

# doing science in the open

part one

# MOTIVATION

# responsibility

being a scientist brings not only  
fun to investigate things you care about  
freedom  
a good salary  
two monitors (for some)

there are also some **responsibilities**

# open science

what we do, we do for everybody  
research is funded by people  
so we should make sure they get something in return

this viewpoint is heavily inspired by [Michael Nielsen](#)



part two

# OUR RESEARCH HABITS

# typical scientific routine

come up with an experiment

write code to run it (Matlab, E-Prime)

collect data

analyze data (Matlab, Excel, SPSS)

present data at a conference (Powerpoint, Illustrator)

write a paper (MS Word)

submit it to a journal

get reviews\*

revise and get paper published

get media coverage

# typical scientific routine

come up with an experiment

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\*negative

# come up with an experiment

You need to read journals to get inspired / replicate findings.

What if you can't access *Current Biology*?

What if your institution is poor?

What if you're just a curious high school student?

# write code to run it

What if you want to reuse somebody's code? How do you obtain it? Will it work on your machine?

What if you don't have the software?

Matlab: € 360 / year (?)

E-Prime: \$ 795 / \$ 995

and, oh,

Windows: € 200 / € 309 / € 319

# collect data

Where do you get enough participants?

Oh, and that's expensive too!

# analyze data

How much time do you spend analyzing it manually?

Programming trivial things?

How much do you pay for your analysis software?

MS Office: € 139 (student) / € 379.01 / € 699 (pro)

SPSS: € 25 (student/year) / € 360

# present data at a conference

Will you ever see anybody's slides/poster again?

# write a paper

Ever got lost among all different versions of your paper?  
Hate formatting?

# submit it to a journal

How much time do you spend preparing your manuscript for submission? Figuring out journal's particular requirements? Redoing all of that for another journal?

How much do you pay for submission?

Journal of Vision: \$ 85 per page (\$ 510 for 6 pages)

The Journal of Neuroscience: \$ 950 / \$ 475 (brief)

PLoS One: \$ 1350

Psychological Science: \$ 0

# get (negative) reviews

Stupid reviewers and unreasonable requests? 3 major revisions?

How many *years* does it take from obtaining results to publishing them?

# revise and get published

Who can read your paper?

Did you know that you did not hold the copyright to your own creative work?

And what did you publish? Just some text? Where is raw data, code, analyses? Maybe you made a mistake? Maybe you cheated?

# get media coverage

Will they see your paper?

Will *anybody* see your paper?

And if they do, what will they find on your website? A conveniently double-spaced paper in the Times New Roman typeface?

part three

**HOW TO FIX THAT**

# come up with an experiment

You need to read journals to get inspired / replicate findings.

What if you can't access *Current Biology*?

What if your institution is poor?

What if you're just a curious high school student?

The next slides will provide solutions for these fundamental flaws.

# write code to run it

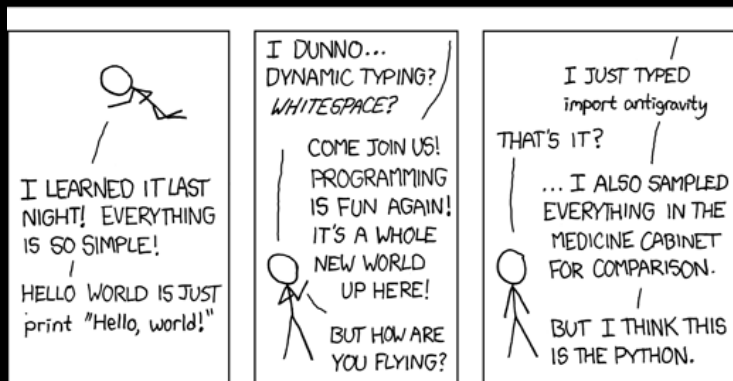
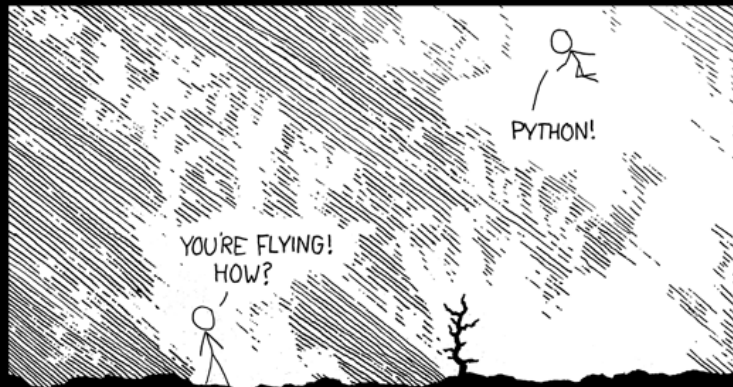
What if you want to reuse somebody's code? How do you obtain it? Will it work on your machine?

What if you don't have the software?

use free and open source software

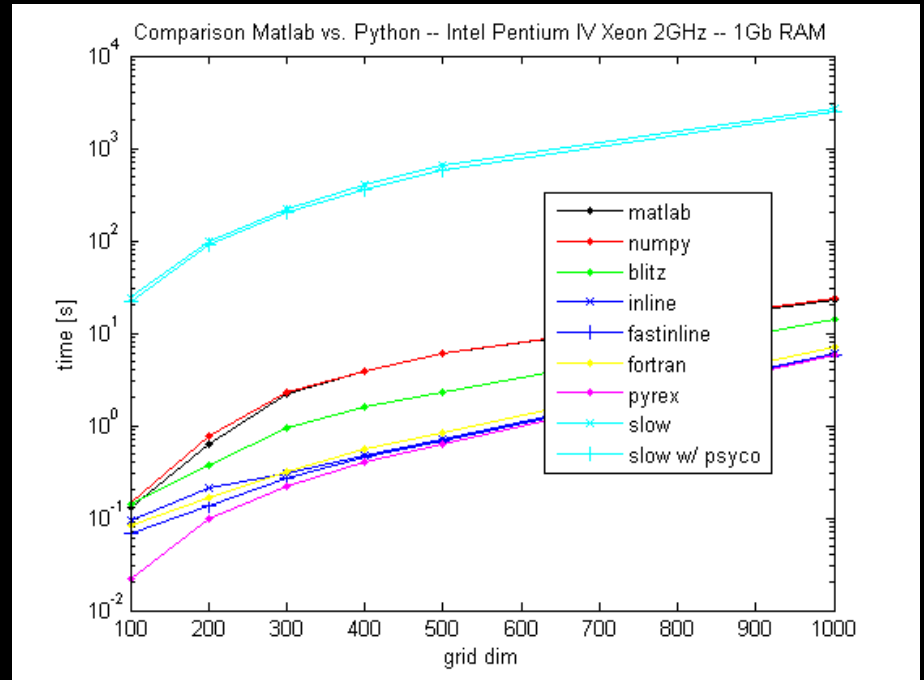
# write code to run it: python

user-friendly



[xkcd](#)

fast



[Lorenzo Bolla's blog](#)

# write code to run it: **python**

has **psychophysics** packages (PsychoPy, Vision Egg)  
and even **point-and-click interfaces** (PsychoPy,  
OpenSesame)

versatile

got some C/C++ code? use Cython

want to go online? use Pyjamas, Sculpt

need parallel computing? use IPython

need more? somebody has probably done that already

and to help you migrate to Python, there is an Open-Source MATLAB-to-Python Compiler

**write code: neurodebian**

get all necessary tools easily: NeuroDebian (maintained actively by Halke/Halchenko in Haxby's group)

# collect data

Where do you get enough participants?

Oh, and that's expensive too!

do experiments online

python can do it!

make your experiments run on a browser

make them fun!

foldit: resolved a crystal structure of an AIDS-related protein

# analyze data

How much time do you spend analyzing it manually?

Programming trivial things?

publish your computer code: it is good enough

use distributed version control systems like git or

mercurial: track changes, instant sharing

# analyze data

How much do you pay for your analysis software?

do you really need anything for your t-test, linear regression, and a correlation?

use R for more complicated statistical tests

use NiPy for fMRI analyses

use PyMVPA, LIBSVM for SVMs

# present data at a conference

Will you ever see anybody's slides/poster again?

use QR codes for immediate dissemination

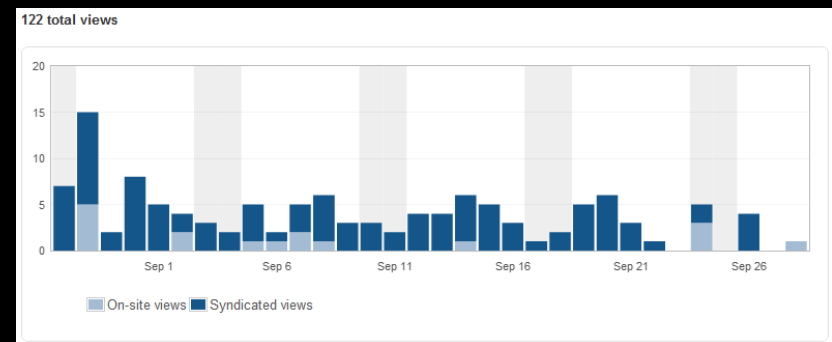
put them on Gestalt Revision

how about your own website? it's free and easy to set up. it's know as a *blog*

bonus: now you know who cares about your stuff

also: why use Powerpoint to make your slides/poster?

try Scribus/Inkscape



# write a paper

Ever got lost among all different versions of your paper?

use Google Docs:  
revision history  
commenting  
available everywhere

Hate formatting?

use LaTeX, ScribTeX

# submit it to a journal

How much time do you spend preparing your manuscript for submission?  
Figuring out journal's particular requirements? Redoing all of that for another journal?

How much do you pay for submission?

why do we need journals at all?

use [arXiv](#)

# get (negative) reviews

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How many *years* does it take from obtaining results to publishing them?

Publish peer reviews

Nikolaus Kriegeskorte:

Open access + Open **post-publication** peer review

# revise and get published

Who can read your paper?

Did you know that you did not hold the copyright to your own creative work?

And what did you publish? Just some text? Where is raw data, code, analyses?  
Maybe you made a mistake? Maybe you cheated?

**publish everything:** data, analysis workflow, code that generated your figures, full text (put a disclaimer like [this one](#))...

# get media coverage

Will they see your paper?

Will *anybody* see your paper?

And if they do, what will they find on your website? A conveniently double-spaced paper in the Times New Roman typeface?

no problem if you used Google Docs or LaTeX and created your website...

[Gallant Lab's example](#) of making it easy for everybody

part four

# **CONCLUDING REMARKS**

# moving to the cloud

no dependency on a particular platform

free backup

access to everything for everyone anywhere

(use [Dropbox](#), [Wuala](#))

instant collaboration tools

# open issues

where do you share your data?

maybe [Dryad](#), [Dataverse Network](#)

no facebook for scientists

maybe [Academia.edu](#), [Research Gate](#)

there aren't mature open alternatives for everything yet,  
e.g., Powerpoint, SPM

privacy issues when moving to the cloud

requires efforts: more coding, more command line  
interfaces, more things to do

# what to do

start by publishing full data, your code, and full text