

Strategies for achieving reproducible research

ANTdrew D. Nguyen,
Evolutionary Physiologist

Research papers: Journals should drive data reproducibility

Gregorio Santori

Nature 535, 355 (21 July 2016) | doi:10.1038/535355b

Published online 20 July 2016

Journals would then publish only papers that are accompanied online by full experimental protocols, raw data and source code, as in the Protocol Exchange repository

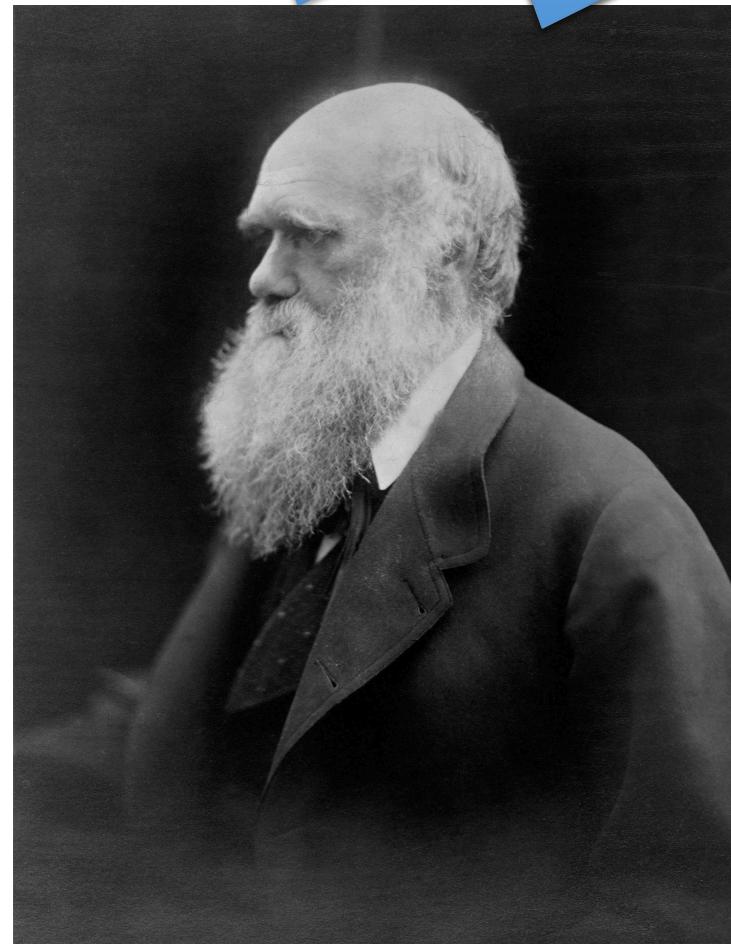
For manuscripts containing statistical analyses, journals should peer review only those papers that use statistics environments based on source code, enforcing the ban on 'point-and-click' statistical software (see go.nature.com/29pdpc1).

Instead of research on reproducibility, just do reproducible research

11 Dec 2015

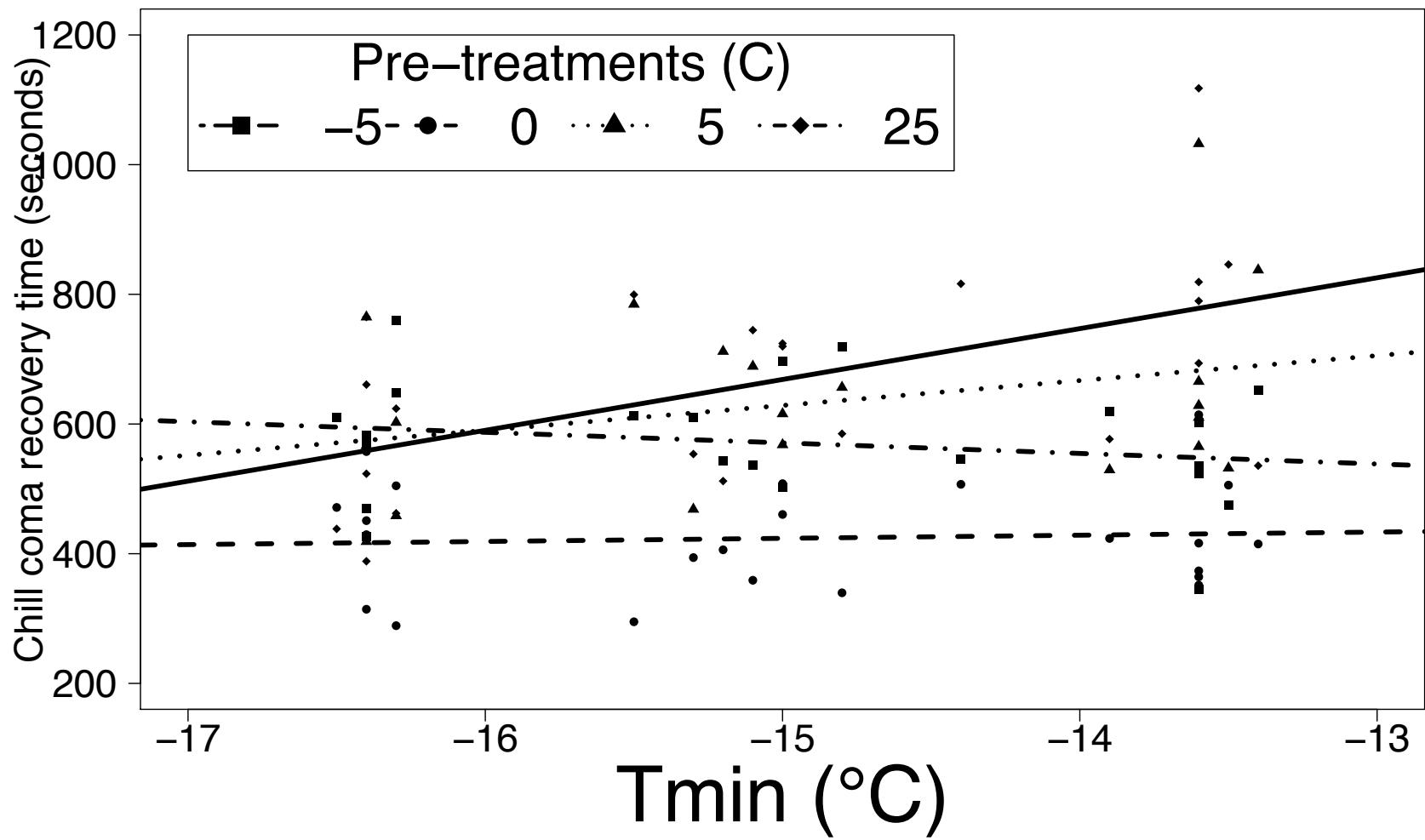
How...?!?!?

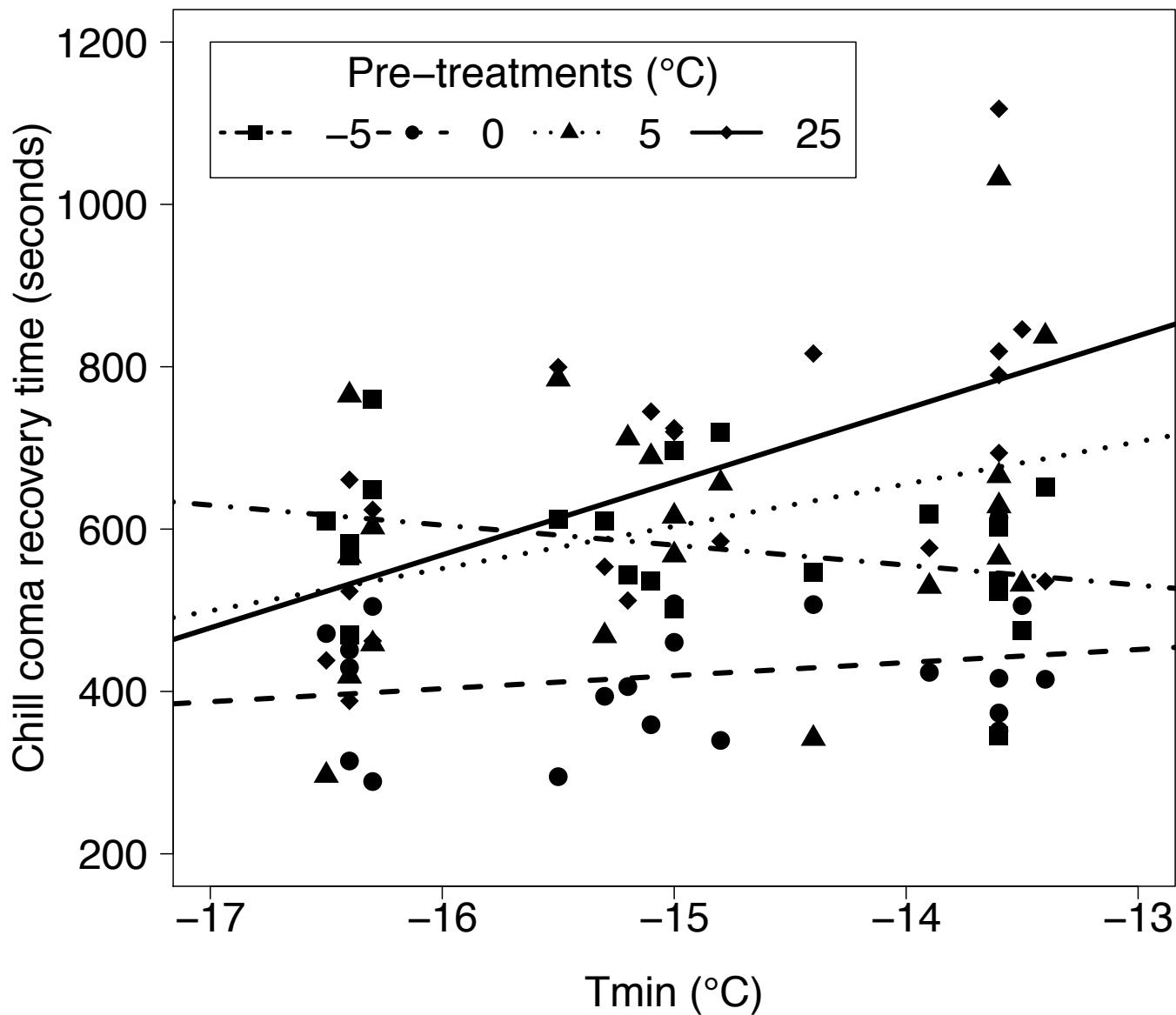
1. Use [Github](#) for version control.
2. Use [rmarkdown](#) or [iPython notebooks](#) for your analysis code
3. When your paper is done post it to [arxiv](#) or [biorxiv](#).
4. Post your data to an appropriate repository like [SRA](#) or a general purpose site like [figshare](#).
5. Send any software you develop to a controlled repository like [CRAN](#) or [Bioconductor](#).
6. Participate in the [post publication discussion](#) on Twitter and with a Blog

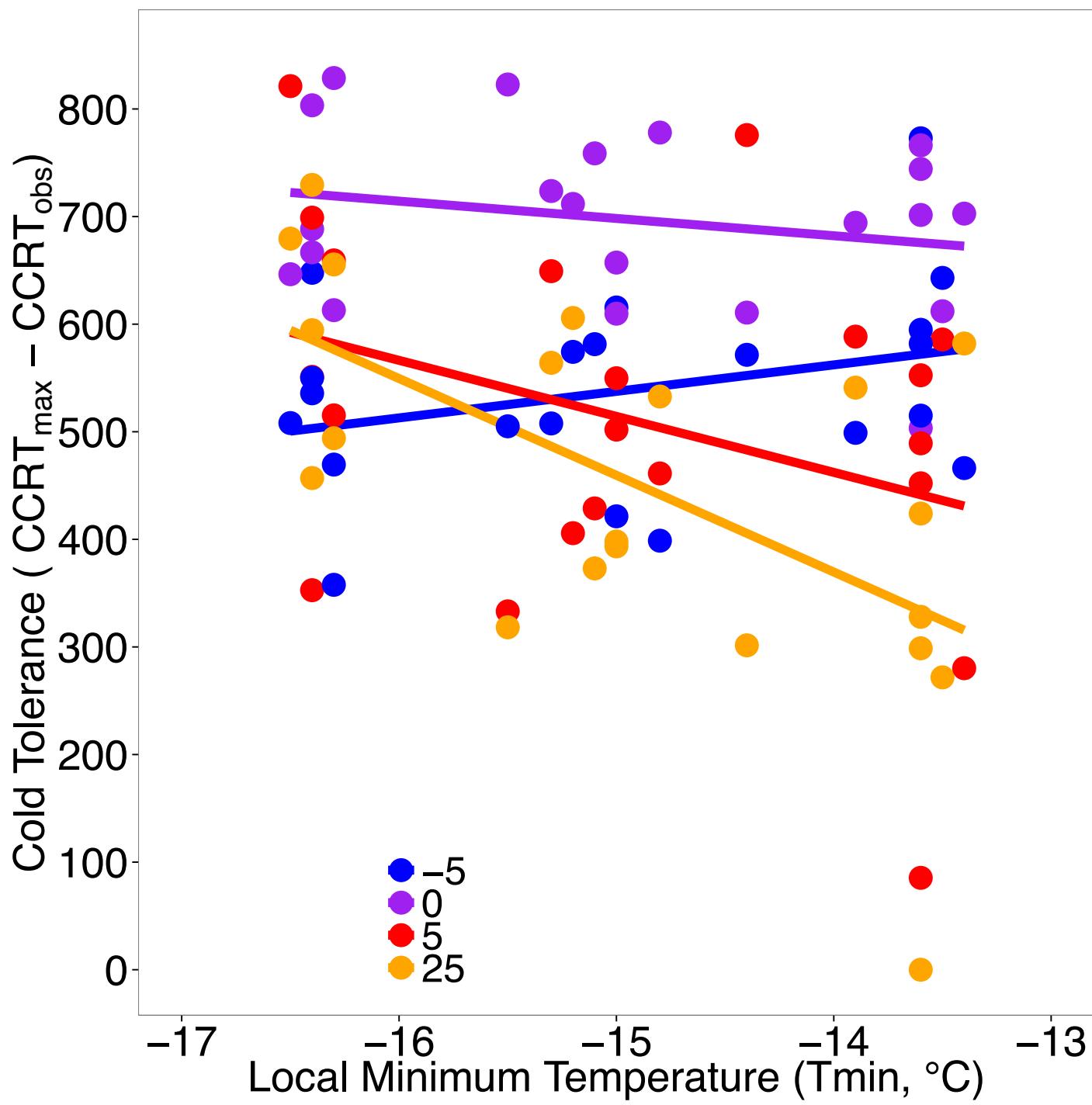


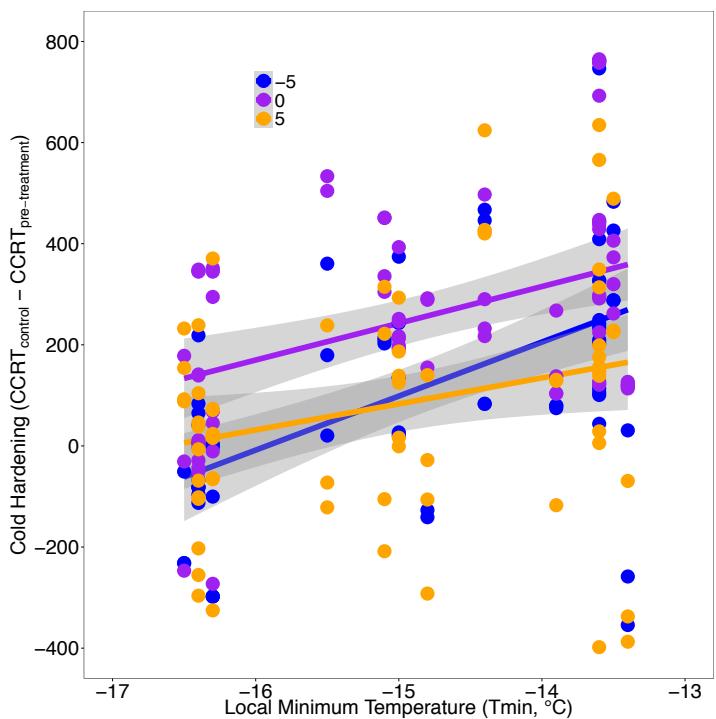
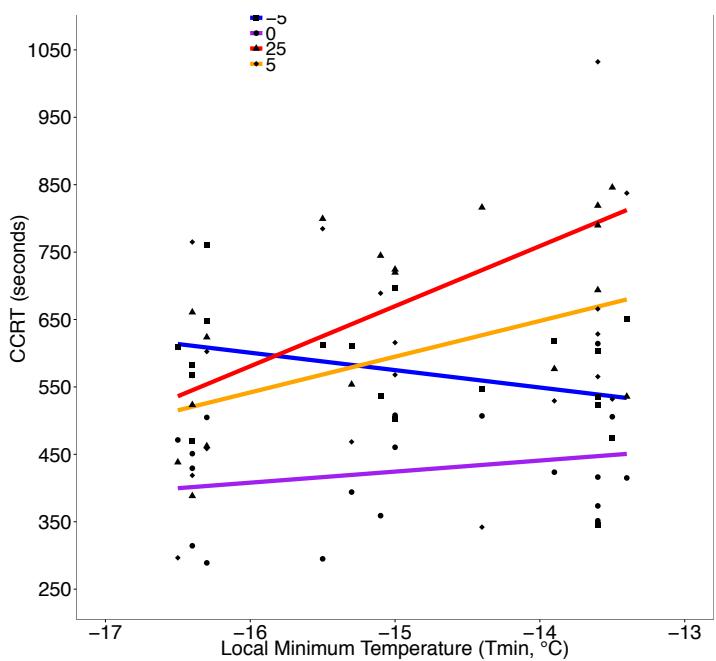
How did you
analyse the
February

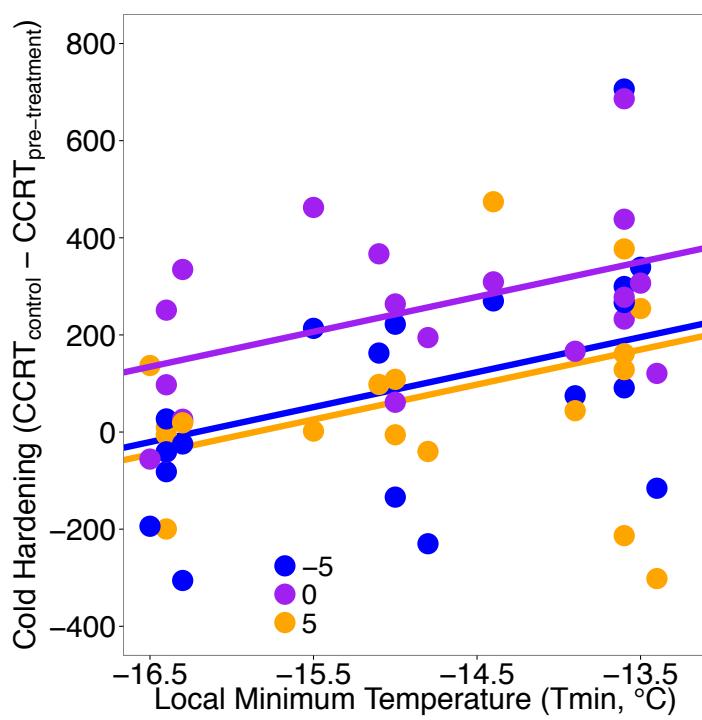
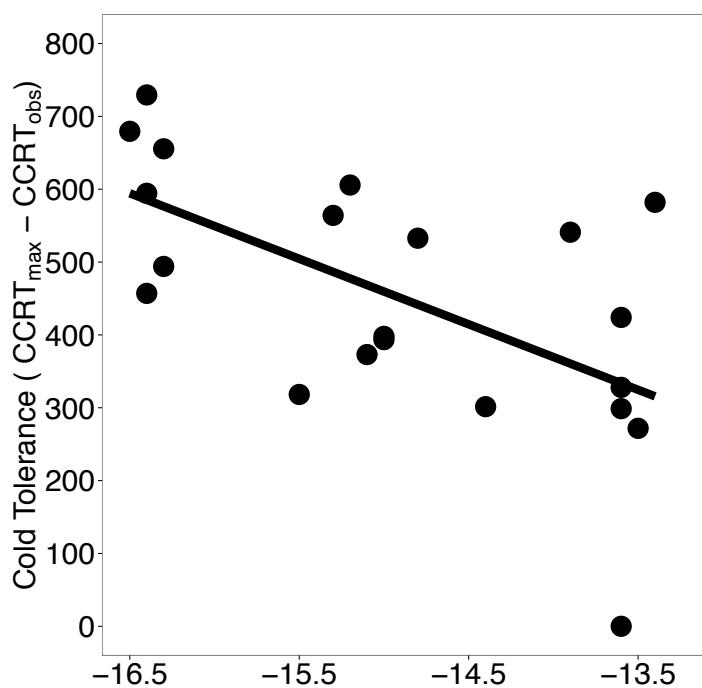
Show me that you
didn't make
anything up!

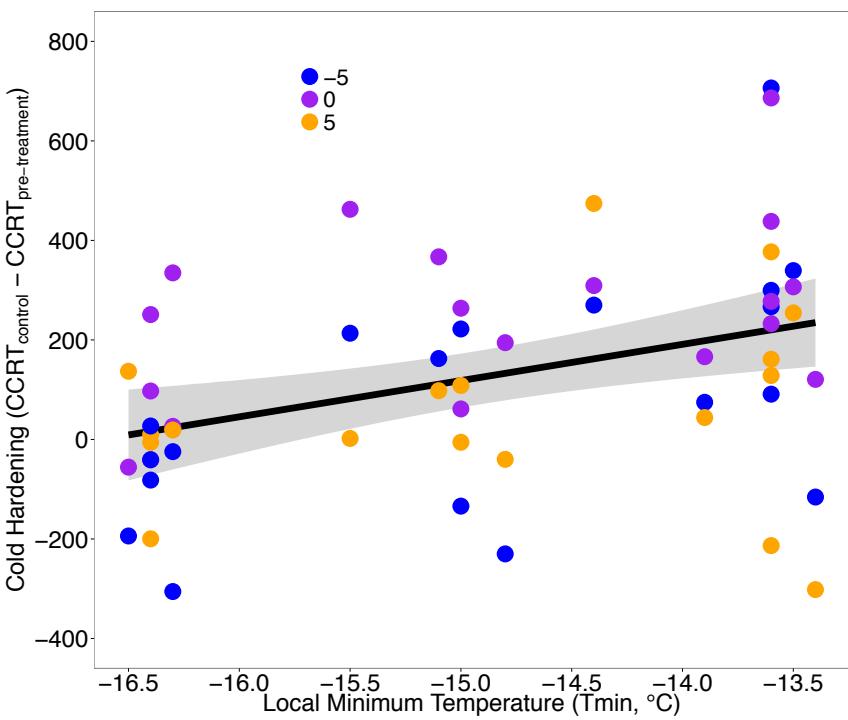
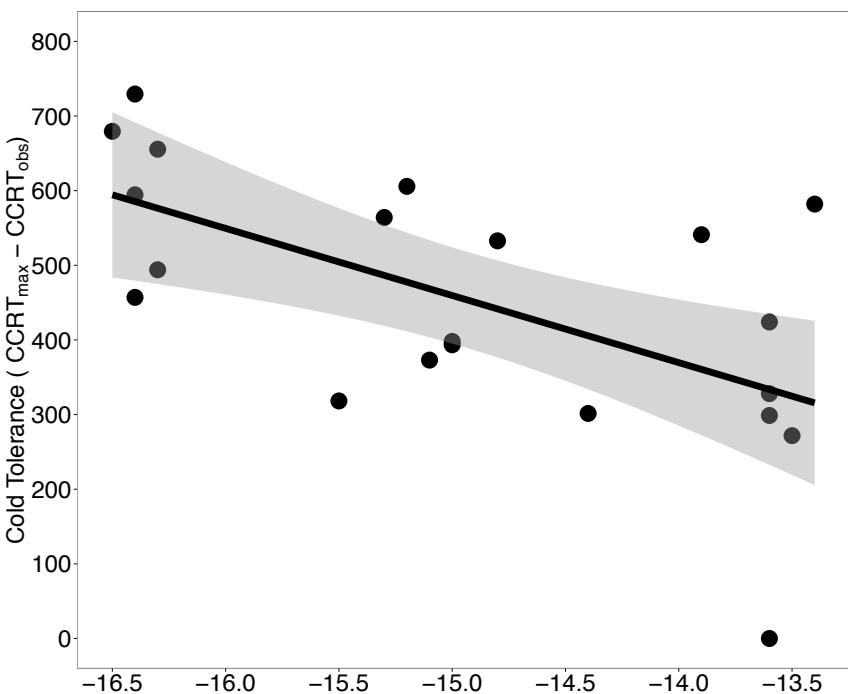


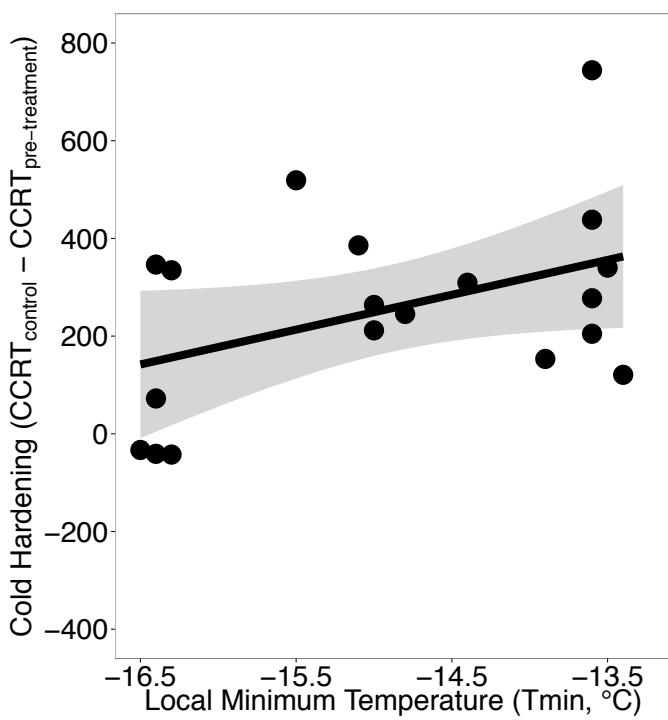
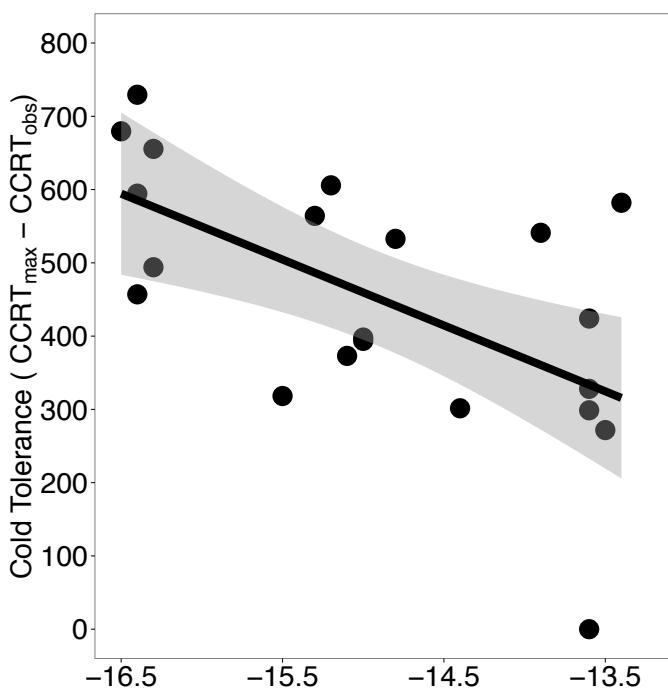


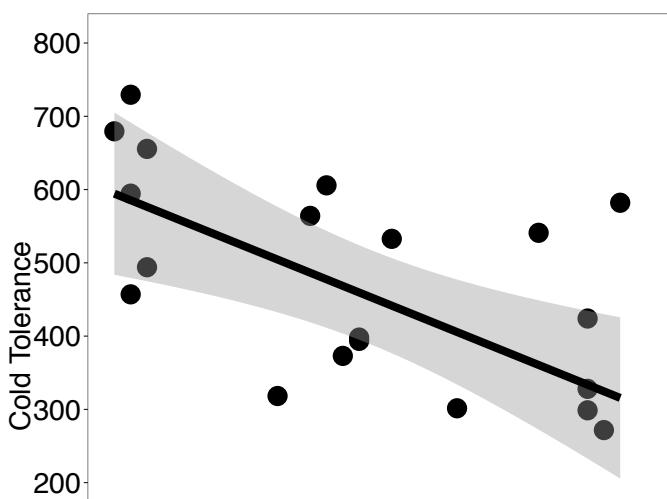




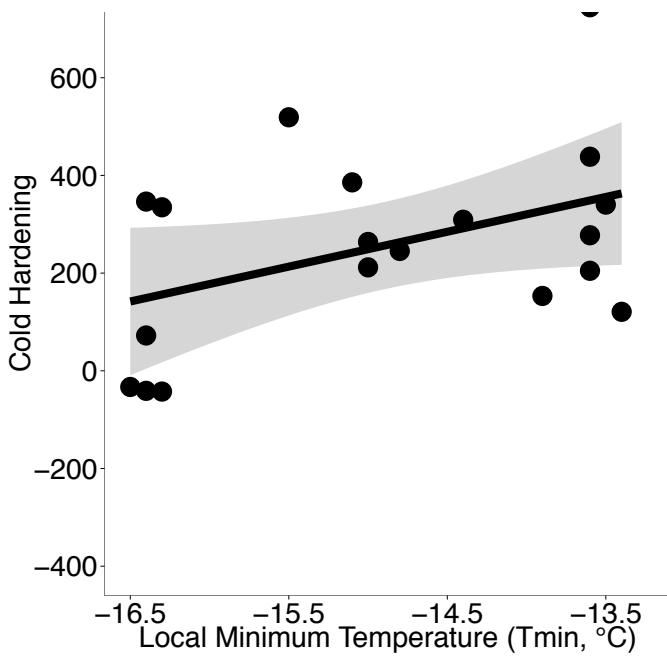






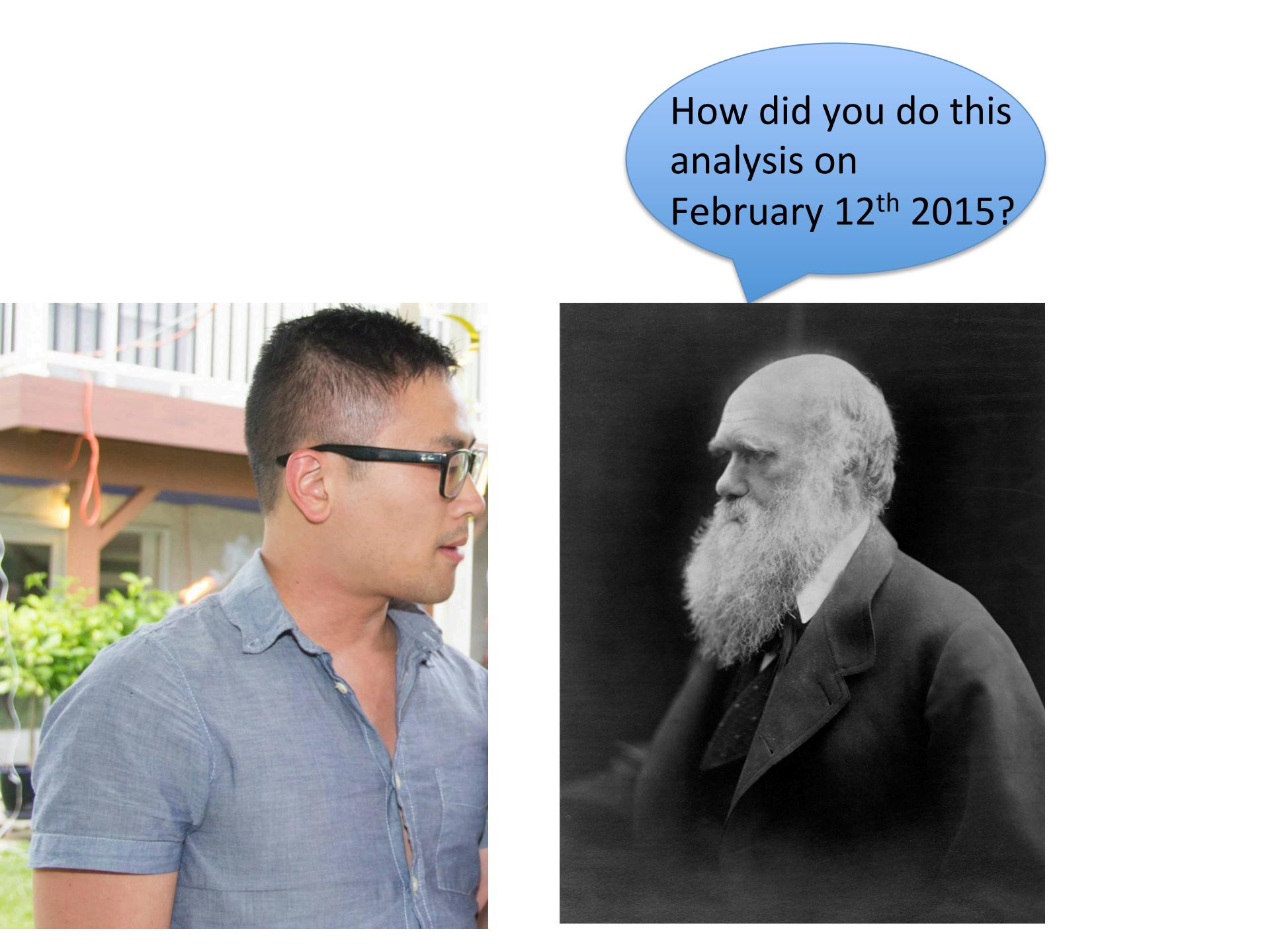


Observation: You're always going to
repeat your work





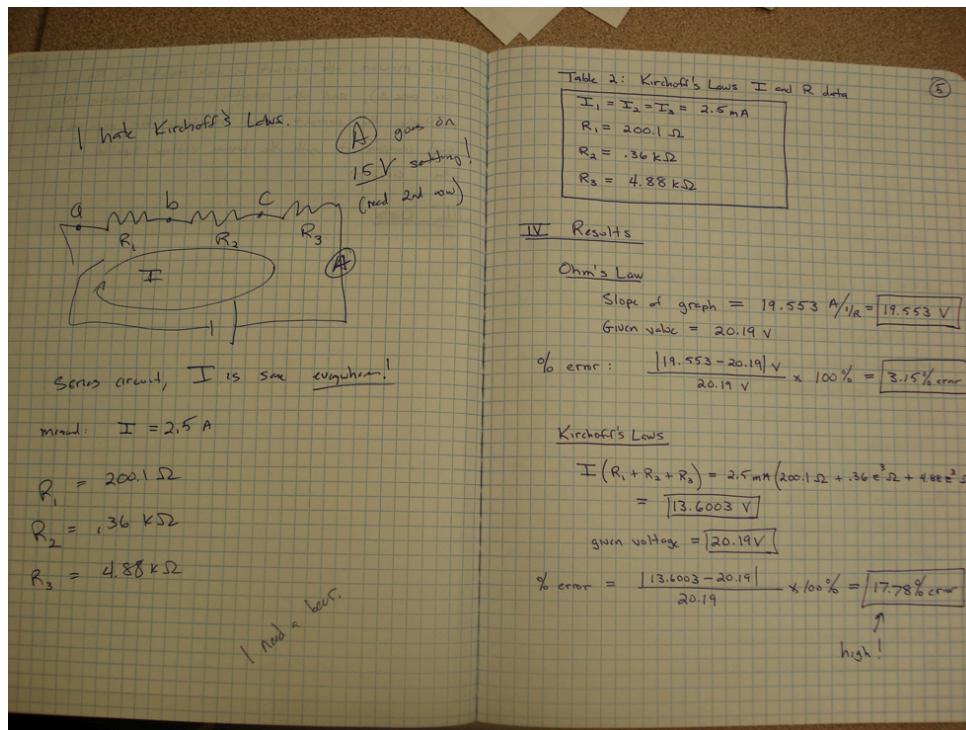
How did you do this analysis from February 12th 2015?

A composite image featuring two photographs. On the left, a young man with short dark hair and glasses, wearing a light blue button-down shirt, is shown in profile facing right. On the right, a black and white portrait of Charles Darwin, showing his profile from the chest up. A blue speech bubble is positioned above the man's head, containing the text "How did you do this analysis on February 12th 2015?".

How did you do this
analysis on
February 12th 2015?

Science needs to be reproducible and transparent! How?

Capture the *process* of science as it is happening and *share* it.



Science needs to be reproducible, transparent! How?

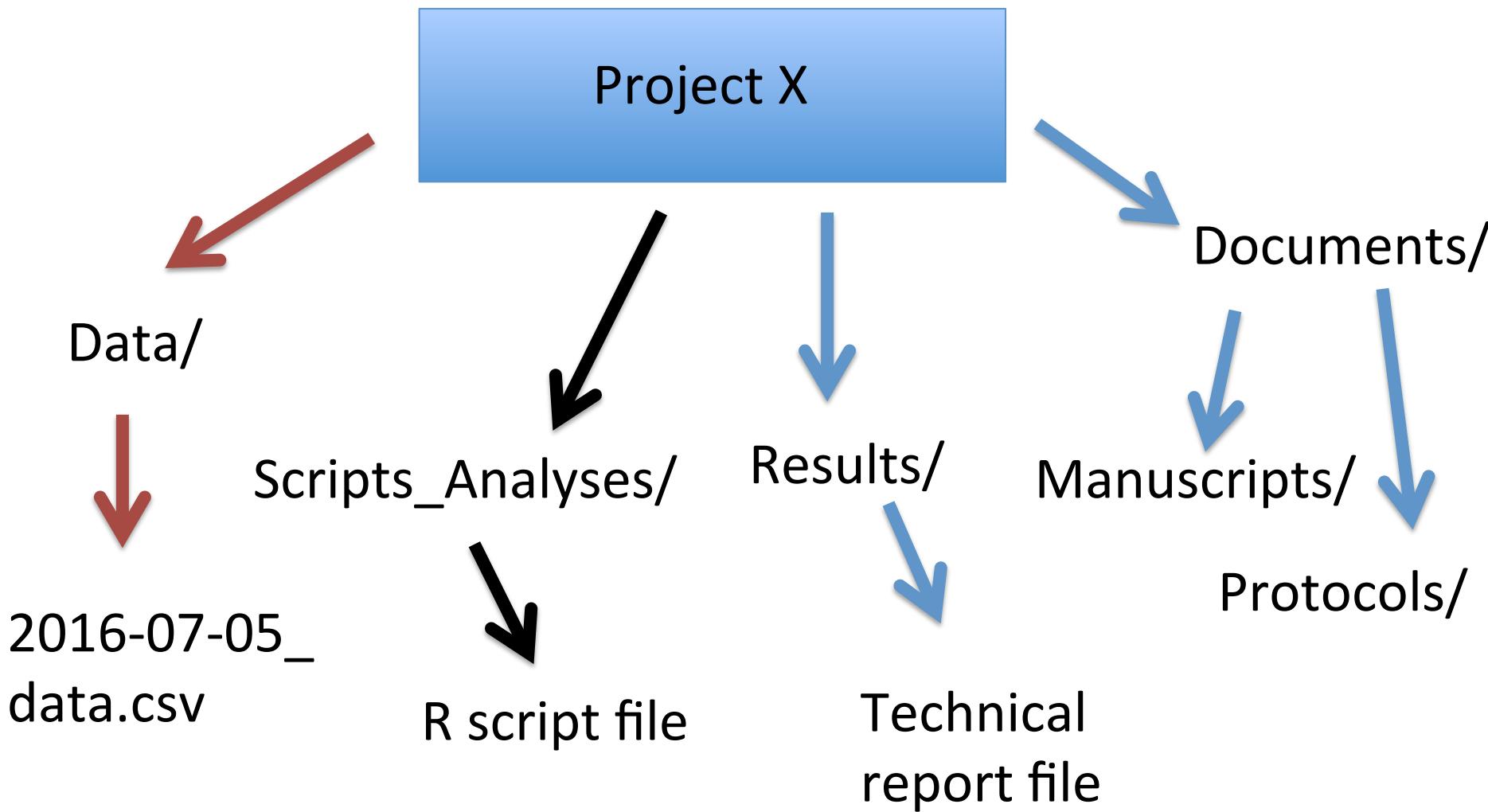
Organization

Transparency

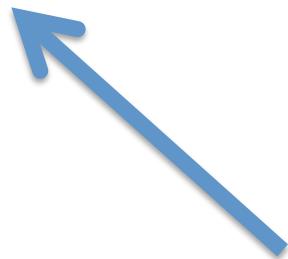
Reproducibility

Github

Organize by projects using a tree-like structure



**Track all of the
changes to your
project**



**Share it online!
Let anybody access and
repeat your analysis**



Organization ✓

Transparency

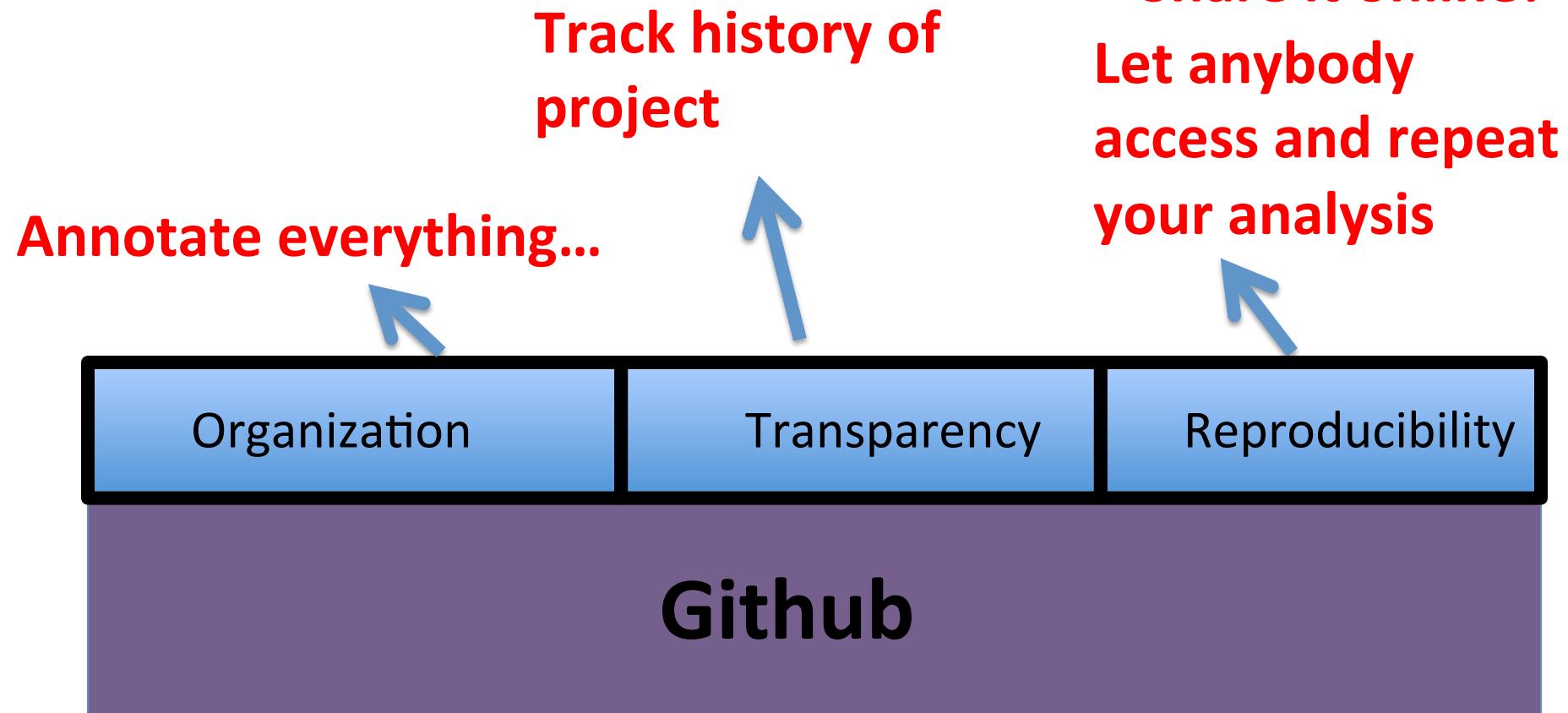
Reproducibility

Github

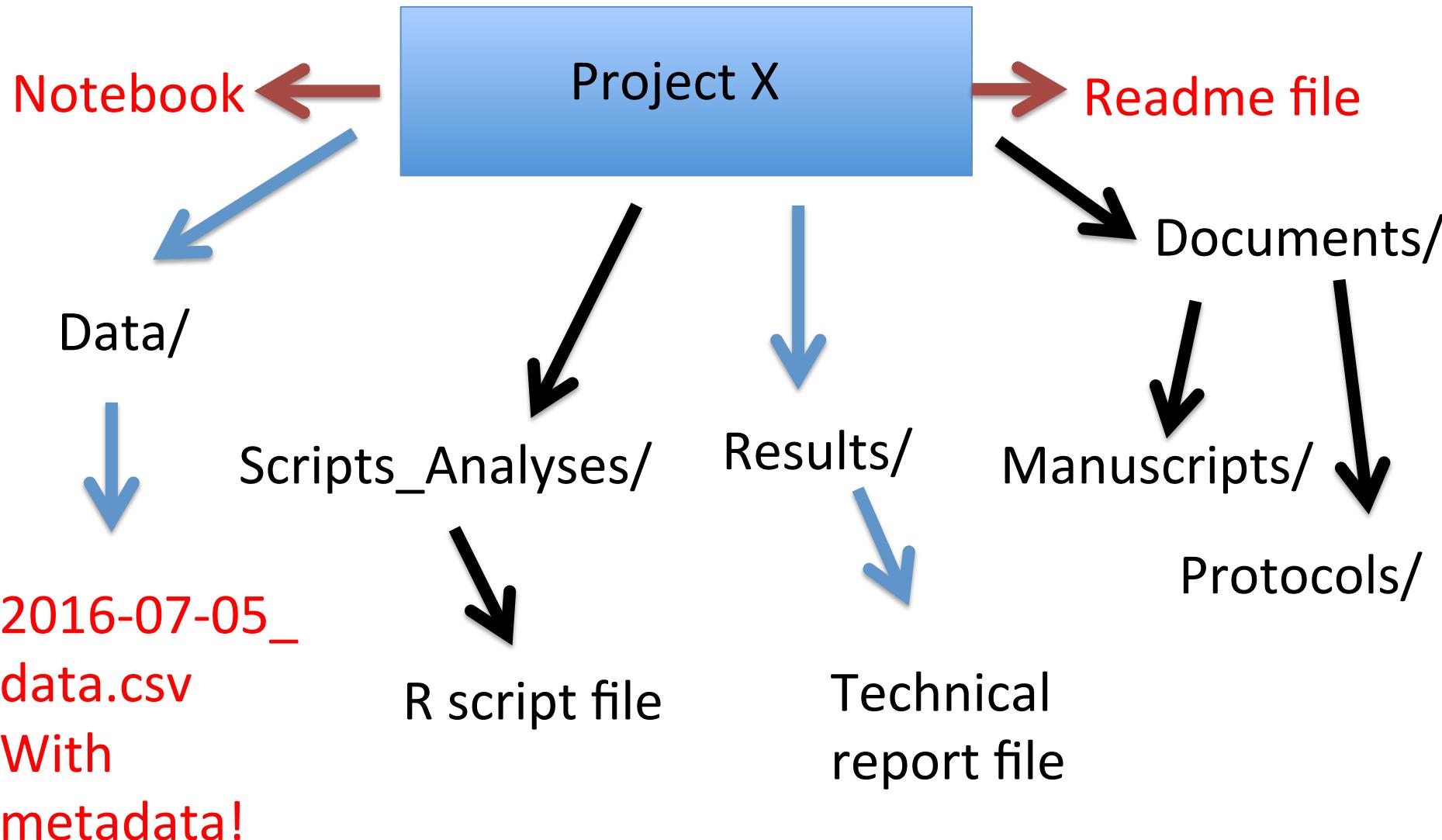
But what if your project is a large tree?



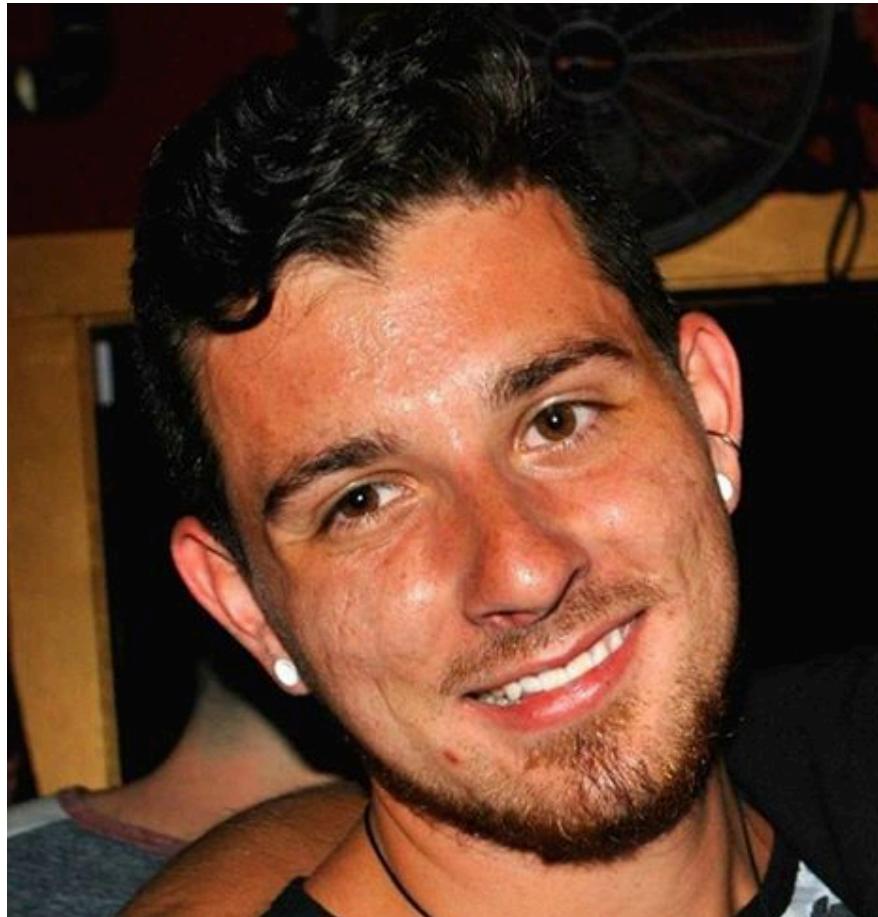
If you didn't write it down, it didn't happen!



Organize by projects using a tree-like structure

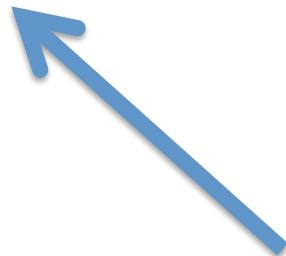


Test case: Undergraduate researcher



Demo!

Track history of the project



Organization ✓

Transparency

Reproducibility

Github

Now, how do we track changes?



Personal computer

Track changes



1. Open up the program (Github)
2. Work on project
3. Github: write what you did and save
4. Say you're welcome to your future self



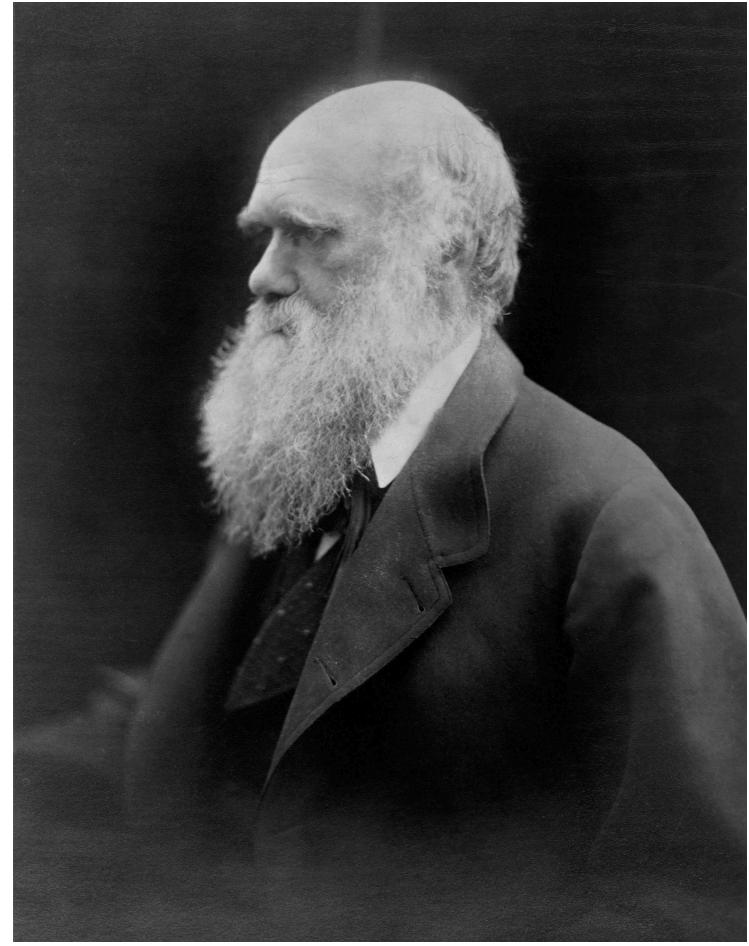
Github software

Demo!

Connects present and future self



Connecting with Darwin?



Now, how do we track changes and share projects?



Personal computer



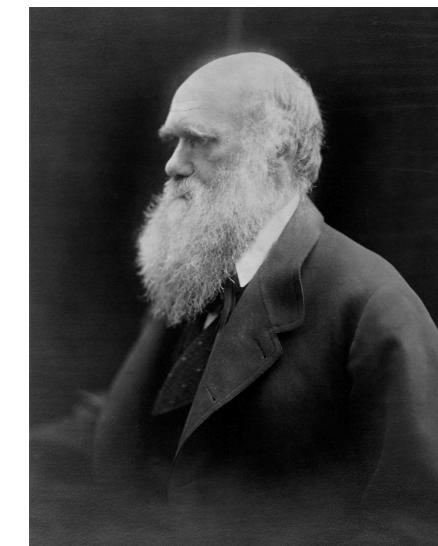
Github online

Track changes

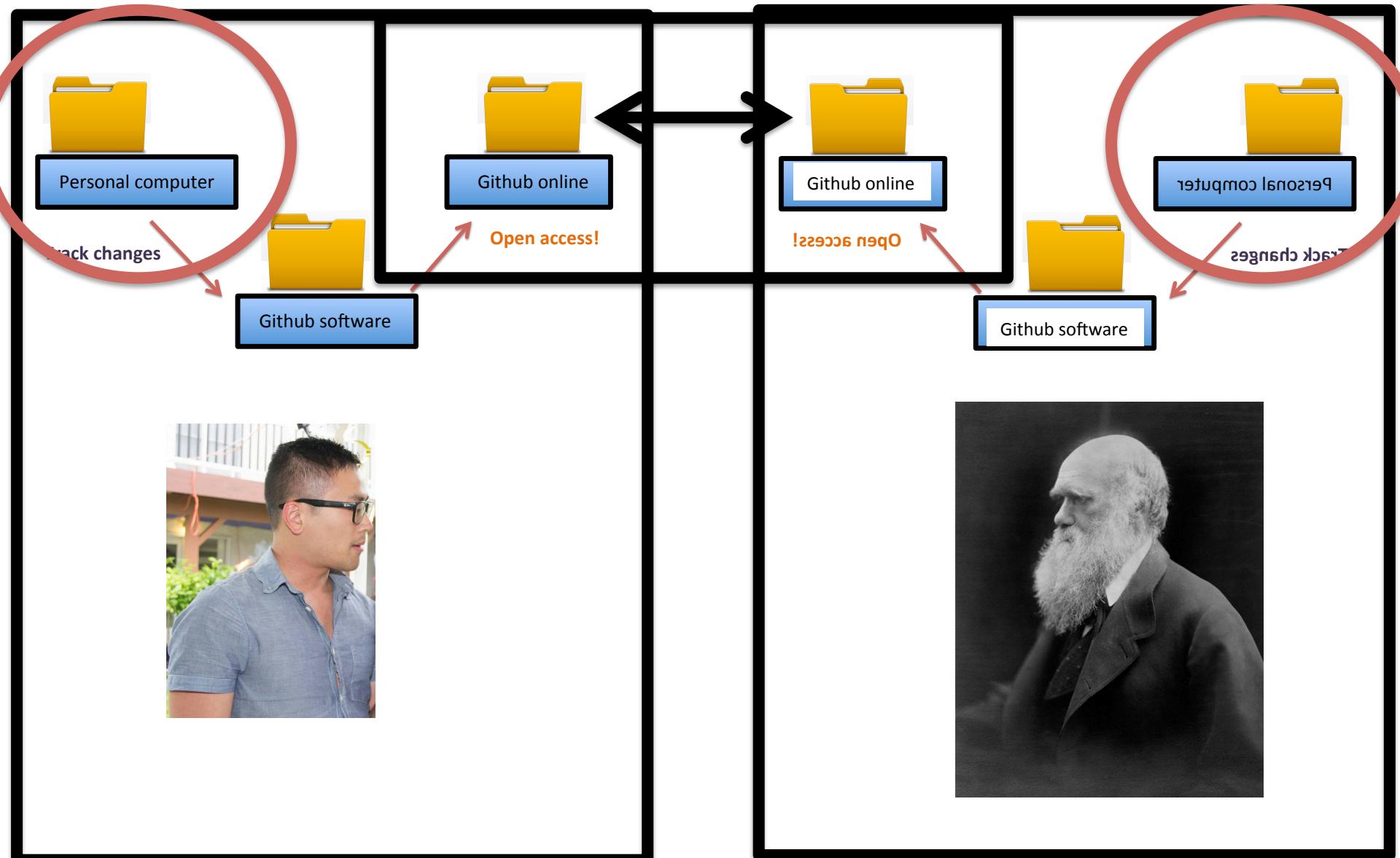


Github software

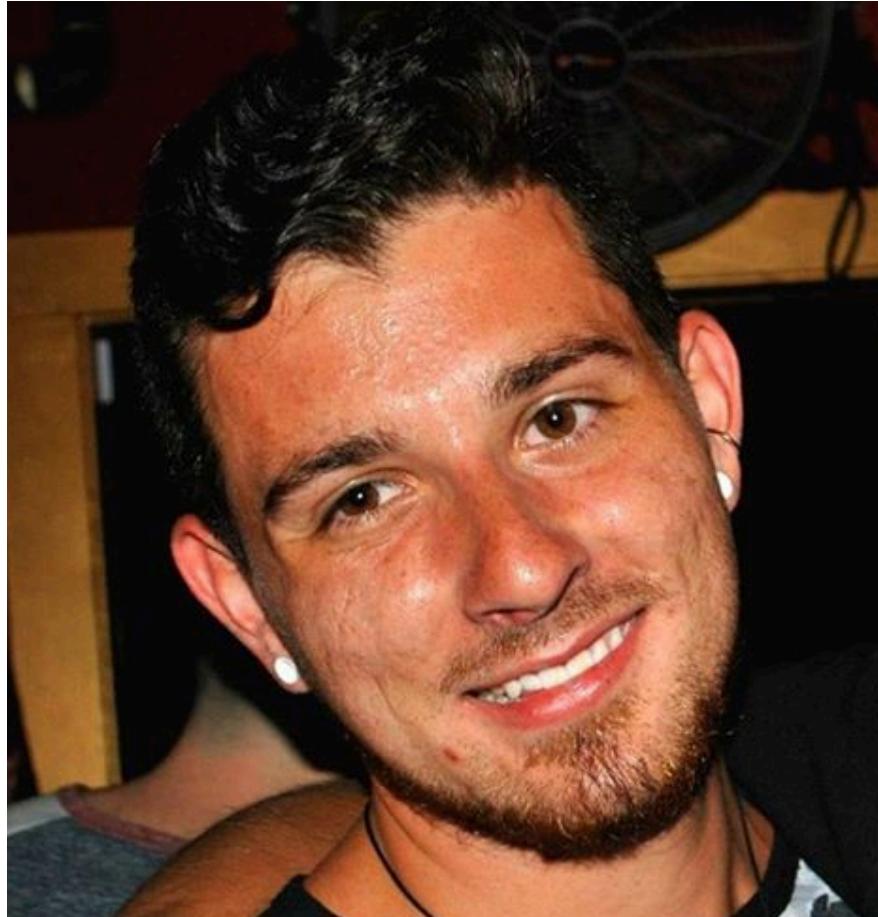
Open access!



Connecting AND collaborating with Darwin



Test case: Undergraduate researcher



http://adnguyen.github.io/2013_stressed_ants_in_warmingchambers/

Tools for reproducible science
already exist, **they just need to be
implemented.**

Research papers: Journals should drive data reproducibility

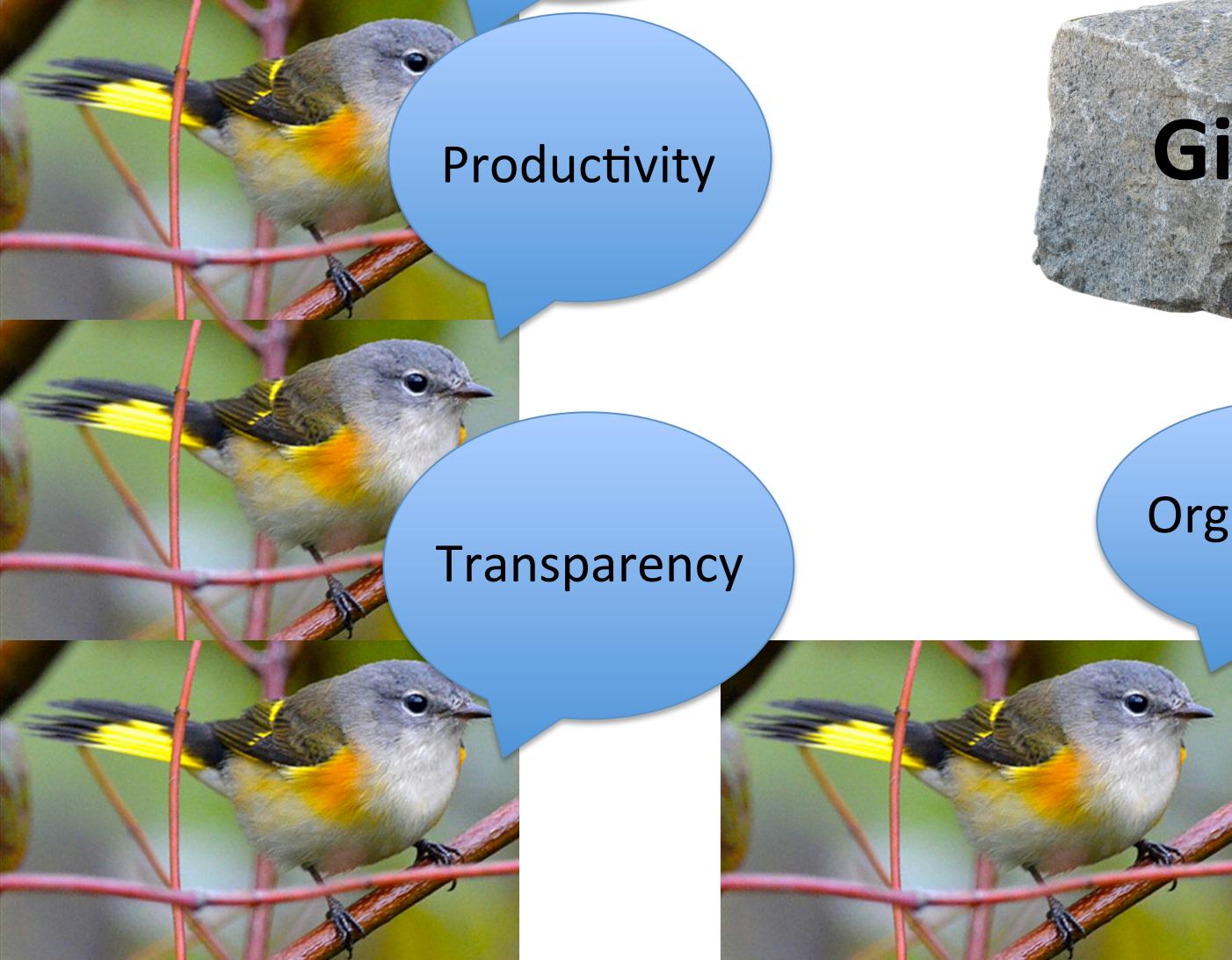
Gregorio Santori

Nature 535, 355 (21 July 2016) | doi:10.1038/535355b

Published online 20 July 2016

Journals would then publish only papers that are accompanied online by full experimental protocols, raw data and source code, as in the Protocol Exchange repository

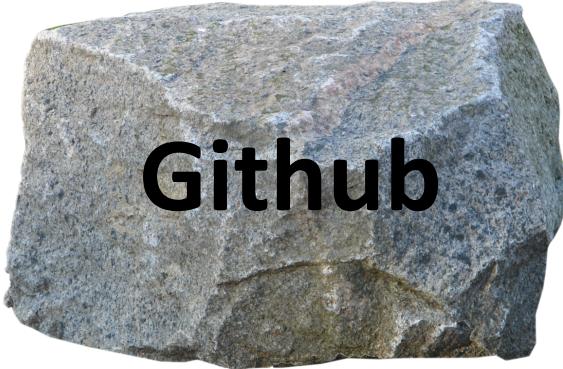
For manuscripts containing statistical analyses, journals should peer review only those papers that use statistics environments based on source code, enforcing the ban on 'point-and-click' statistical software (see go.nature.com/29pdpc1).



Reproducibility

Productivity

Transparency



Github

Organization

Resources for implementation

- [http://
adnguyen.github.io/
blog/2016/03/30/
Resources](http://adnguyen.github.io/blog/2016/03/30/Resources)
- Slides online!
[http://
adnguyen.github.io/
blog/2016/08/30/
reproducible](http://adnguyen.github.io/blog/2016/08/30/reproducible)

