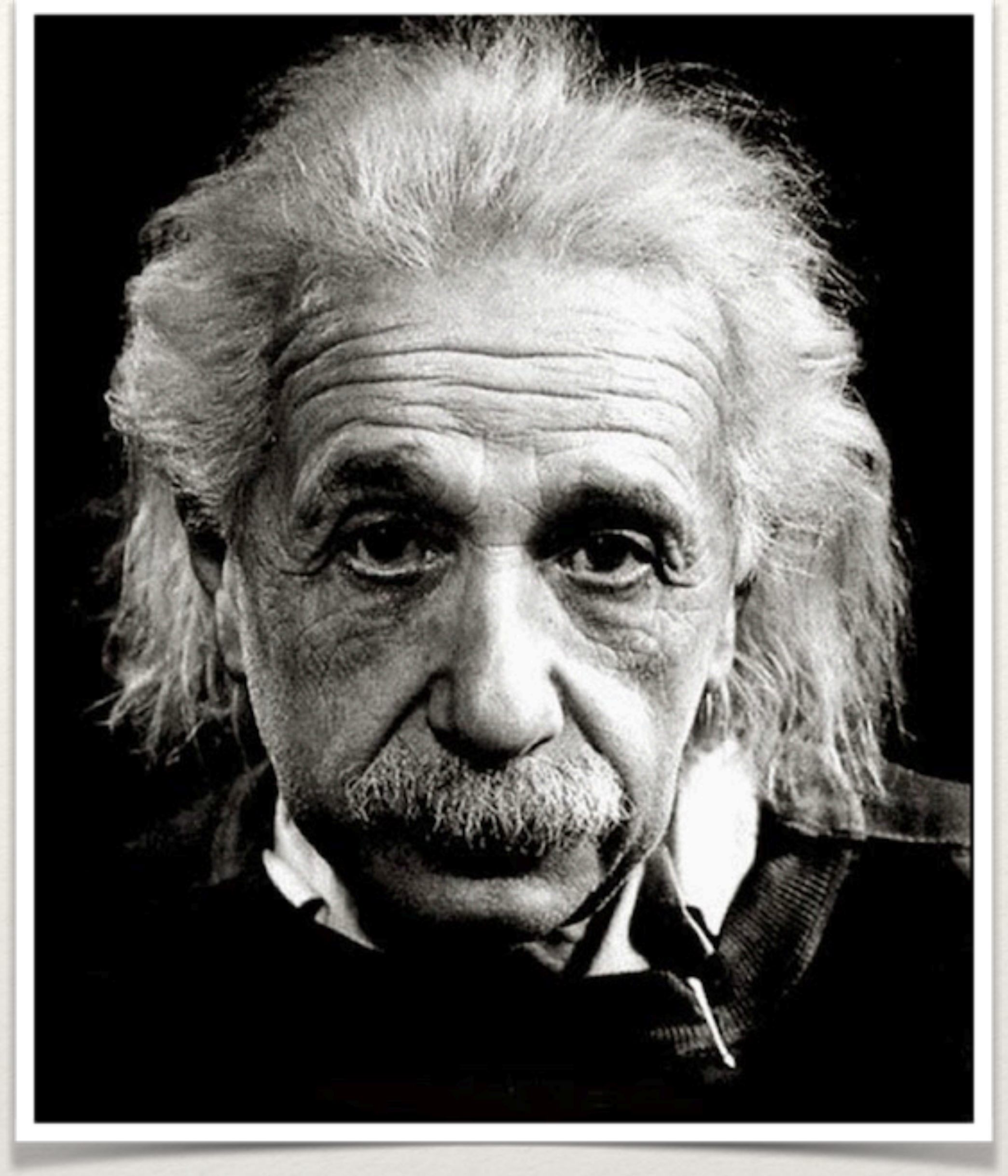
Johannes Kepler

1571-1630



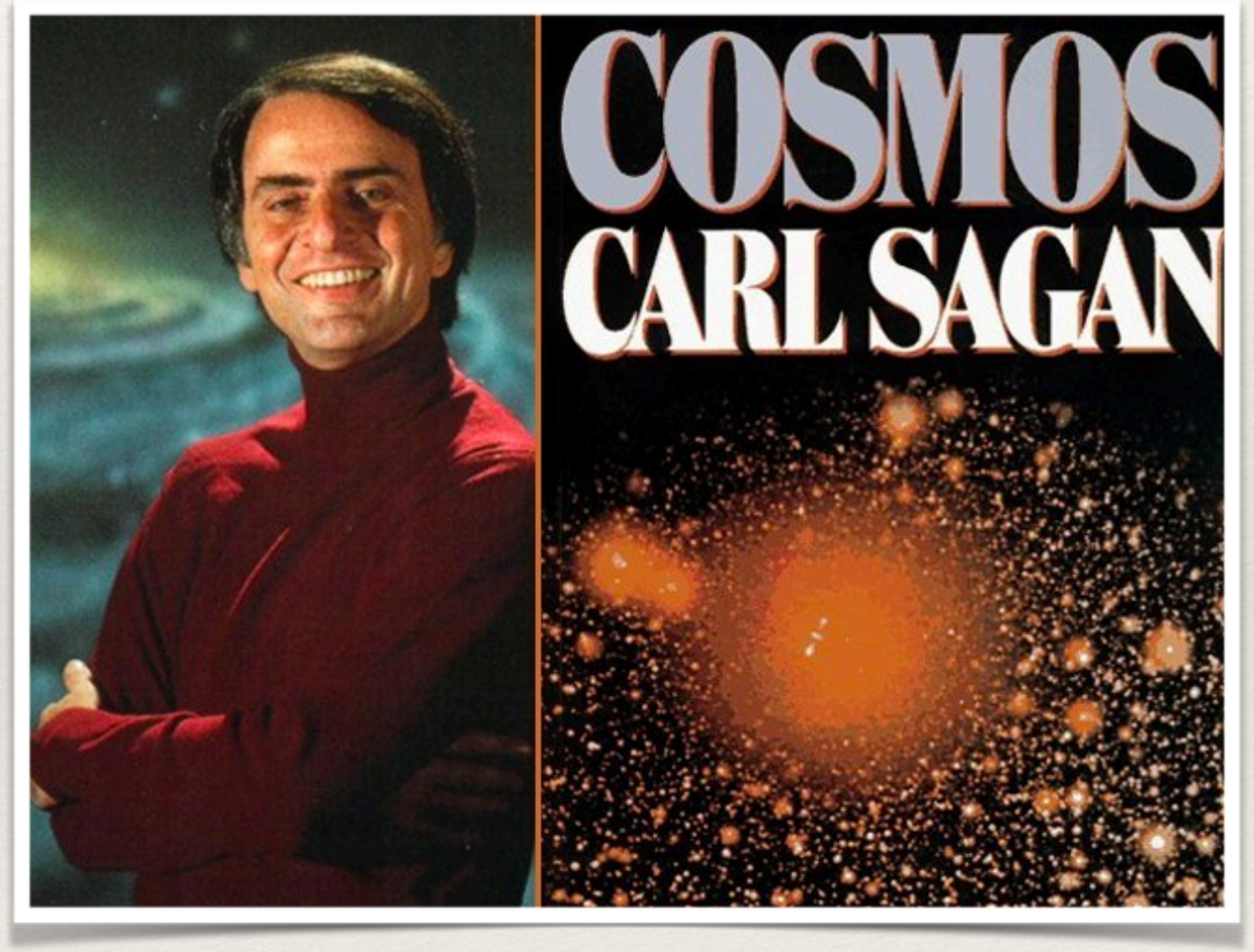
Isaac Newton

1643-1727



Albert Einstein

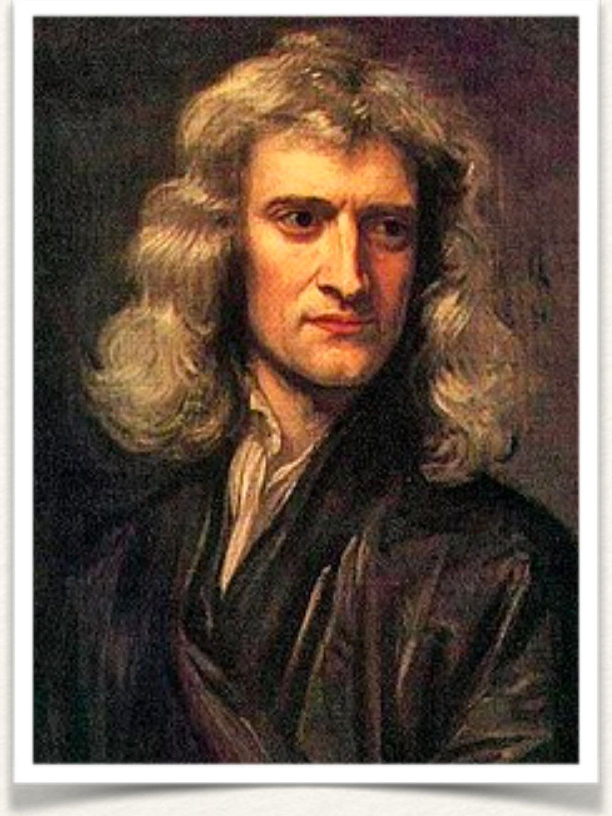
1879-1955

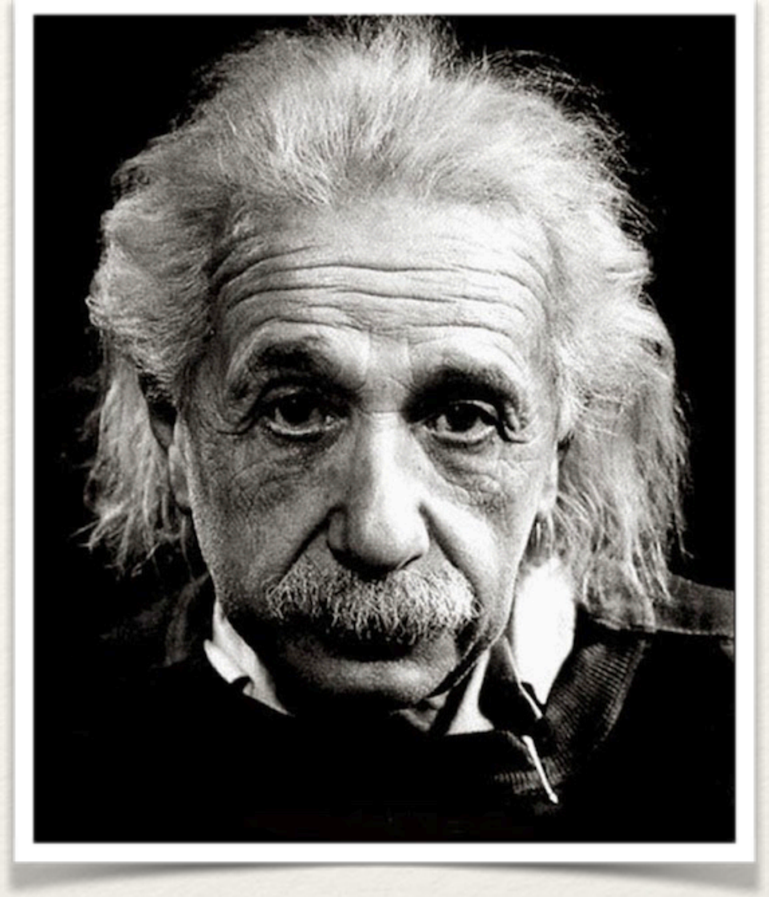


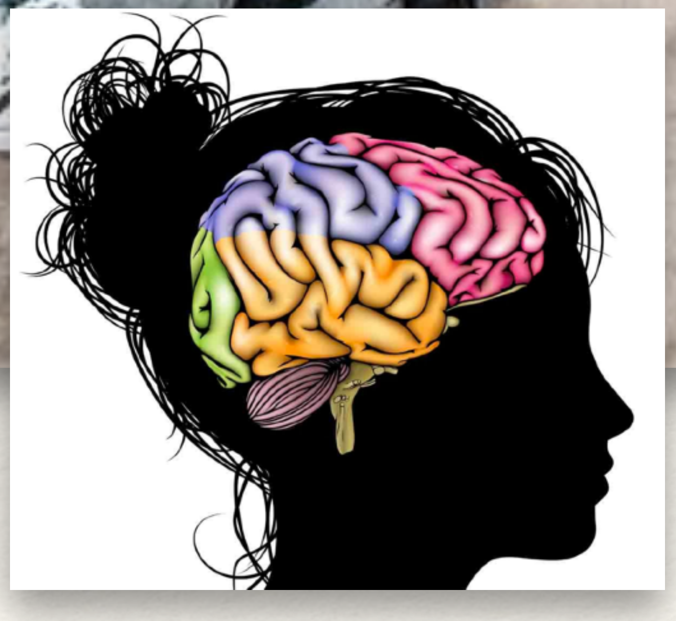
Carl Sagan

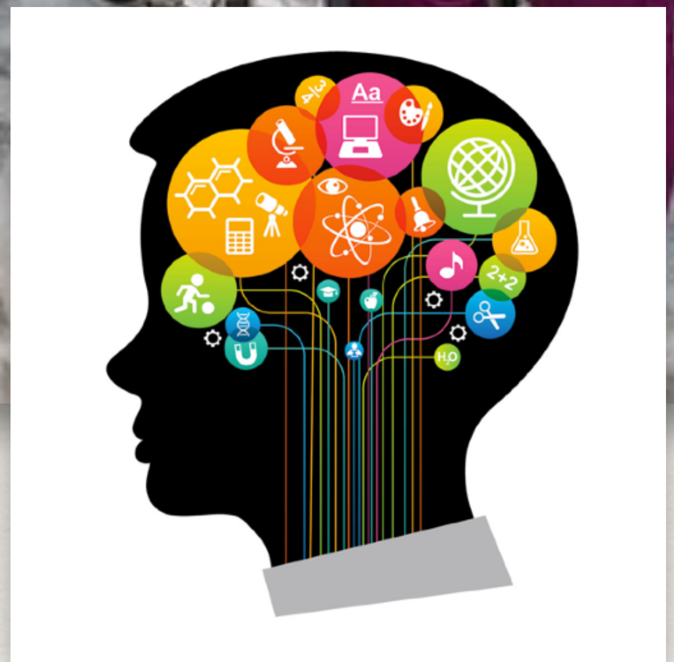
1934-1996

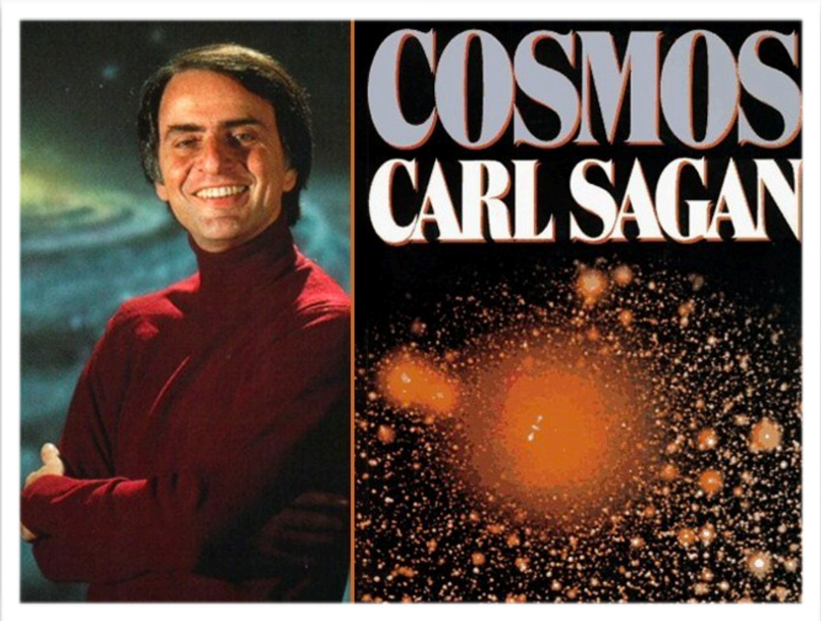
# humanity and ideas











… and careers

# Choose your mentors carefully

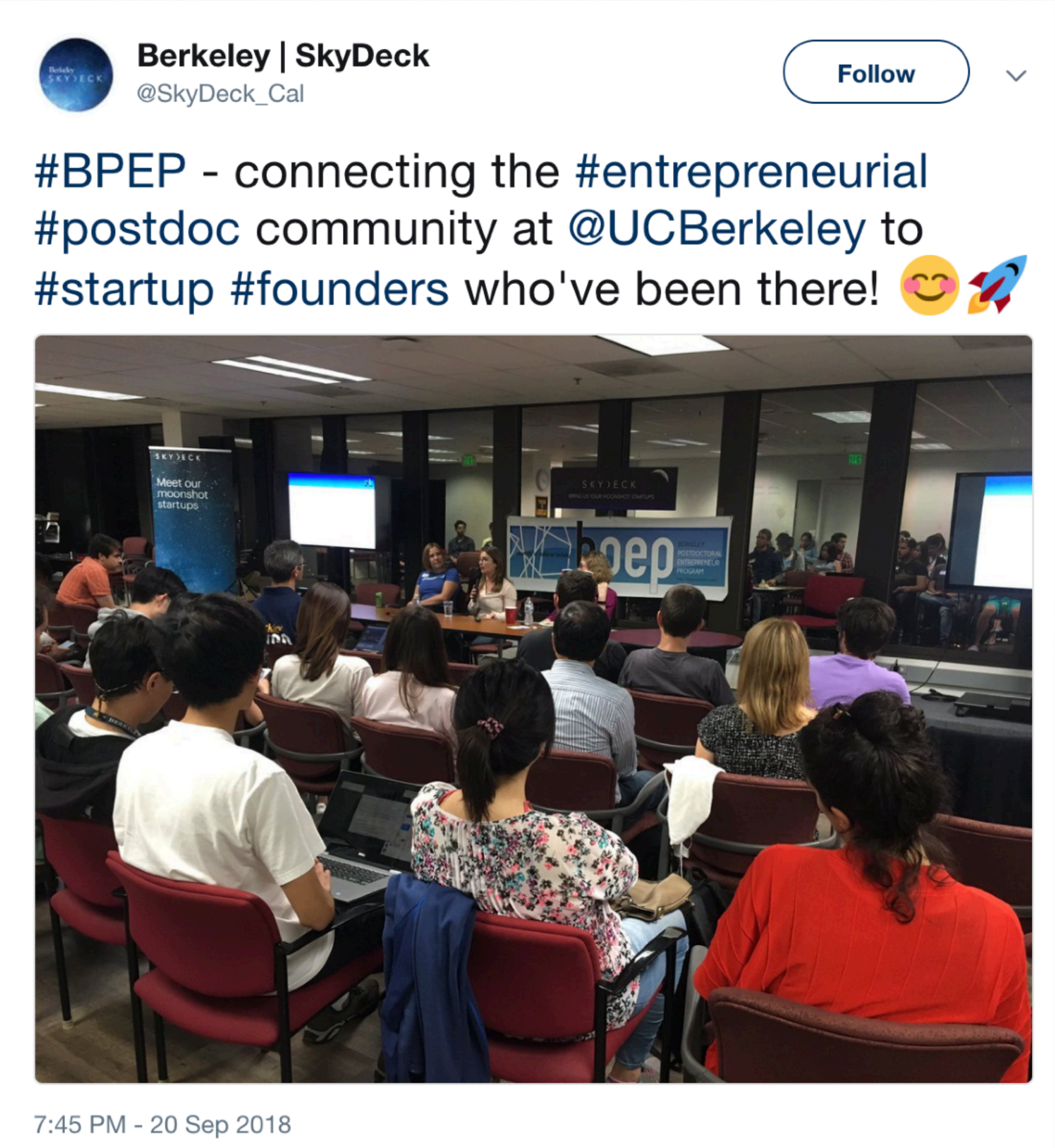
- PhD Advisor: **one of the most important relationships** in your life.
- **Power dynamics** is stacked against you.
- **Personal qualities** of mentor have to compensate for that…
  - And in many cases they do! There are **amazing mentors** out there :)
- **Due diligence**: ask hard questions of former students, postdocs and the mentor.
- A good mentor **pushes you hard** to do your best work, but always treats you first as a human being who merits **respect**.
- In a bad relationship, **walk away**! The earlier the better.

# Beyond Academia?

## You can *choose* a different path!

- It does NOT mean you
  - are not smart/hard working enough,
  - are a sellout,
  - only care about $$$,
  - don’t care about the really hard/interesting problems,
  - wasted your time going to grad school,
  - are a failure as a person,
  - …

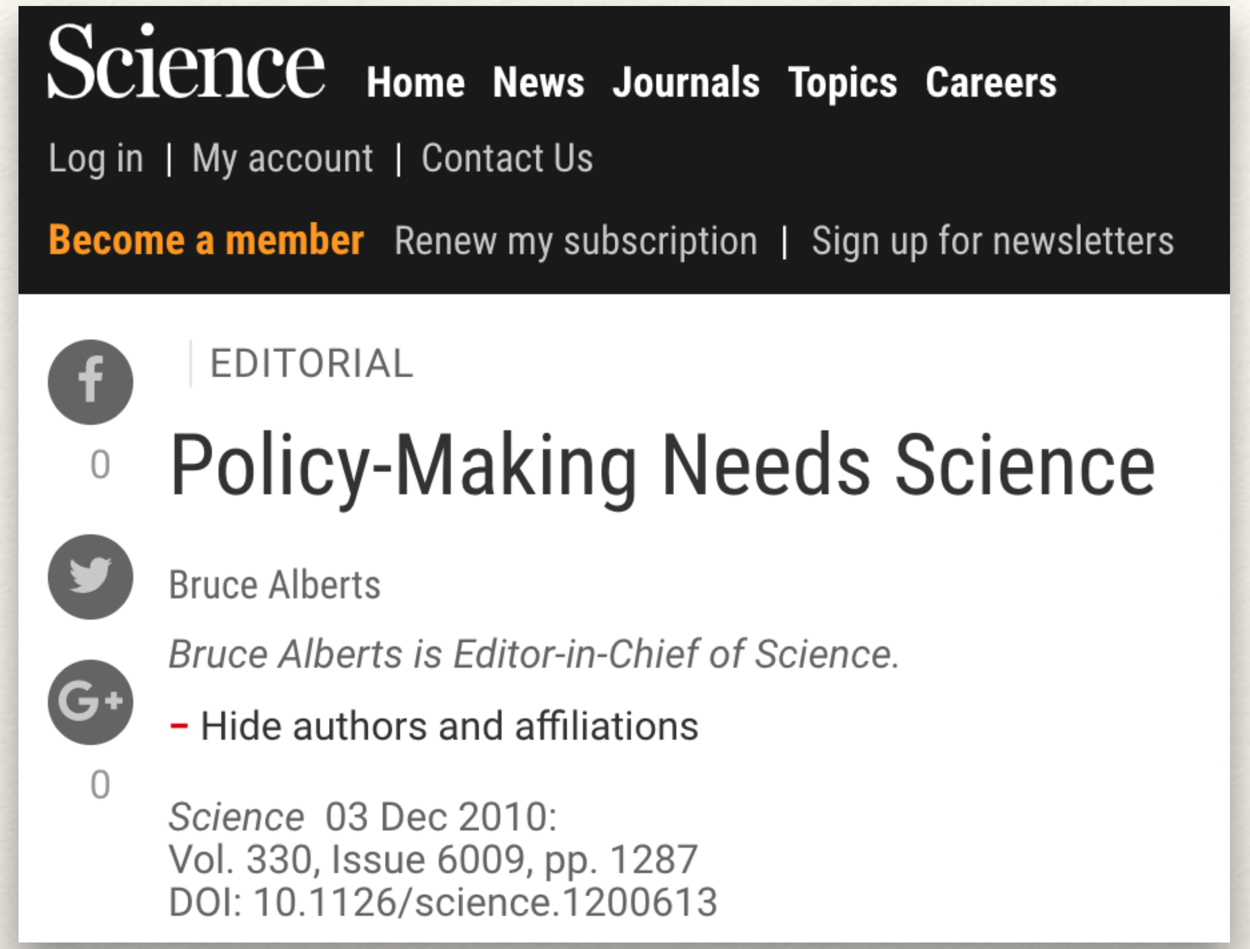
# Beyond Academia…



Berkeley | SkyDeck
@SkyDeck_Cal

#BPEP - connecting the #entrepreneurial #postdoc community at @UCBerkeley to #startup #founders who've been there! 😊🚀

7:45 PM - 20 Sep 2018



Science
Home
News
Journals
Topics
Careers
Log in | My account | Contact Us
Become a member
Renew my subscription | Sign up for newsletters
0
0

EDITORIAL

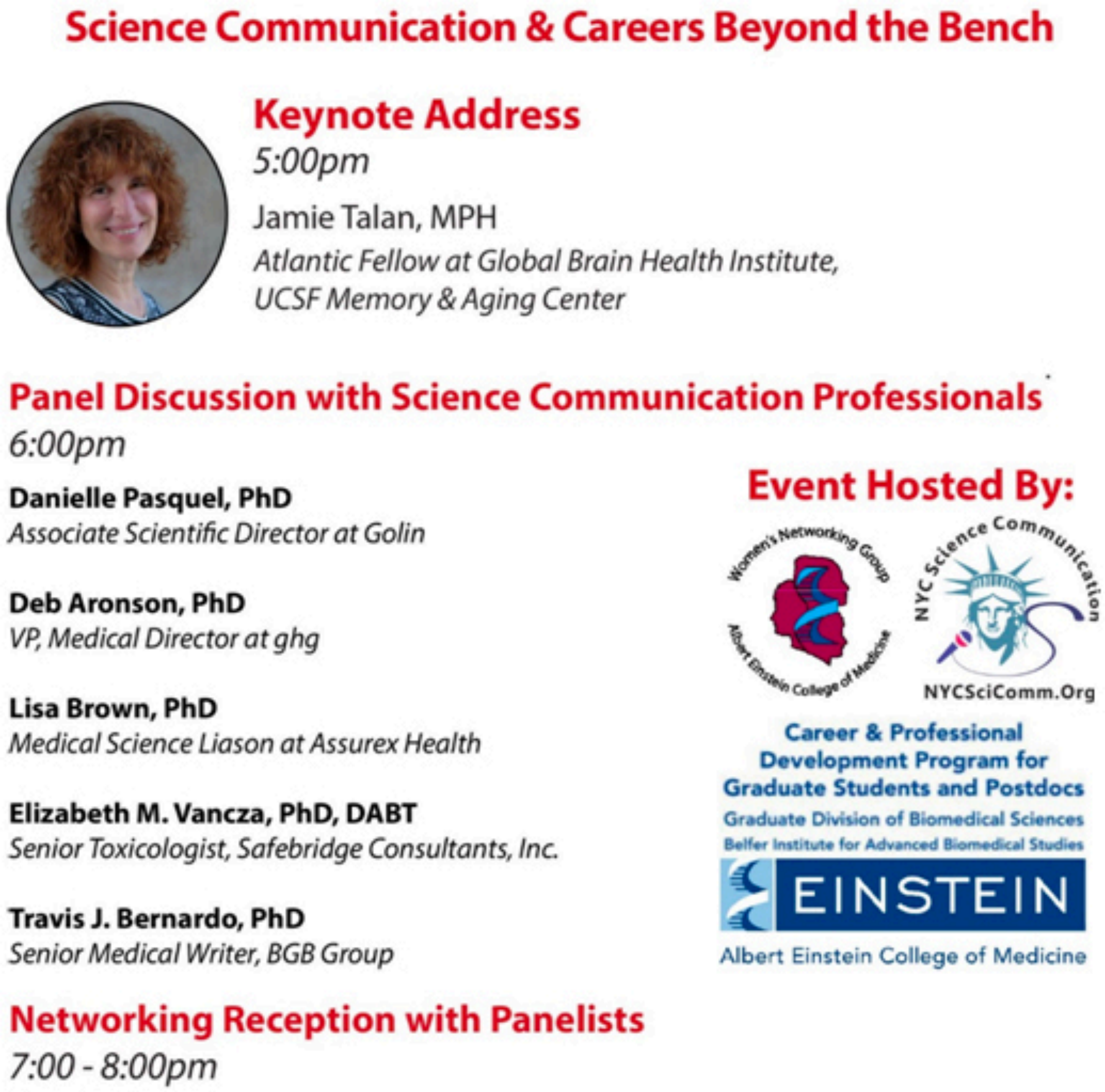
Policy-Making Needs Science

Bruce Alberts

*Bruce Alberts is Editor-in-Chief of Science.*

– Hide authors and affiliations

*Science* 03 Dec 2010:
Vol. 330, Issue 6009, pp. 1287
DOI: 10.1126/science.1200613



Science Communication & Careers Beyond the Bench

Keynote Address
*5:00pm*
Jamie Talan, MPH
*Atlantic Fellow at Global Brain Health Institute,*
*UCSF Memory & Aging Center*

Panel Discussion with Science Communication Professionals
*6:00pm*

**Danielle Pasquel, PhD**
*Associate Scientific Director at Golin*

**Deb Aronson, PhD**
*VP, Medical Director at ghg*

**Lisa Brown, PhD**
*Medical Science Liason at Assurex Health*

**Elizabeth M. Vancza, PhD, DABT**
*Senior Toxicologist, Safebridge Consultants, Inc.*

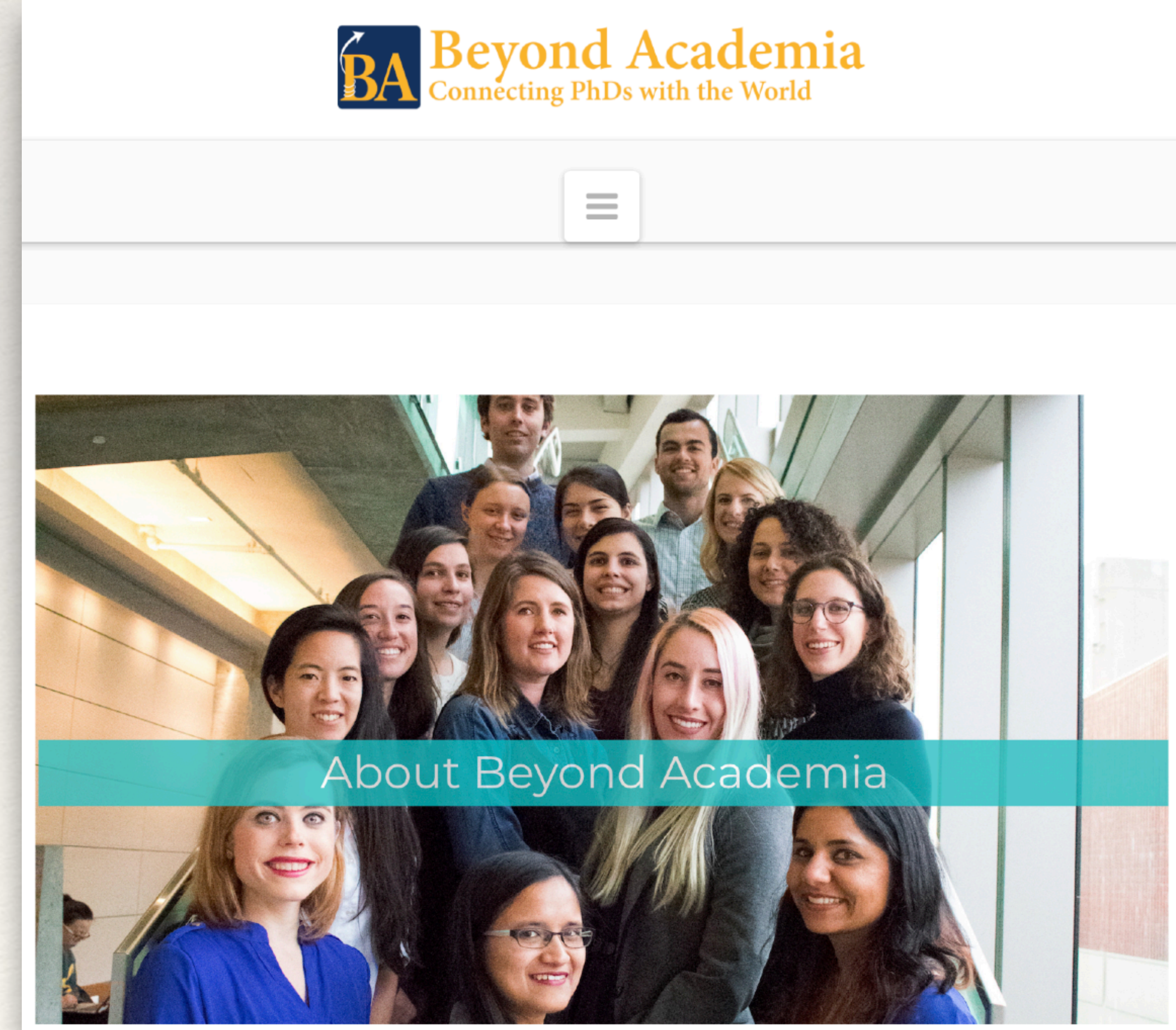
**Travis J. Bernardo, PhD**
*Senior Medical Writer, BGB Group*

Event Hosted By:

Women's Networking Group
Albert Einstein College of Medicine
NYC Science Communication
NYCSciComm.Org

Career & Professional Development Program for Graduate Students and Postdocs
Graduate Division of Biomedical Sciences
Belfer Institute for Advanced Biomedical Studies
EINSTEIN
Albert Einstein College of Medicine

Networking Reception with Panelists
*7:00 - 8:00pm*



Beyond Academia
Connecting PhDs with the World

About Beyond Academia

# Thank You!