Git and GitHub

Part 1: Early workflows

GitHub Personal access token

- We're going verify you've got a PAT set up.
- https://happygitwithr.com/https-pat.html
- Key commands
  - `usethis::gh_token_help()`
  - `usethis::git_sitrep()`
  - `usethis::create_github_token()`
  - `gitcreds::gitcreds_set()`

git operations via ssh	
example	`git clone git@github.com:OWNER/REPO.git`
creds	local private ssh key + public key on GitHub

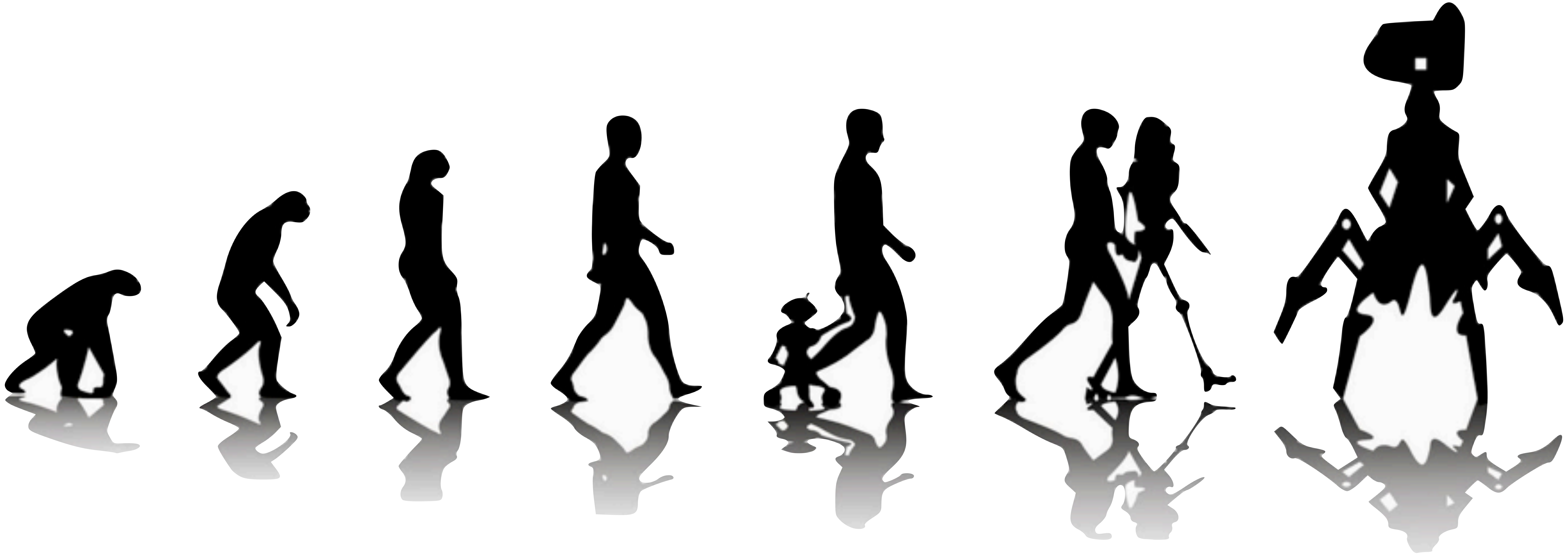
git operations via https	
example	`git clone https://github.com/OWNER/REPO.git`
creds	username + password (password can be GITHUB_PAT)

git server

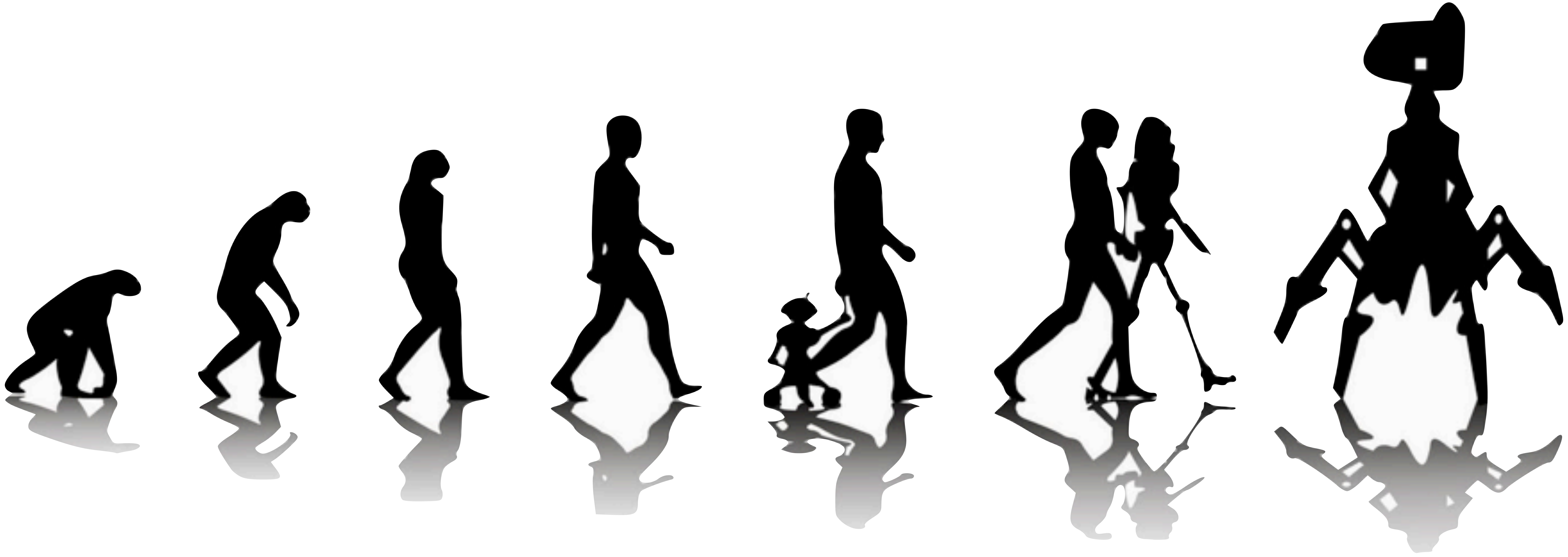
GitHub API requests via REST	
example	`curl -H "Authorization: token $GITHUB_PAT" https://api.github.com/user/repos`
creds	GITHUB_PAT

web service

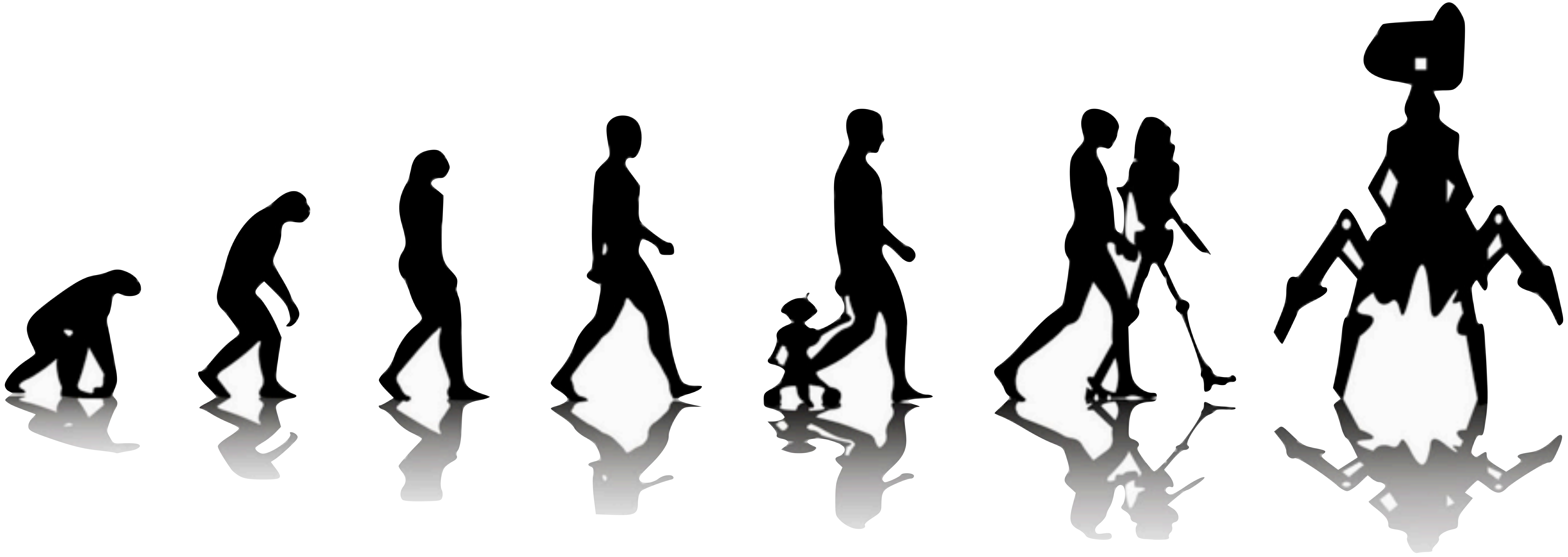
Deep Thoughts



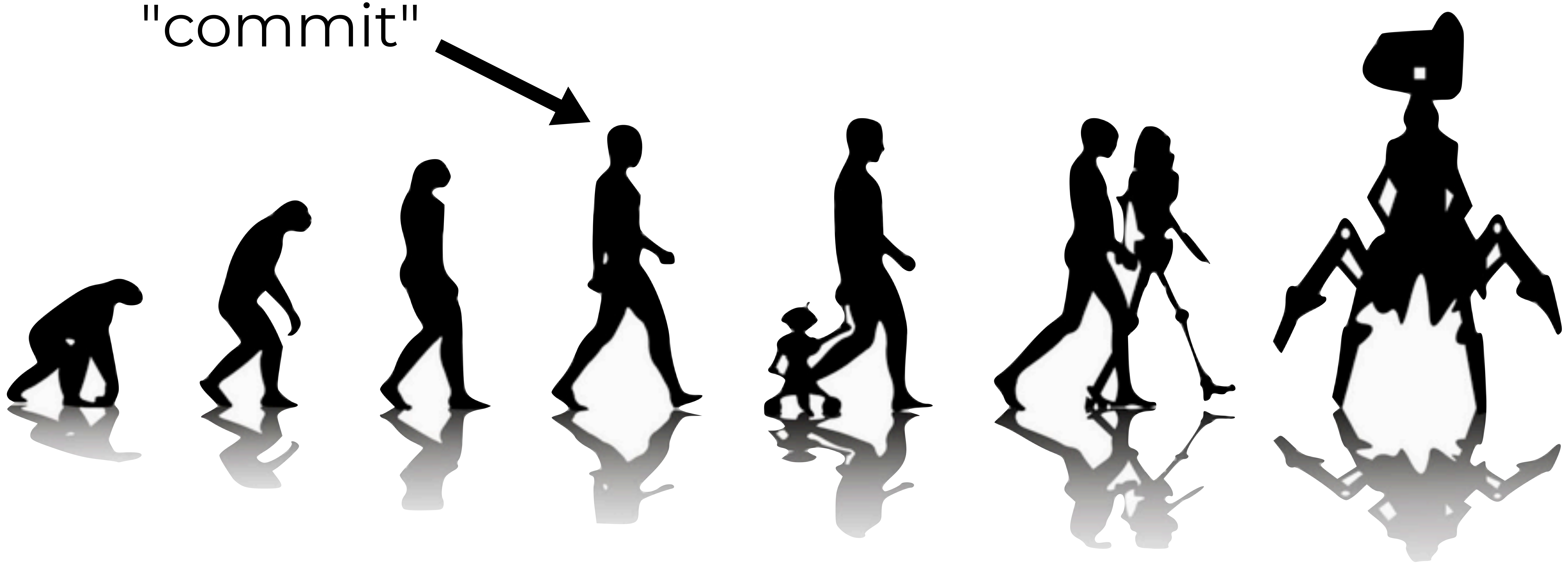
use version control



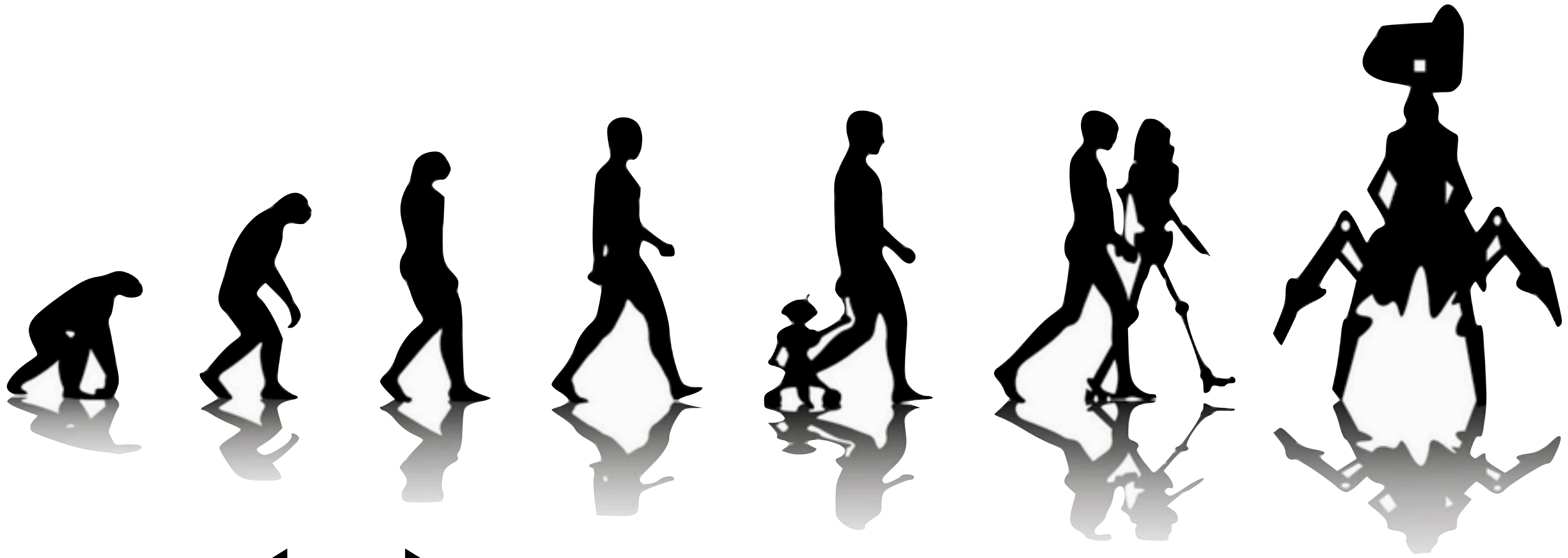
we teach Git & GitHub



a **repository or repo** is a collection of files,
representing a project,
which might also be a an RStudio Project



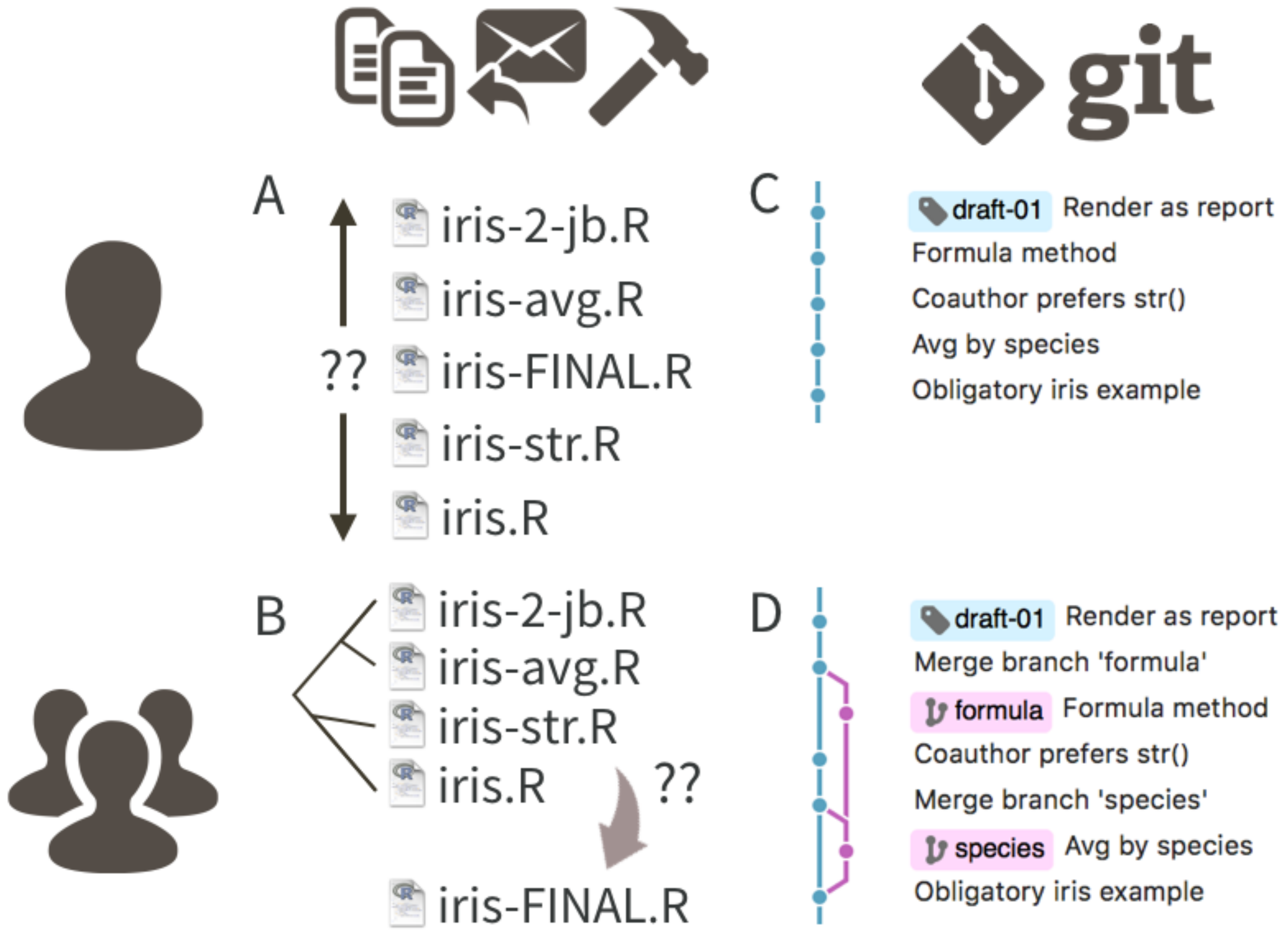
a file or project state that is **meaningful to you**
for inspection, comparison, or restoration

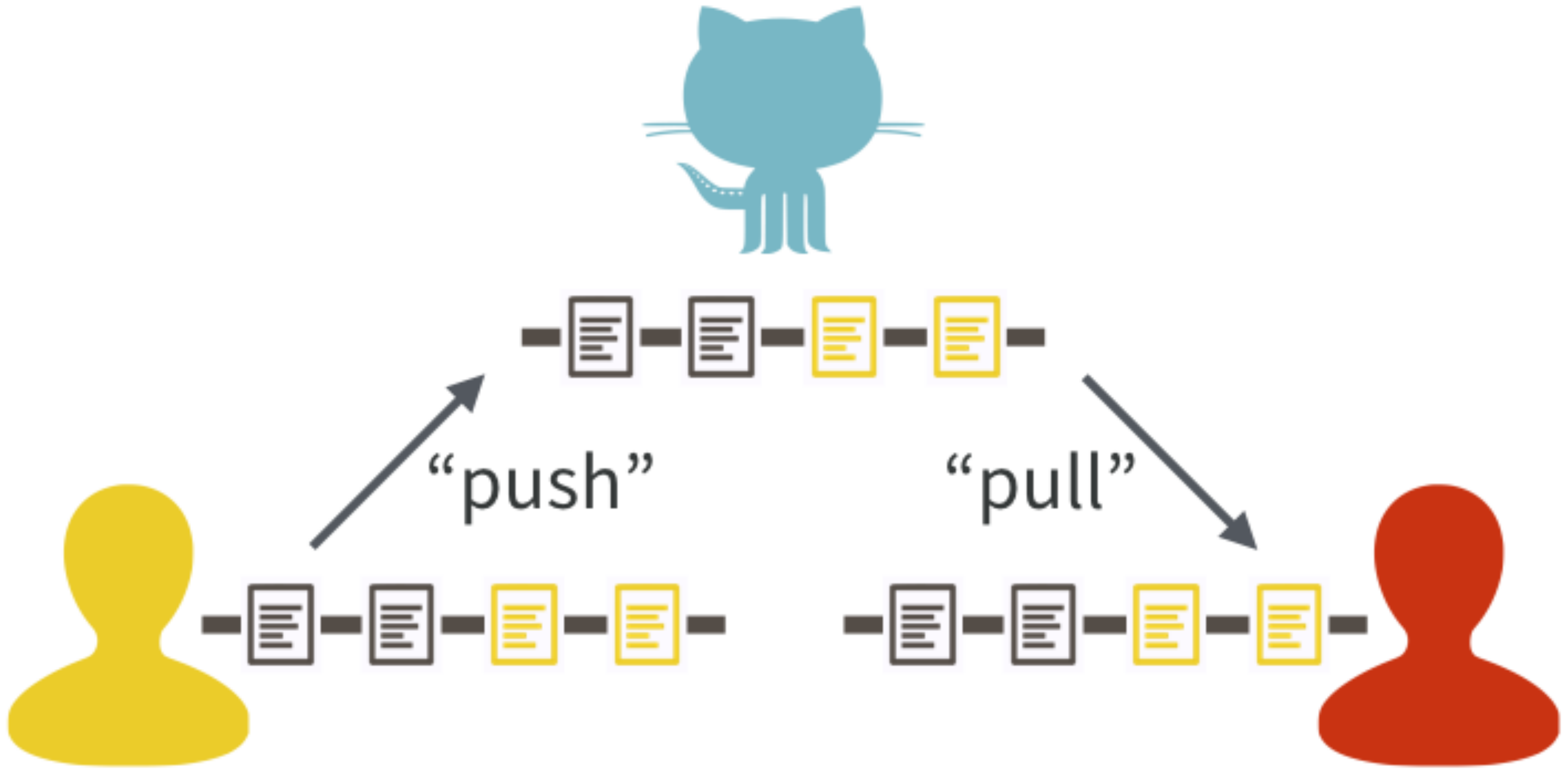


Δ

"diff"

What changed here?
Why?


git
A
iris-2-jb.R
iris-avg.R
??
iris-FINAL.R
iris-str.R
iris.R
B
iris-2-jb.R
iris-avg.R
iris-str.R
iris.R
??
iris-FINAL.R
C
draft-01 Render as report
Formula method
Coauthor prefers str()
Avg by species
Obligatory iris example
D
draft-01 Render as report
Merge branch 'formula'
formula Formula method
Coauthor prefers str()
Merge branch 'species'
species Avg by species
Obligatory iris example

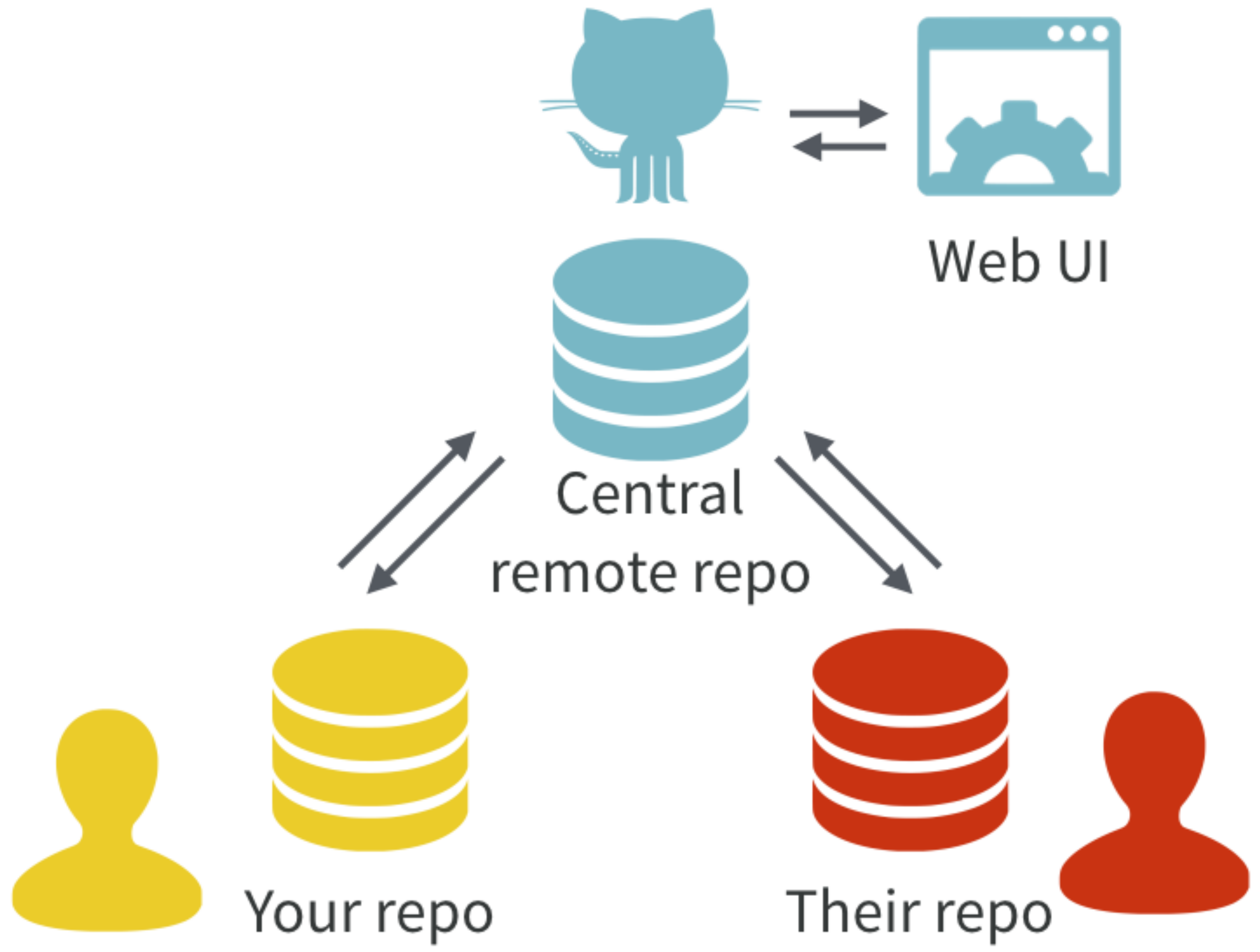


collaboration

Excuse me, do you have a moment to talk about version control?

https://doi.org/10.1080/00031305.2017.1399928 in The American Statistician

https://doi.org/10.7287/peerj.preprints.3159v2 in PeerJ Preprints



Git for humans

Alice Bartlett
Senior Developer, Financial Times
@alicebartlett

Excellent presentation by Alice Bartlett, originally delivered in 2016 at UX Brighton.

https://speakerdeck.com/alicebartlett/git-for-humans

happygitwithr.com

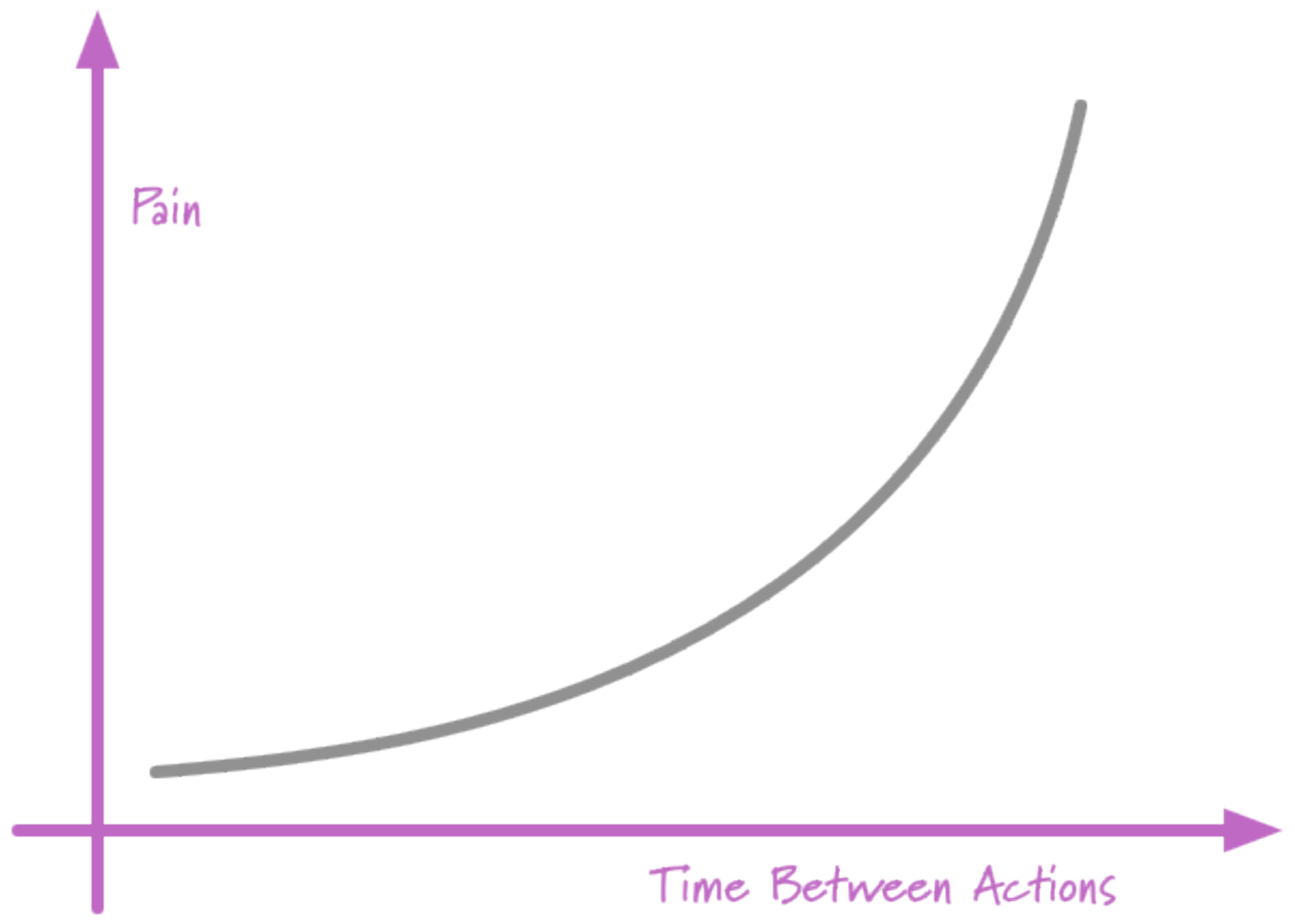
Why use version control?

- experiment without fear
- explore cause and effect
- embrace incrementalism
- expose your work
- collaborate

how Git feels

get off the beach!

"If it hurts, do it more often."



https://martinfowler.com/bliki/FrequencyReducesDifficulty.html

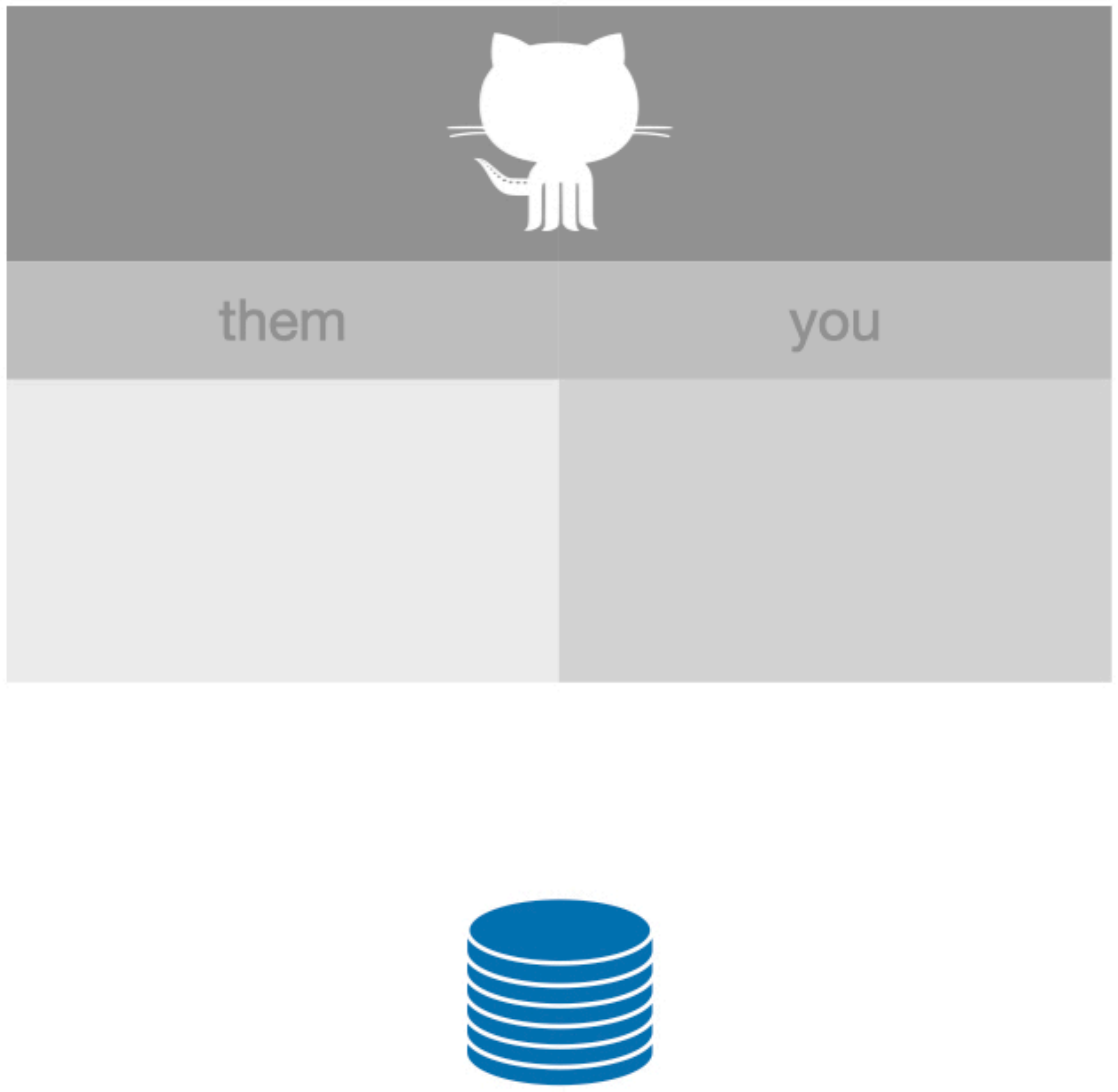
accumulate reps

agony : flow

agony : flow

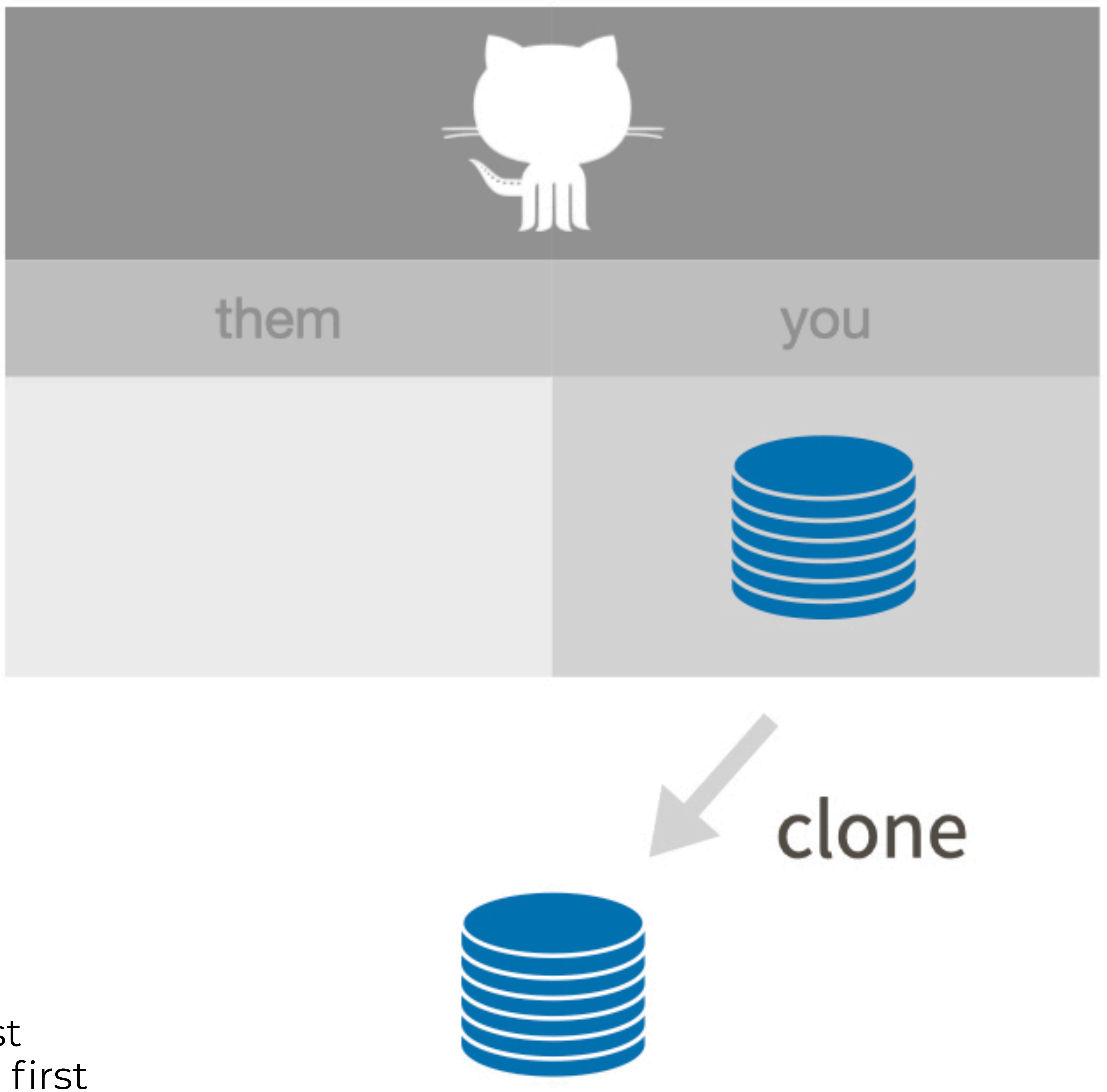
Use a graphical Git client, if you want

- No one is giving out merit badges to people who only use command line Git.
- I use RStudio and GitKraken.
- http://happygitwithr.com/git-client.html

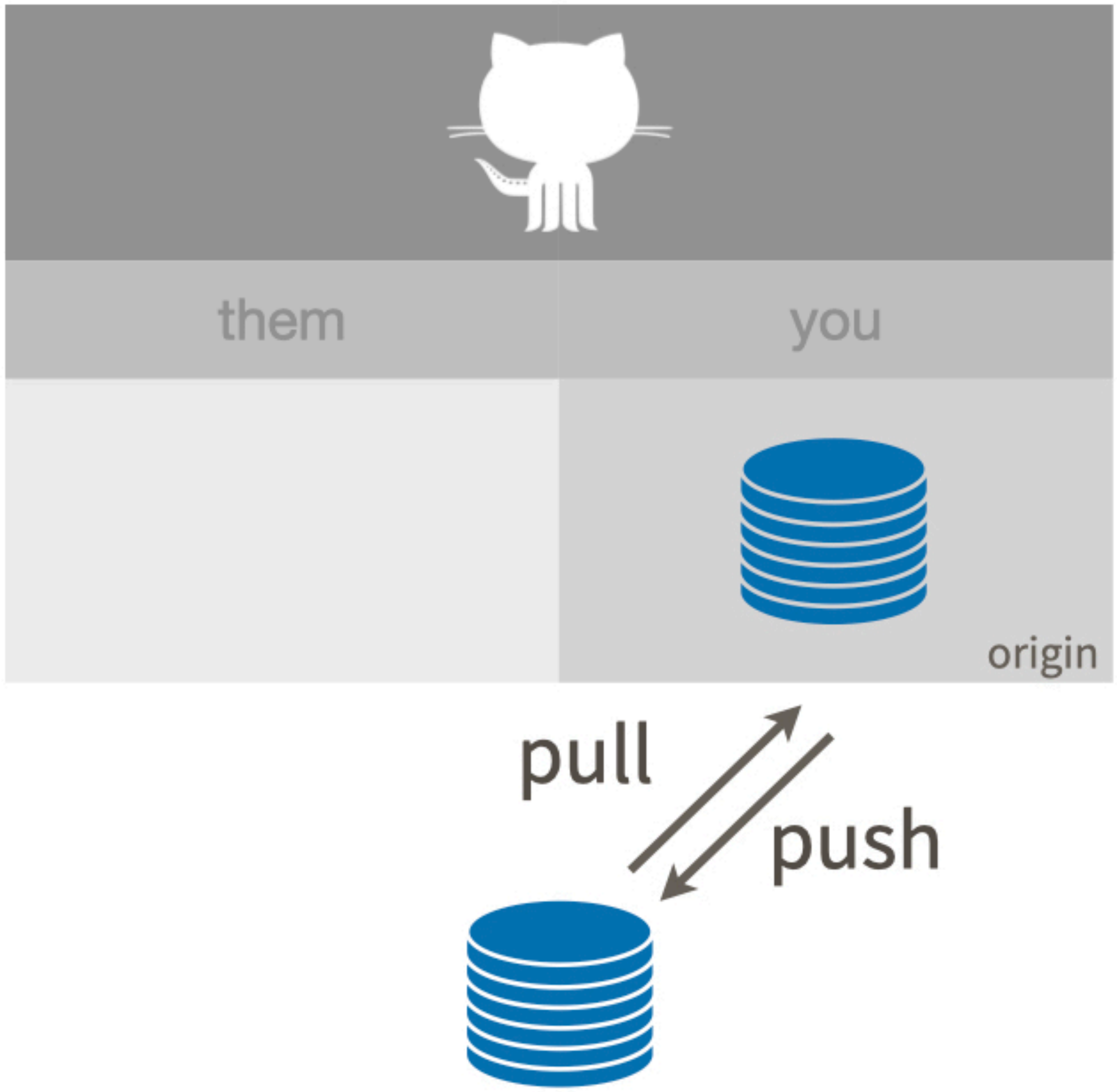

them
you

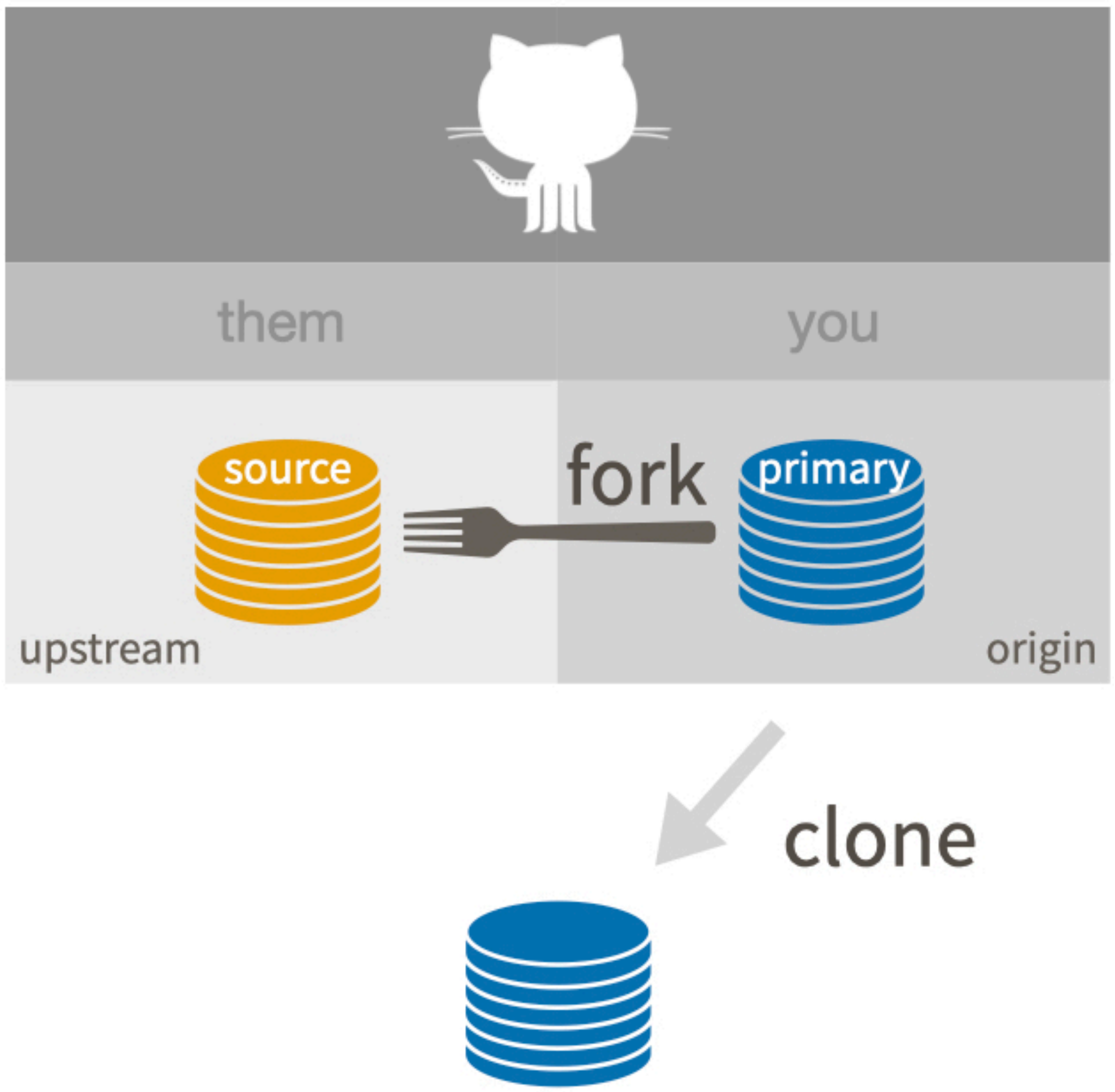
Workflows for project initiation

- **Clone**: Make a local project from a remote one.
- Fork: Make a remote copy of another repo.
- **Fork and clone**: Make a remote copy of another repo. Then make a local project from that.
- Make a remote repo from a local project.

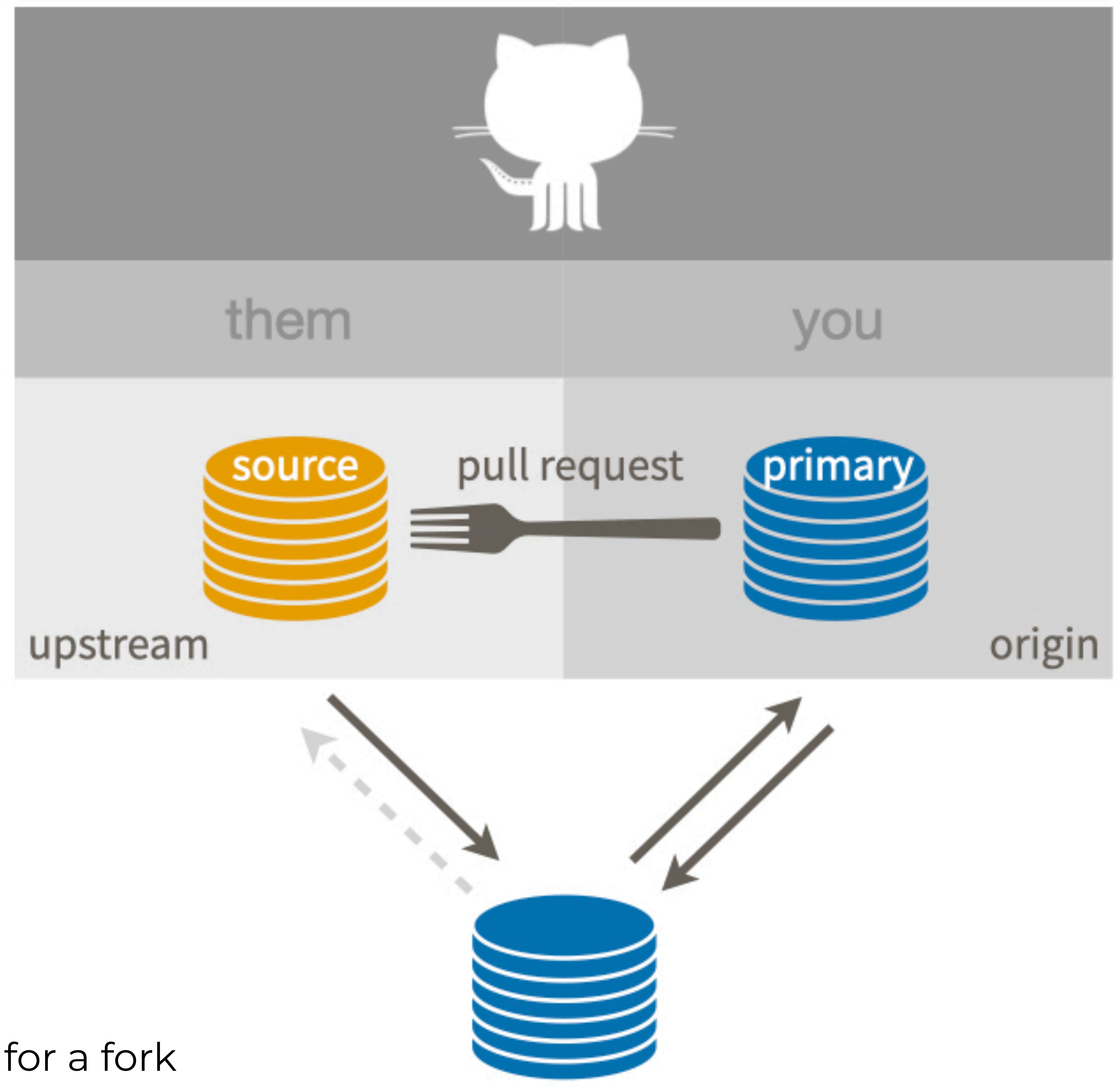


In Happy Git:
New project, GitHub first
Existing project, GitHub first

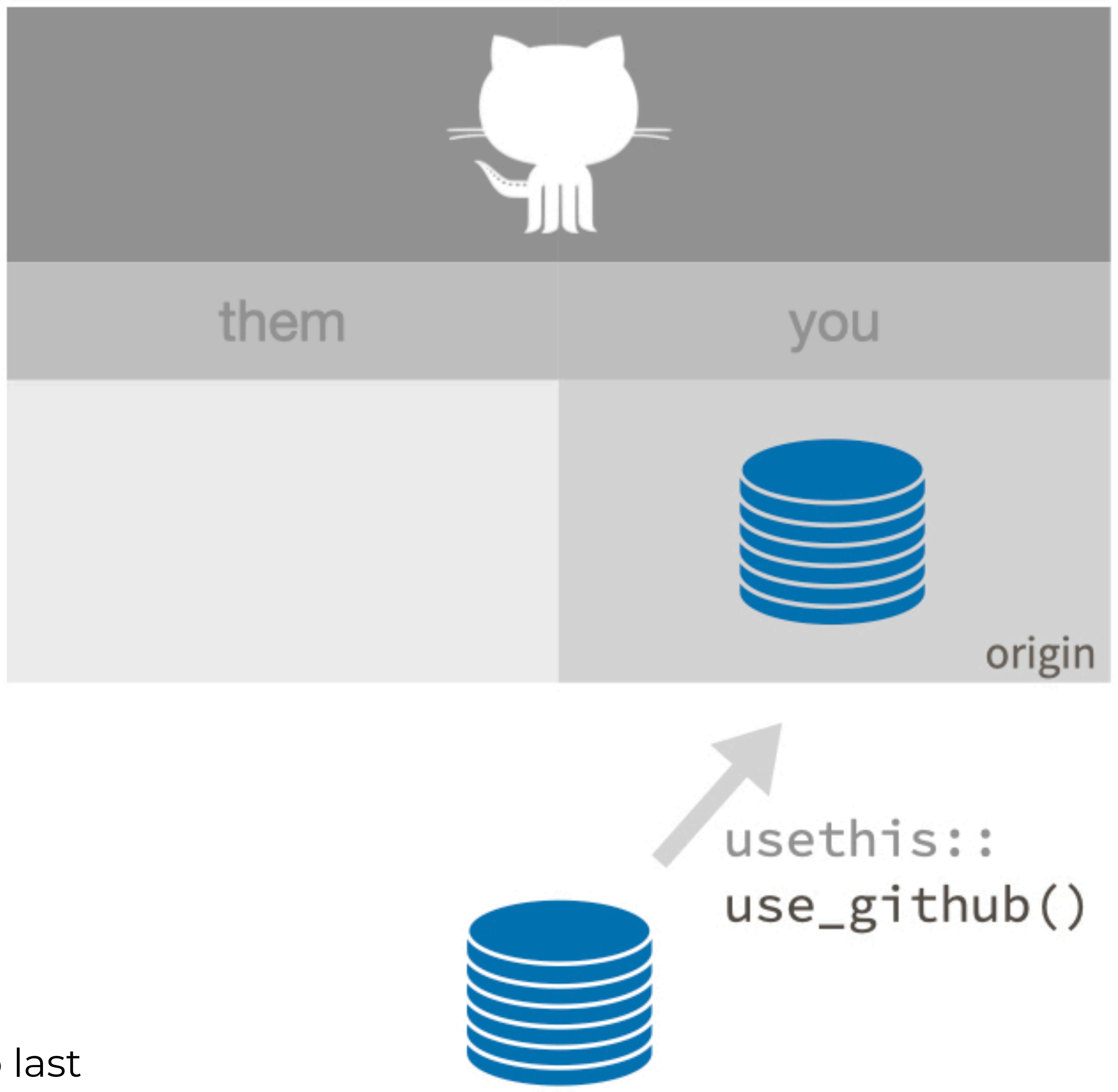

them
you
origin
pull
push



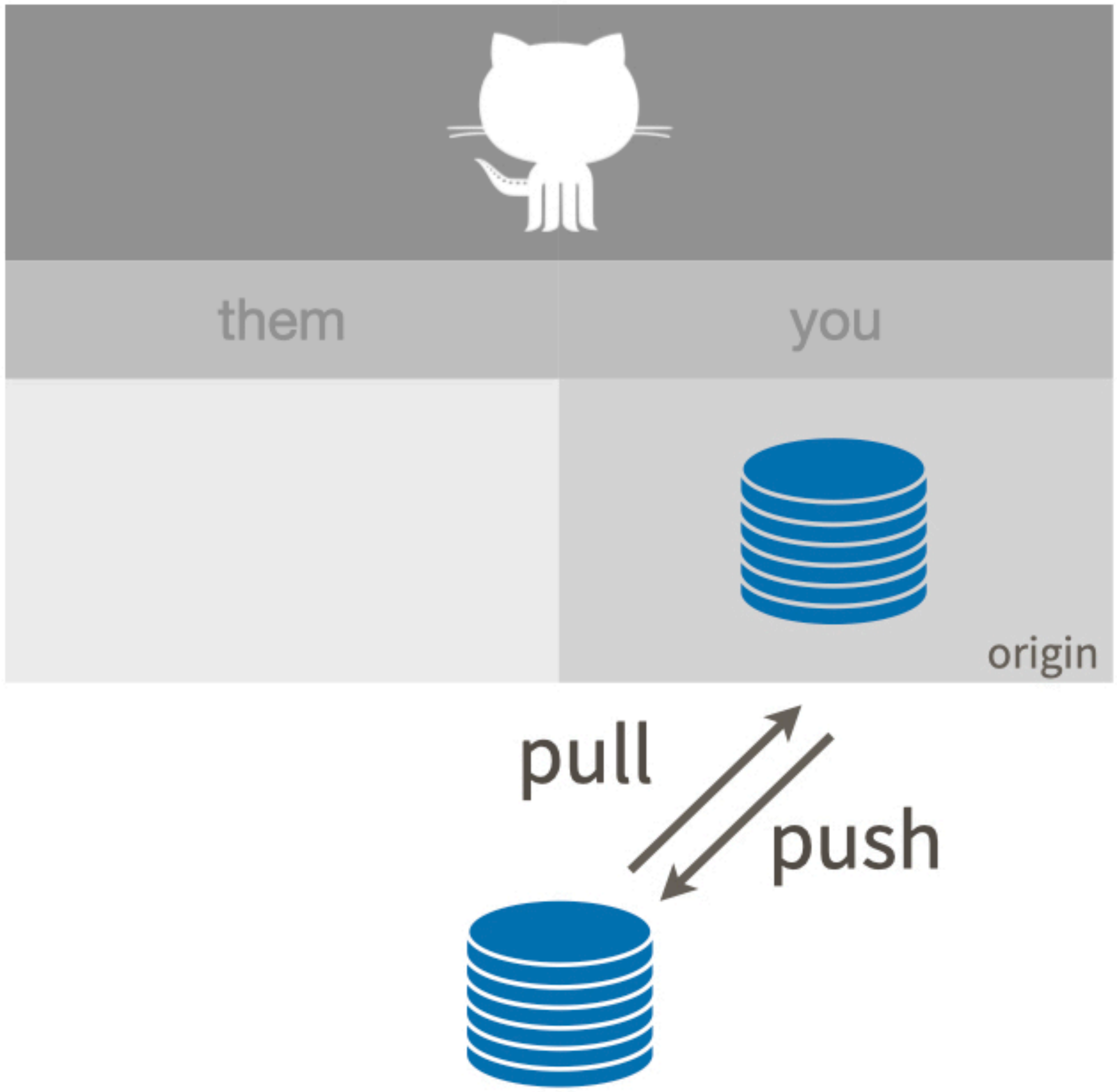
In Happy Git:
Fork and clone



In Happy Git:
Get upstream changes for a fork



In Happy Git:
Existing project, GitHub last


them
you
origin
pull
push

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GitHub API requests via REST	
example	`curl -H "Authorization: token $GITHUB_PAT" https://api.github.com/user/repos`
creds	GITHUB_PAT

web service

"New project, GitHub first"

- We'll walk through this together.
- http://happygitwithr.com/new-github-first.html
- Ideas re: name and location
  - repo / Project / folder name = "packages-report"
  - locate as sibling to any folders/Projects created earlier

Building on "New project, GitHub first"

- Create a new .R file in the local repo.
- Use a little bit of code developed earlier today.
- Notice what's changed in the Git pane, inspect the diff, stage the file, commit, push.
- Verify the new .R file is now on GitHub.
- Wait … is a .R file really all I want to share?

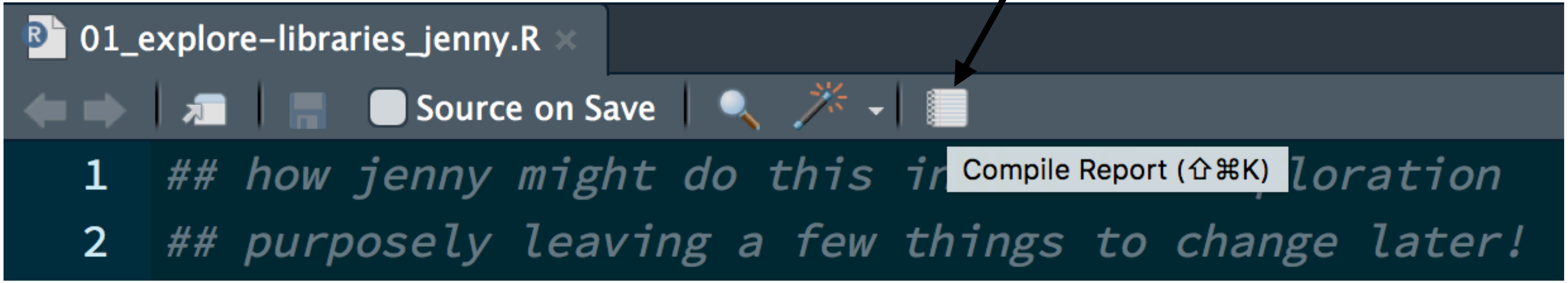
what you need to write

what people like to read

```
foo.R
foo.Rmd
```

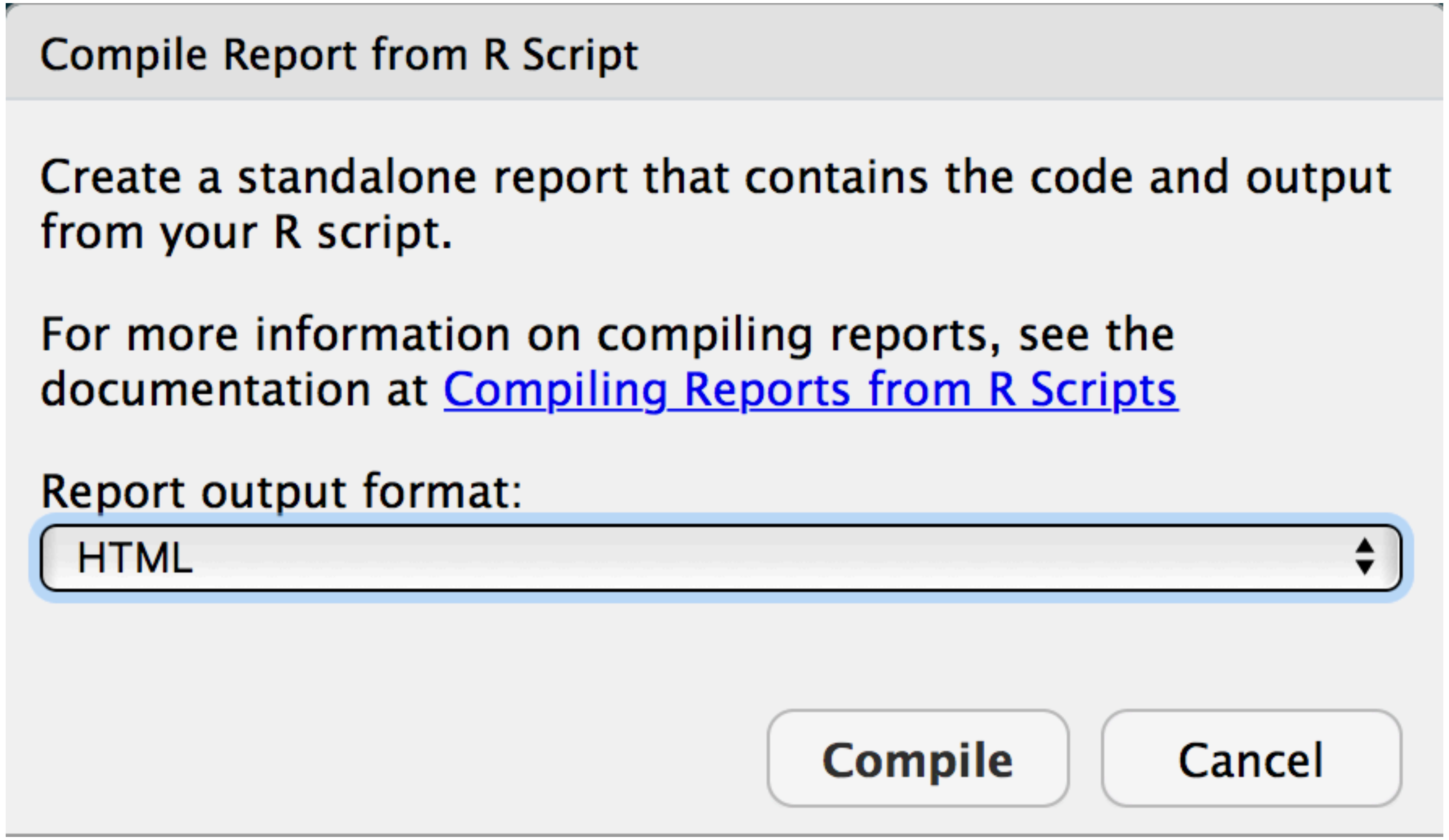
```
foo.md
foo.html
```

Compile Report



```
## how jenny might do this in
## purposely leaving a few things to change later!
```

≈ `rmarkdown::render("whatever.R")`



Compile Report from R Script

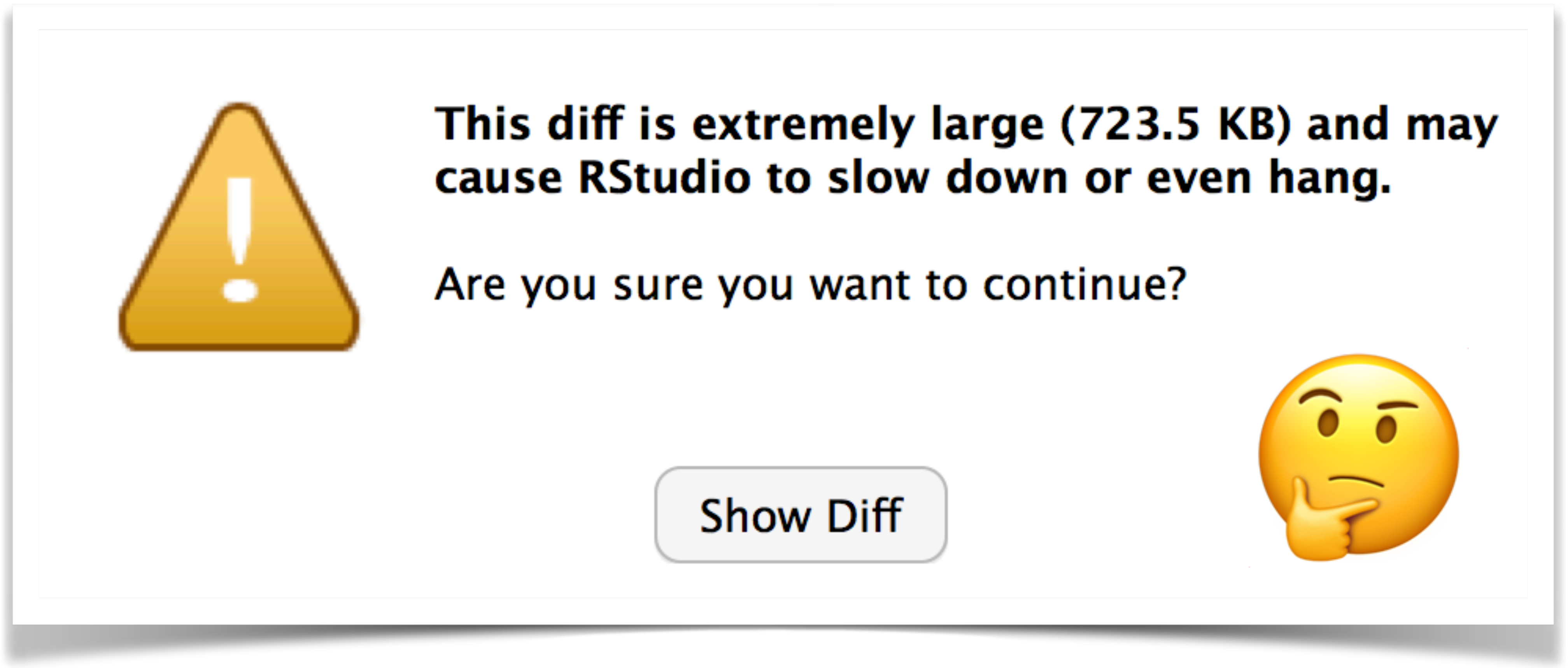
Create a standalone report that contains the code and output from your R script.

For more information on compiling reports, see the documentation at Compiling Reports from R Scripts

Report output format:

HTML

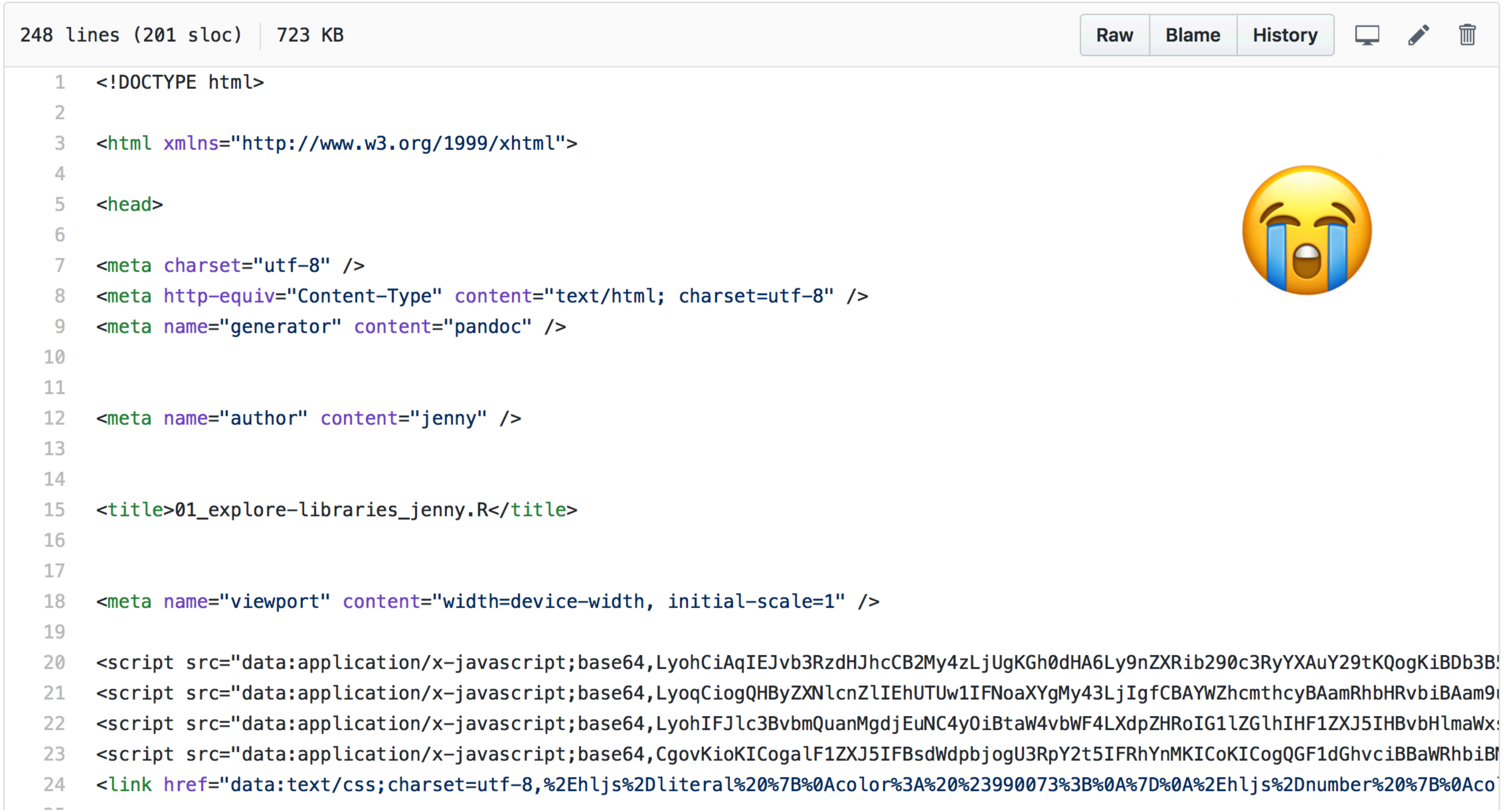
Sure, HTML is fine ... for now.


This diff is extremely large (723.5 KB) and may cause RStudio to slow down or even hang.

Are you sure you want to continue?

What changed in Git pane?
Inspect the diff. Or not.
Stage.
Commit.
Push.
Verify the .html file is now on GitHub.

Wait … is .html immediately useful on GitHub?



248 lines (201 sloc) | 723 KB

Raw Blame History

```
<!DOCTYPE html>

<html xmlns="http://www.w3.org/1999/xhtml">

<head>

<meta charset="utf-8" />
<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<meta name="generator" content="pandoc" />


<meta name="author" content="jenny" />



<title>01_explore-libraries_jenny.R</title>



<meta name="viewport" content="width=device-width, initial-scale=1" />

<script src="data:application/x-javascript;base64,LyohCiAqIEJvb3RzdHJhcCB2My4zLjUgKGh0dHA6Ly9nZXRib290c3RyYXAuY29tKQogKiBDb3B
<script src="data:application/x-javascript;base64,LyoqCiogQHByZXNlcnZlIEhUTUw1IFNoaXYgMy43LjIgfCBAYWZhcmthcyBAamRhbHRvbiBAam9
<script src="data:application/x-javascript;base64,LyohIFJlc3BvbmQuanMgdjEuNC4yOiBtaW4vbWF4LXdpZHRoIG1lZGlhIHF1ZXJ5IHBvbHlmaWx
<script src="data:application/x-javascript;base64,CgovKioKICogalF1ZXJ5IFBsdWdpbjogU3RpY2t5IFRhYnMKICoKICogQGF1dGhvciBBaWRhbiBN
<link href="data:text/css;charset=utf-8,%2Ehljs%2Dliteral%20%7B%0Acolor%3A%20%23990073%3B%0A%7D%0A%2Ehljs%2Dnumber%20%7B%0Aco
```

NO, raw .html **is NOT immediately useful*** on GitHub.

But Markdown = **.md is useful**.

Let's render .R to .md instead of .html!

* it obviously is useful in actual web publishing workflows

$$\begin{tikzcd}\text{foo.R} \arrow[rr] & & \text{foo.html}\end{tikzcd}$$

```
#' ---
#' output: html_document
#' ---
```

$$\begin{tikzcd}\text{foo.R} \arrow[r] & \text{foo.md} \arrow[r] & \text{foo.html}\end{tikzcd}$$

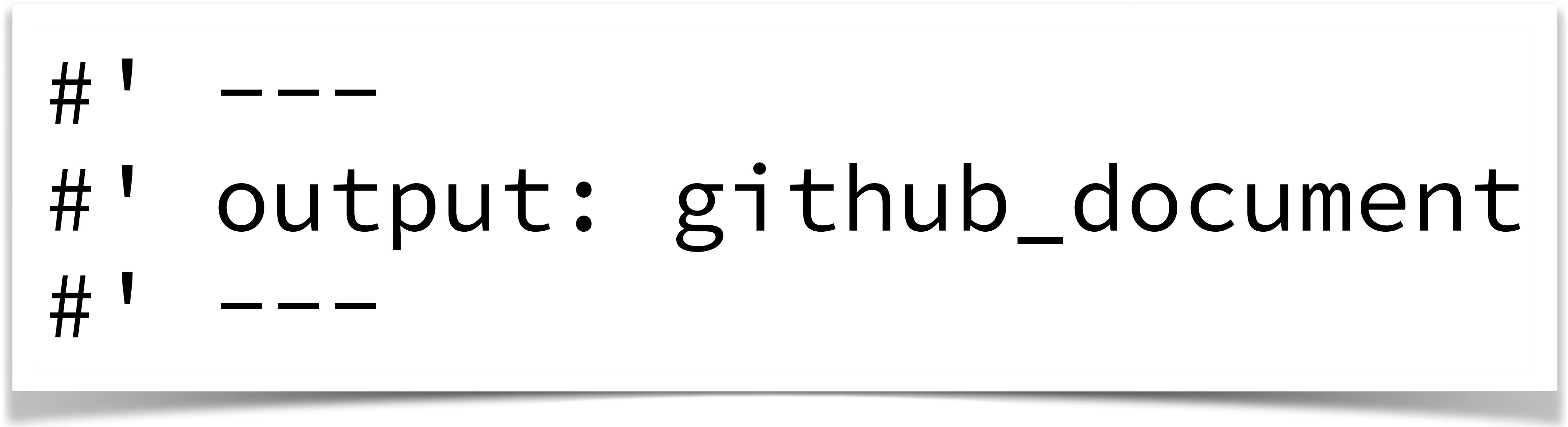
```
#' ---
#' output:
#'   html_document:
#'     keep_md: yes
#' ---
```

$$\begin{tikzcd}\text{foo.R} \arrow[r] & \text{foo.md}\end{tikzcd}$$

```
#' ---
#' output: md_document
#' ---
```

$$\begin{tikzcd}\text{foo.R} \arrow[r] & \text{foo.md}\end{tikzcd}$$

```
#' ---
#' output: github_document
#' ---
```



```
#' ---
#' output: github_document
#' ---
```

Add this YAML frontmatter to your .R file.

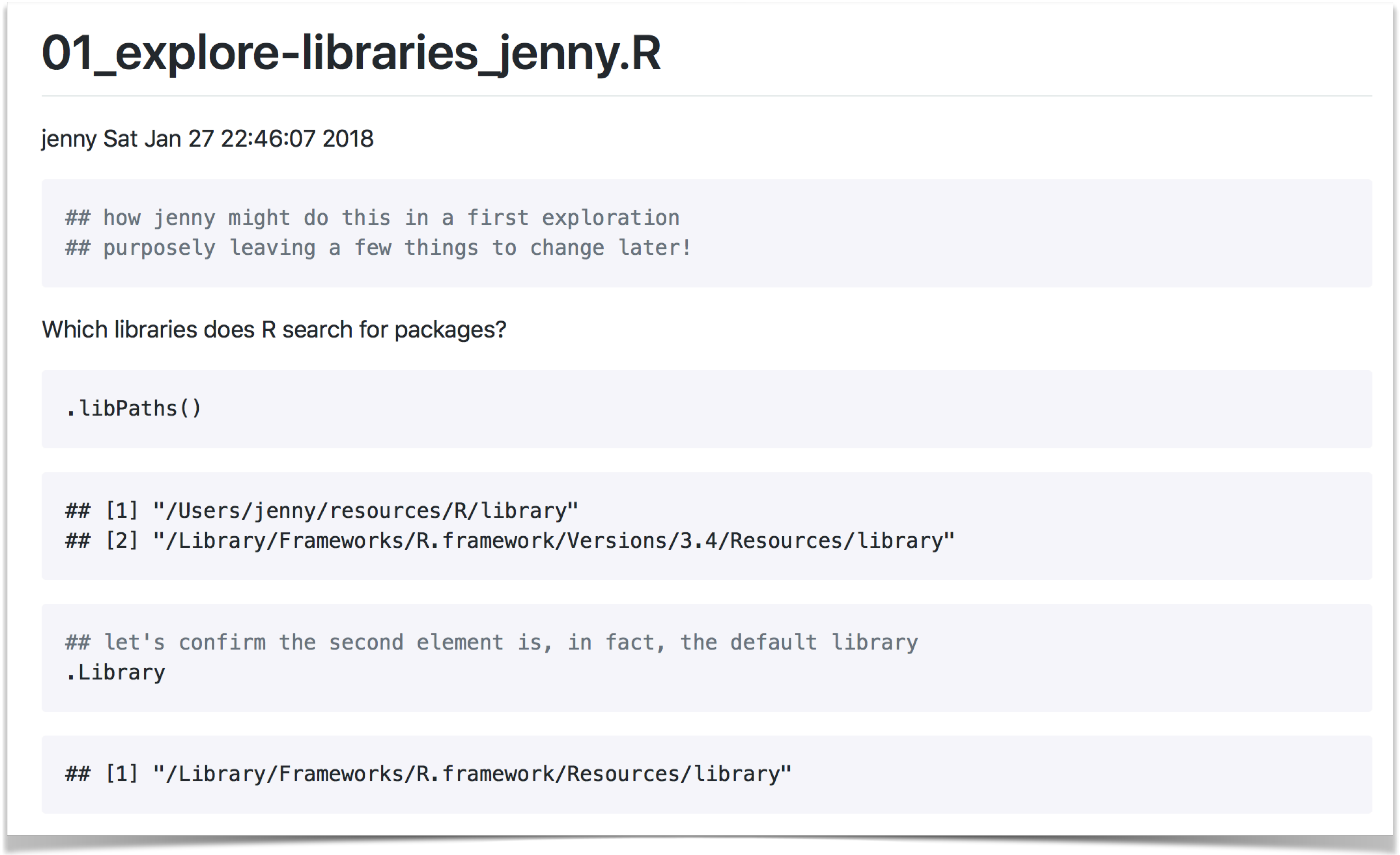
Re-Compile Notebook

What changed? Look at the Git diff.

This is what I mean by "explore cause and effect" and "experiment without fear".

Get comfortable with the diff.
Stage.
Commit.
Push.
Verify the .md file is now on GitHub.

Revel in how nice the .md looks!



01_explore-libraries_jenny.R

jenny Sat Jan 27 22:46:07 2018

```
## how jenny might do this in a first exploration
## purposely leaving a few things to change later!
```

Which libraries does R search for packages?

```
.libPaths()
```

```
## [1] "/Users/jenny/resources/R/library"
## [2] "/Library/Frameworks/R.framework/Versions/3.4/Resources/library"
```

```
## let's confirm the second element is, in fact, the default library
.Library
```

```
## [1] "/Library/Frameworks/R.framework/Resources/library"
```

This is what I mean by "expose your work".

Take away #1

- It is absolutely OK to track rendered or derived products in Git and push them to GitHub. Often it's a good idea!
- Just because someone can fork, clone, install all necessary packages, then run your code, it doesn't mean they want to or will.
- Be humane. Be realistic.

Take away #2

- For consumption on GitHub, Markdown (.md) is vastly more useful than .html, .docx, .pdf, etc.
- Binary formats like .docx and .pdf are also a reliable source of merge conflicts. Think carefully before you track them with Git.

How to think about files + Git

- Not all file types play equally well with Git. Plain text works best.
  - "Excuse Me, ..." article has a section on "Which files to commit"
- Not all file types play equally well with GitHub. Markdown is especially awesome.
  - https://happygitwithr.com/workflows-browsability.html

Keep doing "New/Existing project, GitHub first"

- Continue to port your earlier work on library exploration into your new Git/GitHub repo. Or bring an example solution over.
- Make lots of small additions and changes.
- Play with rendering to markdown.
- Look at diffs, stage, commit, push, verify.
- This is what I mean by "embrace incrementalism".

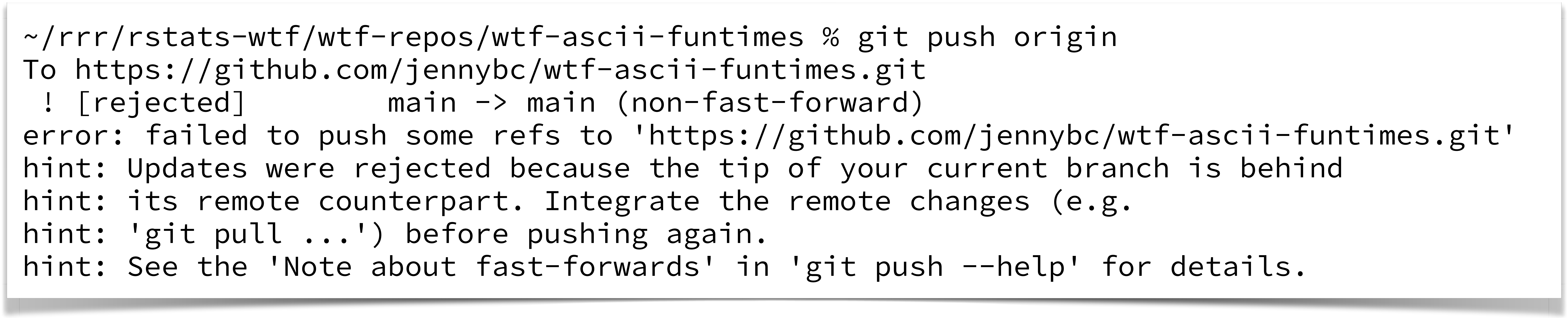
Why use version control?

- experiment without fear
- explore cause and effect
- embrace incrementalism
- expose your work
- collaborate

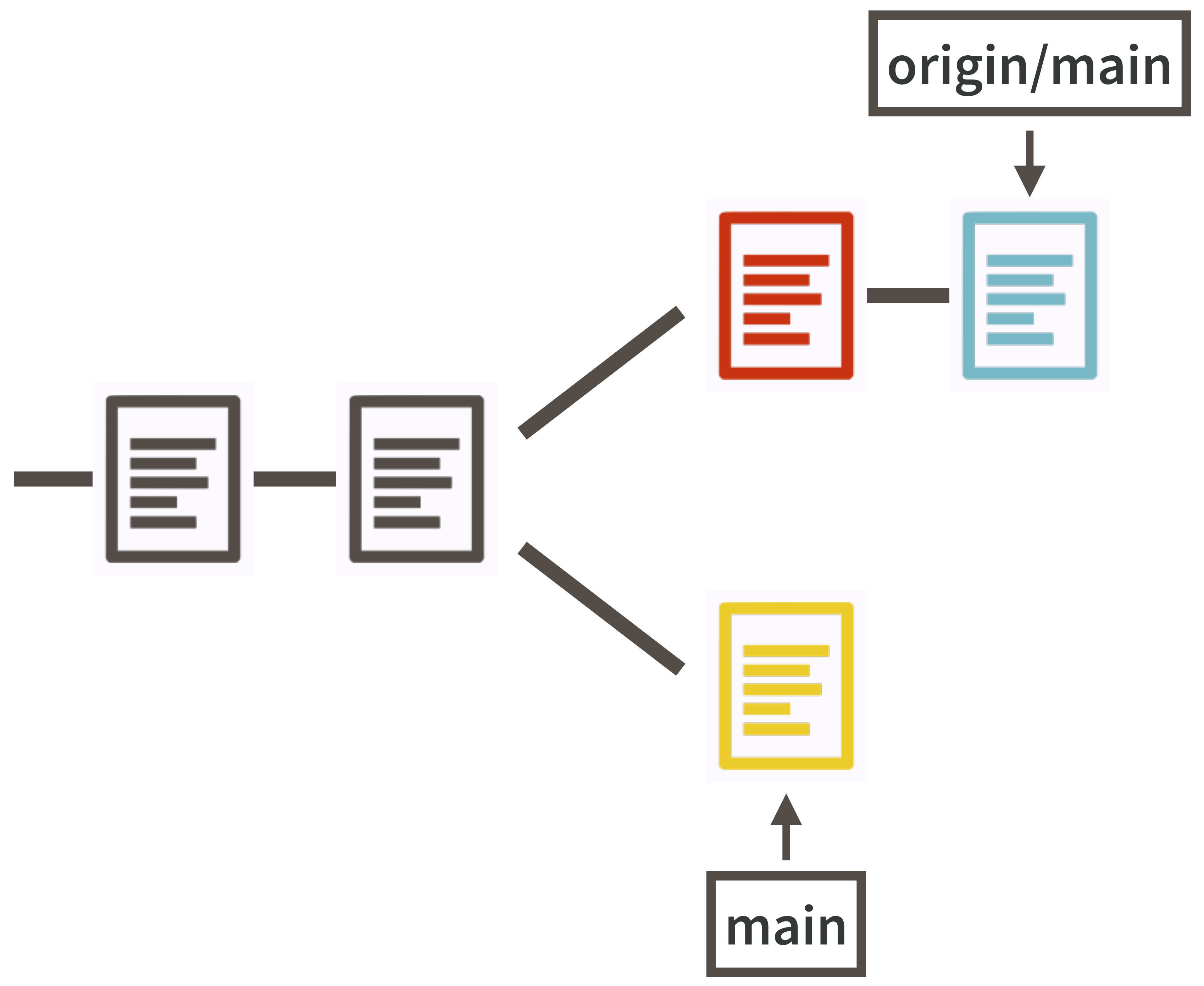
let's practice dealing with unpleasant situations

Dealing with push rejection

- A push attempt will fail if your local commit history is incompatible with that on the remote.

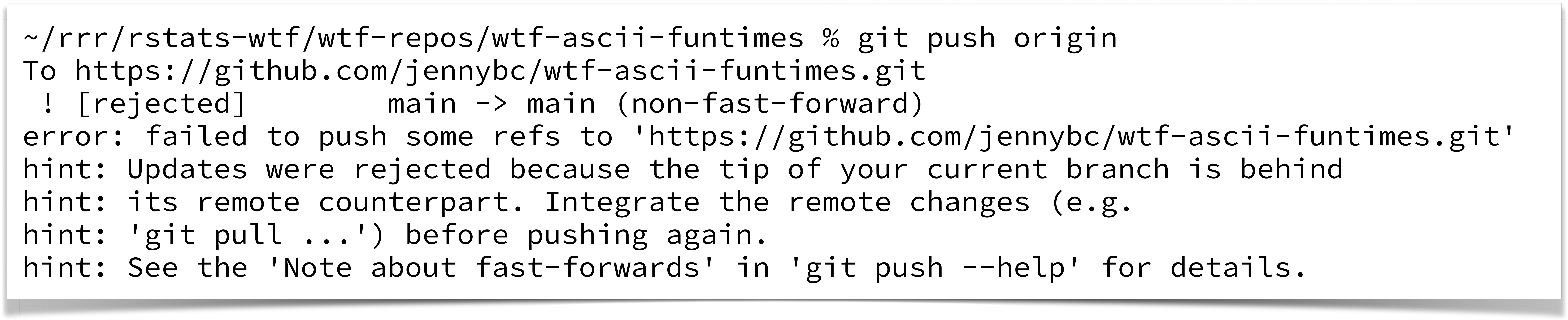


```
~/rrr/rstats-wtf/wtf-repos/wtf-ascii-funtimes % git push origin
To https://github.com/jennybc/wtf-ascii-funtimes.git
 ! [rejected]        main -> main (non-fast-forward)
error: failed to push some refs to 'https://github.com/jennybc/wtf-ascii-funtimes.git'
hint: Updates were rejected because the tip of your current branch is behind
hint: its remote counterpart. Integrate the remote changes (e.g.
hint: 'git pull ...') before pushing again.
hint: See the 'Note about fast-forwards' in 'git push --help' for details.
```



`git push` is rejected.

You must `git pull` first.



```
~/rrr/rstats-wtf/wtf-repos/wtf-ascii-funtimes % git push origin
To https://github.com/jennybc/wtf-ascii-funtimes.git
 ! [rejected]          main -> main (non-fast-forward)
error: failed to push some refs to 'https://github.com/jennybc/wtf-ascii-funtimes.git'
hint: Updates were rejected because the tip of your current branch is behind
hint: its remote counterpart. Integrate the remote changes (e.g.
hint: 'git pull ...') before pushing again.
hint: See the 'Note about fast-forwards' in 'git push --help' for details.
```

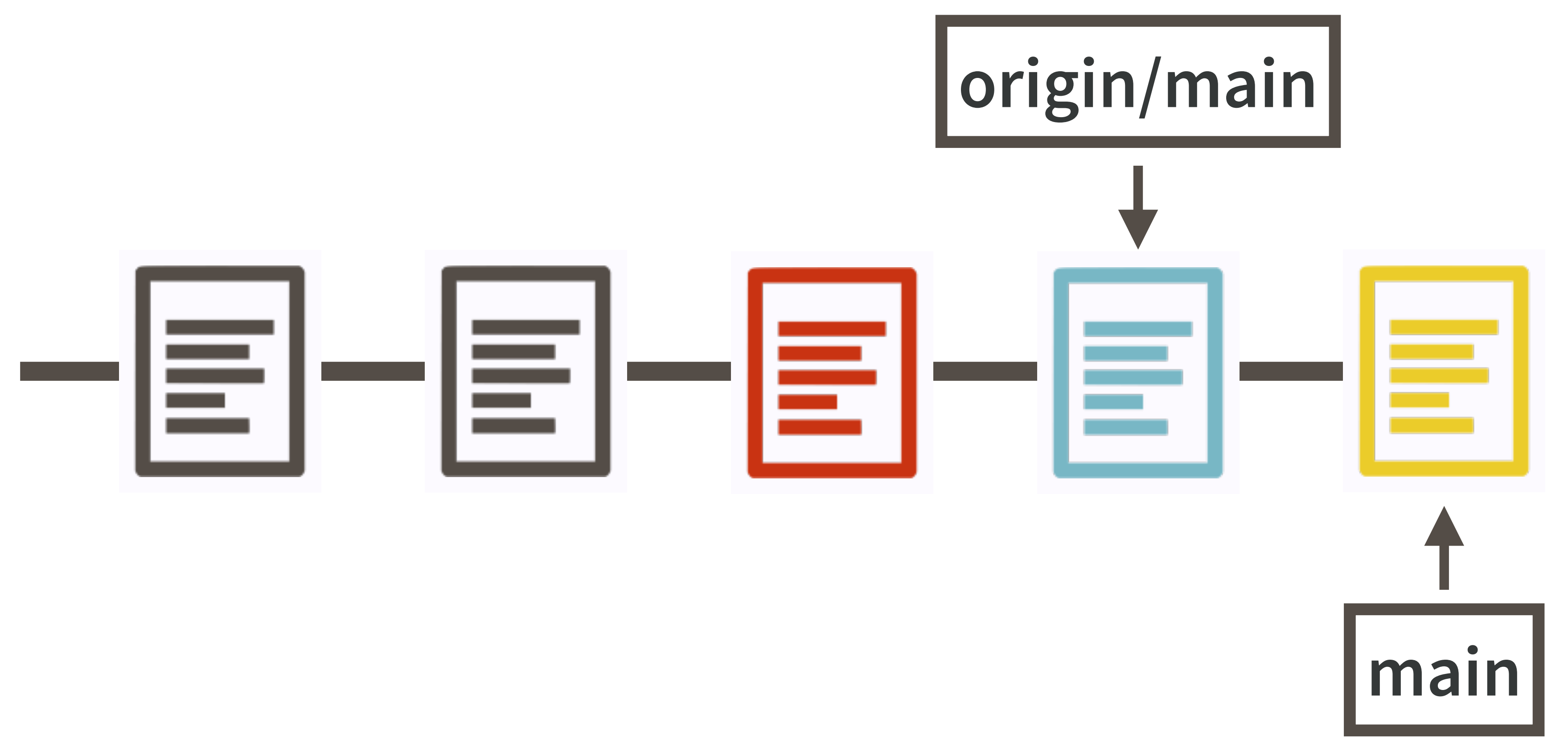
At this point, we (or at least I) will create the troublesome situation.

How?

Make a commit on GitHub, via the browser. (Don't pull.)

Make a local commit.

Try to push. Fail. Now what?



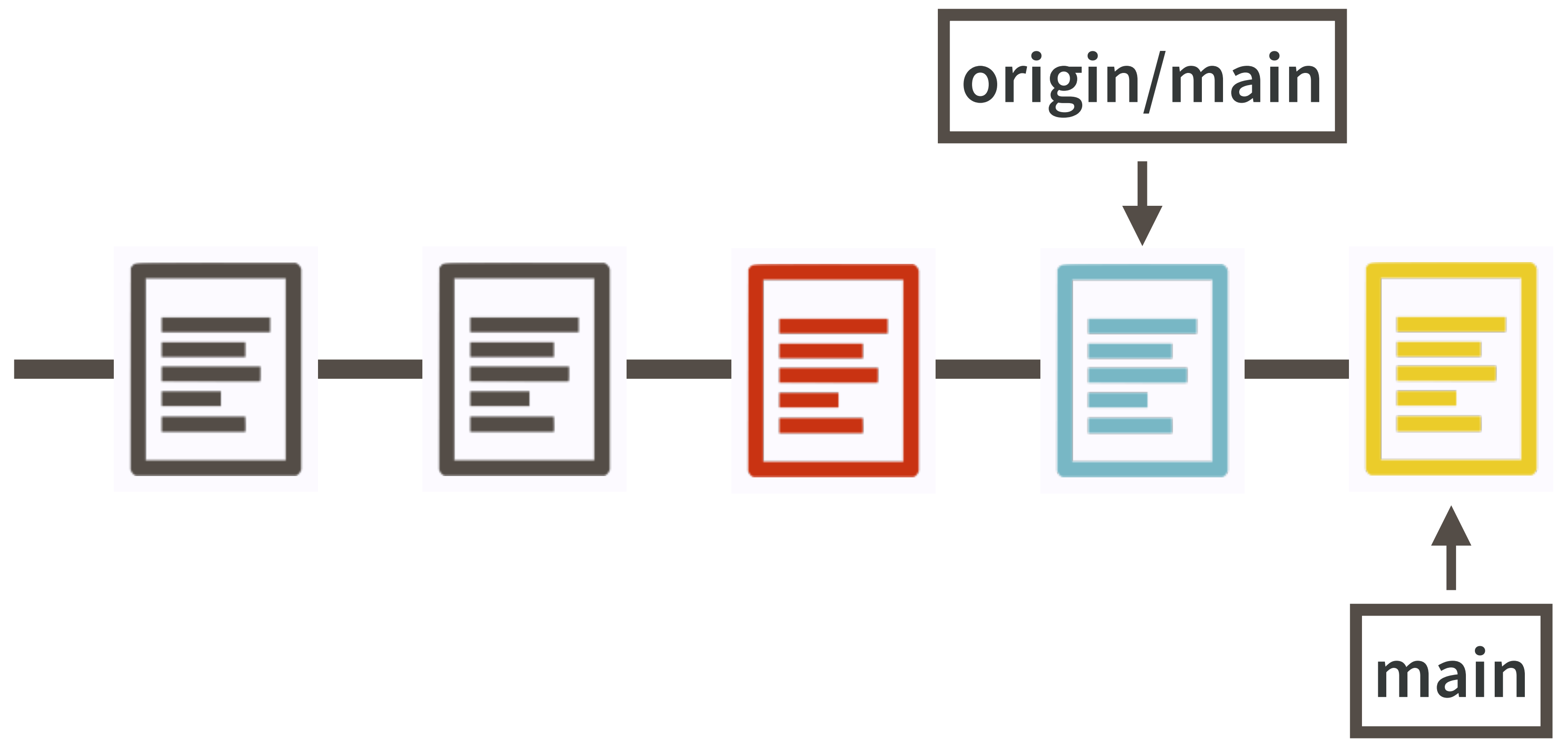
My preferred resolution.
I love a linear history.

Not always possible, but often is.
Depends on the situation, i.e. what's in the diffs.

Achieved by a "pull with rebase".

One-off invocation:

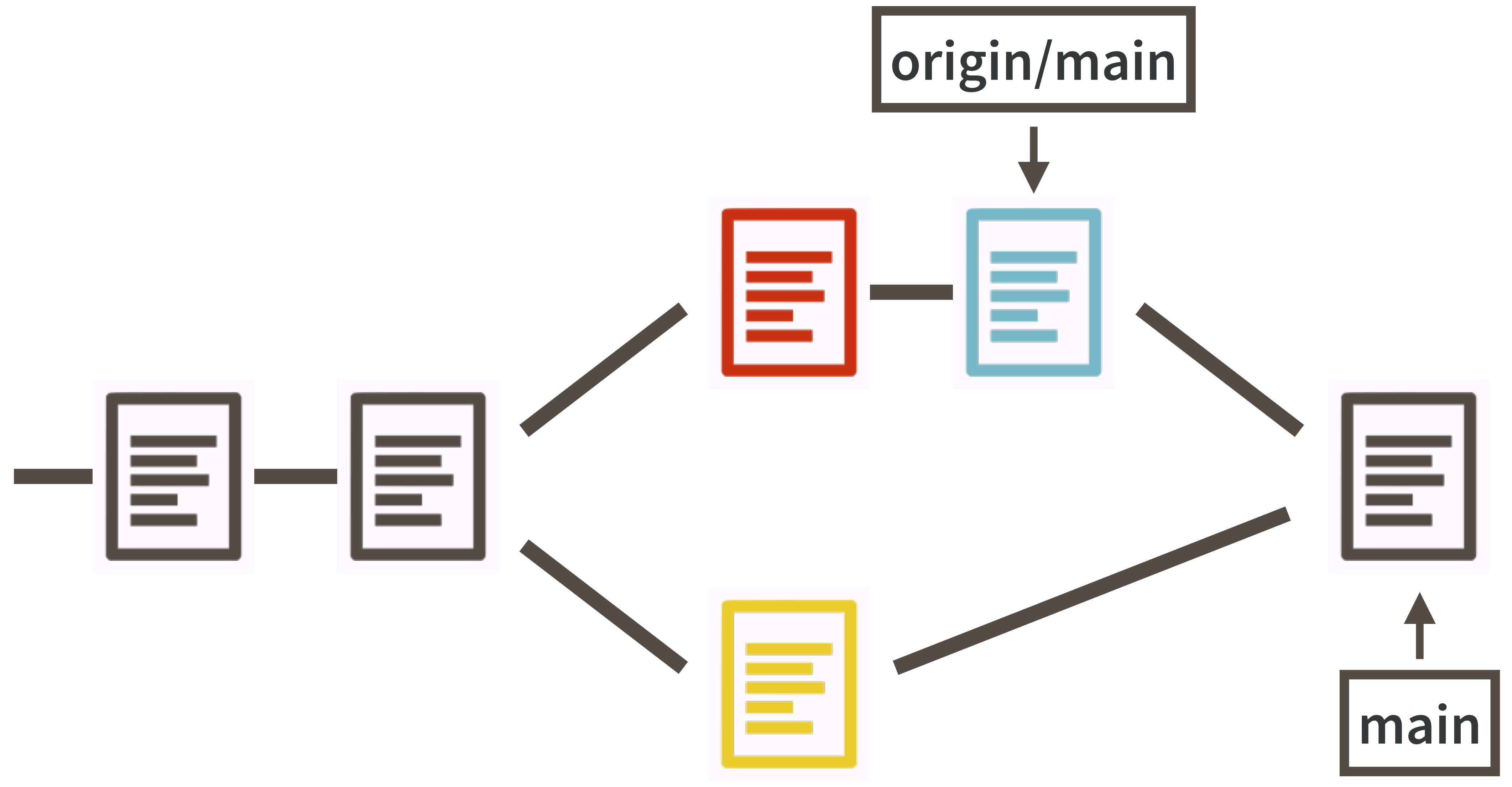
```
git pull --rebase
```



I recommend "pull with rebase" as a lifestyle.
IMO it should be the default.

Opt-in like so:

```
git config --global pull.rebase true
```

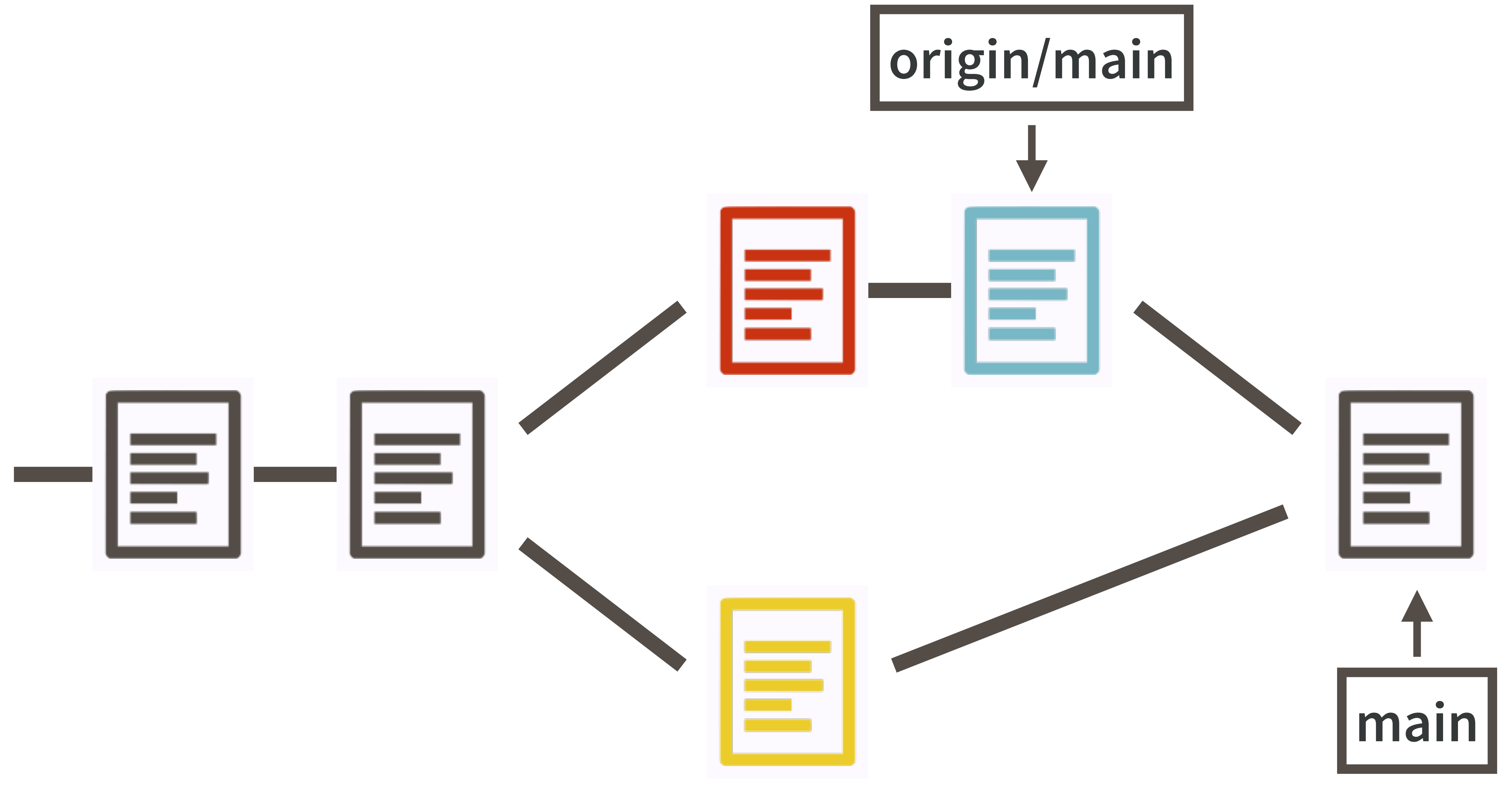


An acceptable outcome. (But I don't care for it.)

Resolution via a merge commit.

(Sort of) the default behaviour, but recent versions of Git will complain and encourage you to be more explicit.

Also, awkwardness about generating the commit message.

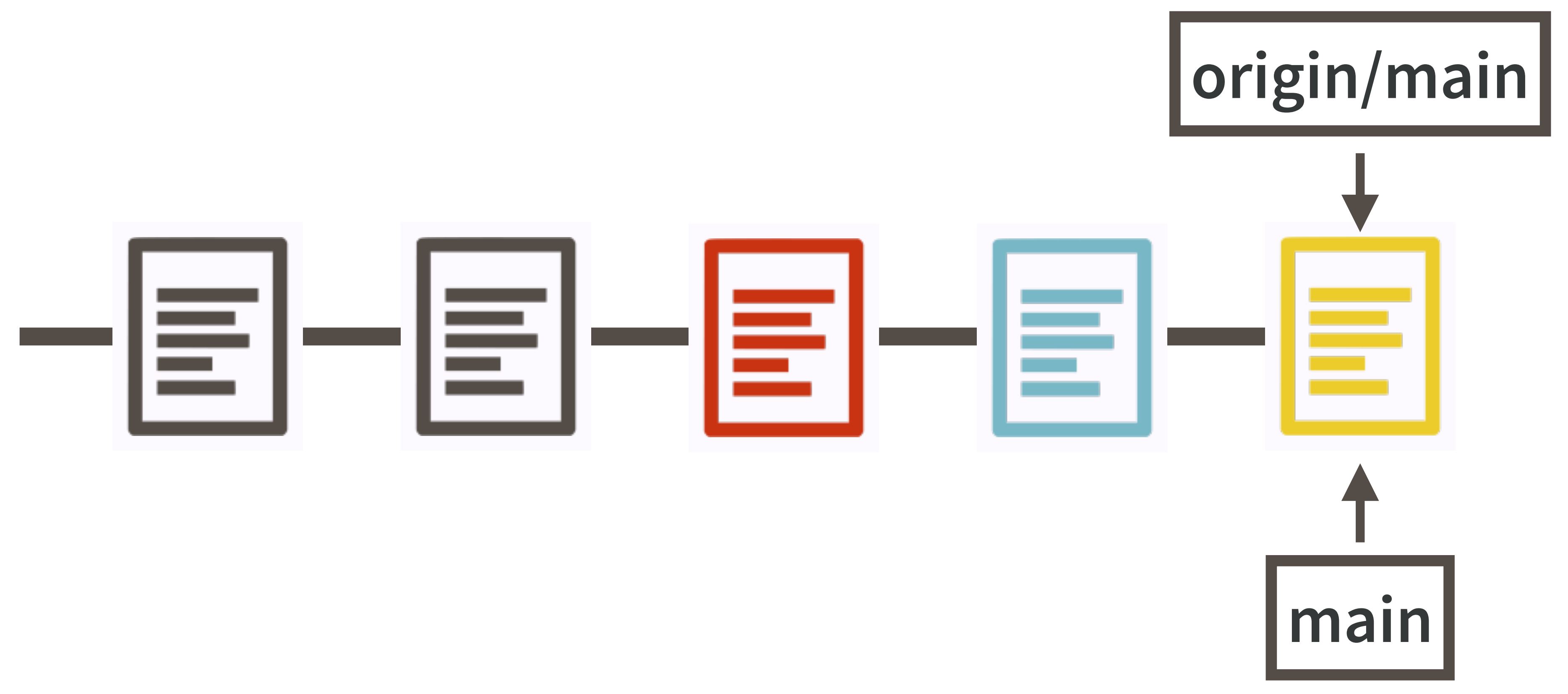


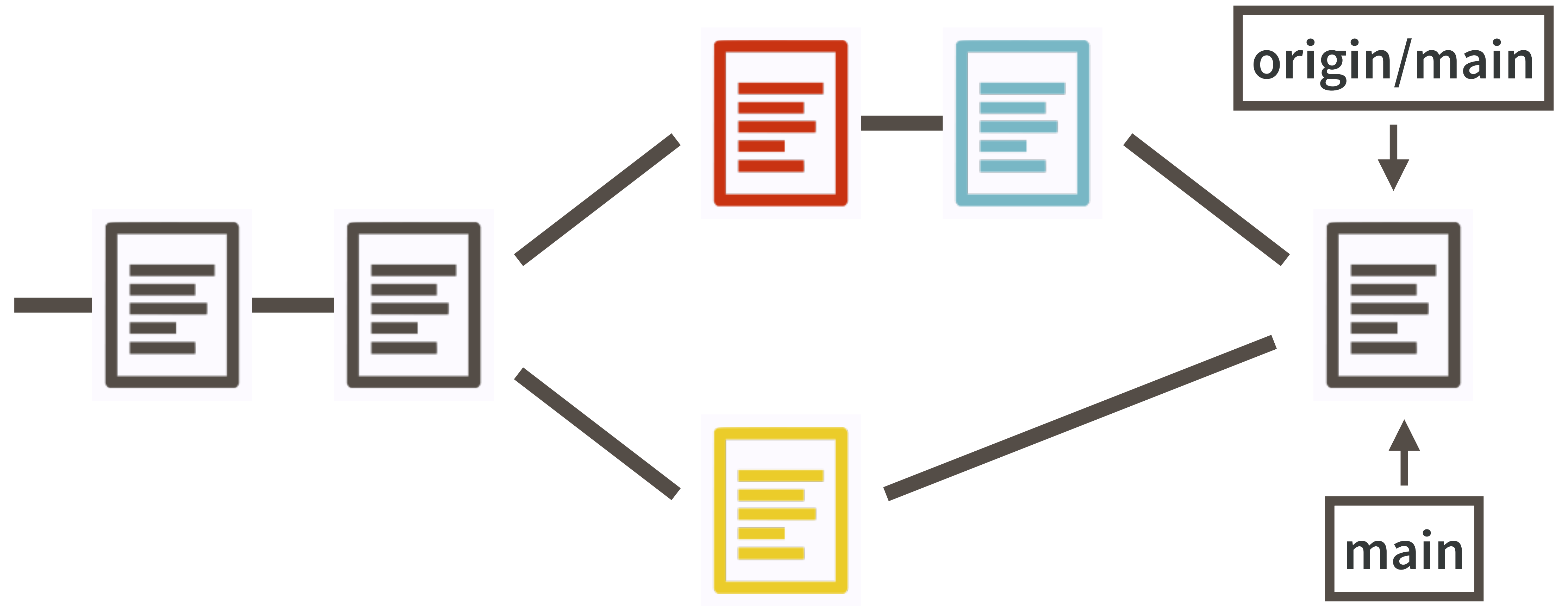
If you're in the middle of this and you want to back out:

```
git merge --abort
```

If you want to complete the merge:

```
git commit -m 'Merge commit'
```





No matter what, don't forget to `git push`!

You want to get back to a happy place where local and remote are synced up.

Read more in Happy Git:

Dealing with push rejection

Pull, but you have local work

Dealing with a merge conflict

- A pull attempt will fail if Git can't figure out how to do the rebase or merge.

```
From github.com:jennybc/bunny-scarf
   958548f..3357952  master     -> origin/master
Auto-merging README.md
CONFLICT (content): Merge conflict in README.md
Automatic merge failed; fix conflicts and then commit the result.
```

If you simply cannot deal with the mess right now, back out and come back later.

If it's a "pull with rebase":

```
  git rebase --abort
```

If it's a "fetch and merge":

```
  git merge --abort
```

We (or at least I) am going to soldier on and resolve the conflict.

Every locus of conflict looks like this.

How things look locally (or on the currently checked out branch).

How things look remotely (or on the branch you're merging).

```
<<<<<<< HEAD
Wingardium Leviosaaaaaaaa
=======
Wing-GAR-dium Levi-O-sa
>>>>>>> 3357952
```

*conflict markers appear in orange

At each locus of conflict, you must form a consensus state and remove the conflict marker lines.

```
<<<<<<< HEAD
Wingardium Leviosaaaaaaaa
=======
Wing-GAR-dium Levi-O-sa
>>>>>>> 3357952
```

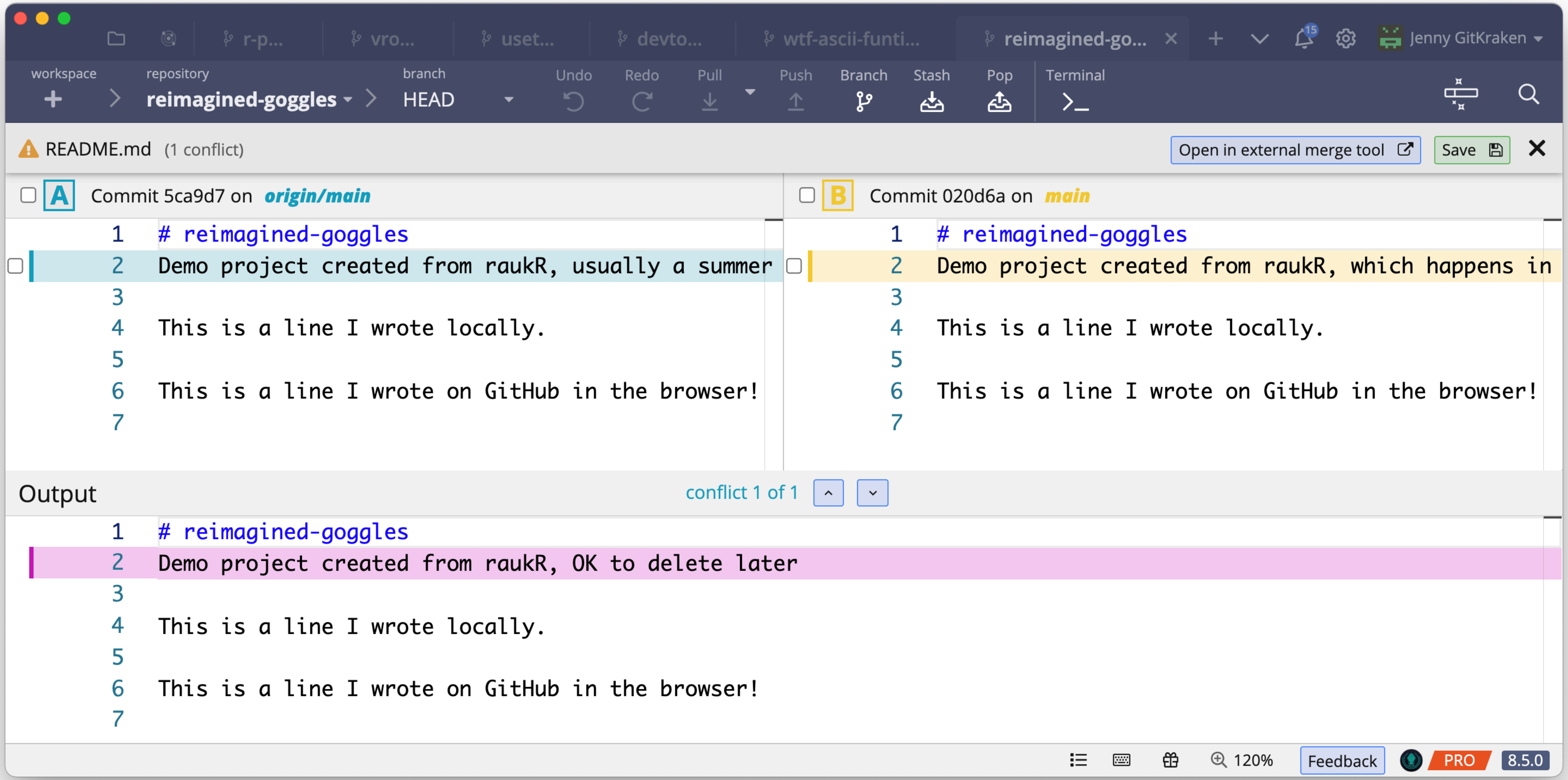
$\longrightarrow$

```
Wingardium Levi-O-sa
```

Stage and commit all affected files.
Commit.
Push.
Carry on.

*conflict markers appear in orange

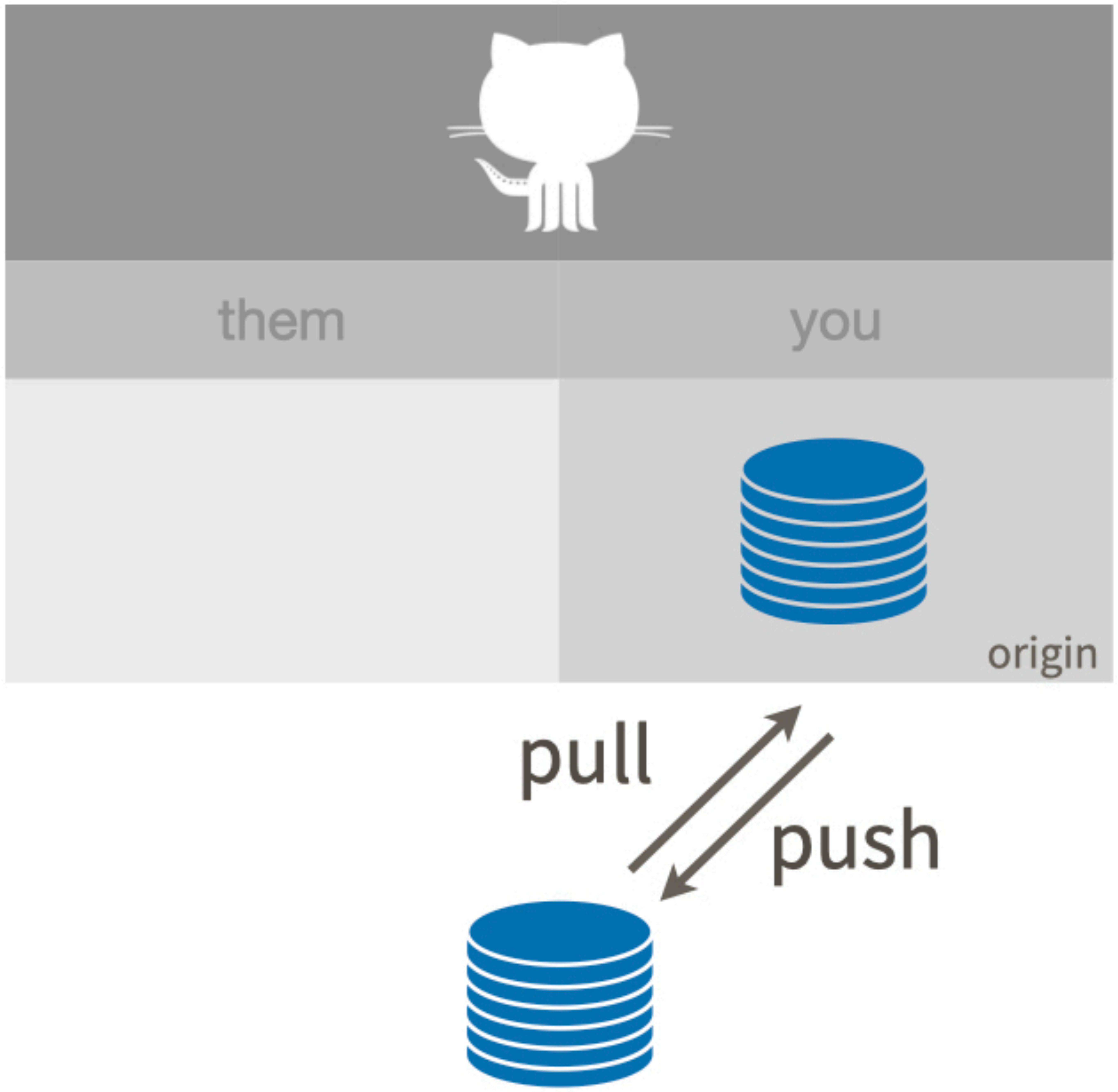
Powerful Git clients, like GitKraken, offer support for resolving merge conflicts.



```
# reimagined-goggles
Demo project created from raukR, usually a summer

This is a line I wrote locally.

This is a line I wrote on GitHub in the browser!
```

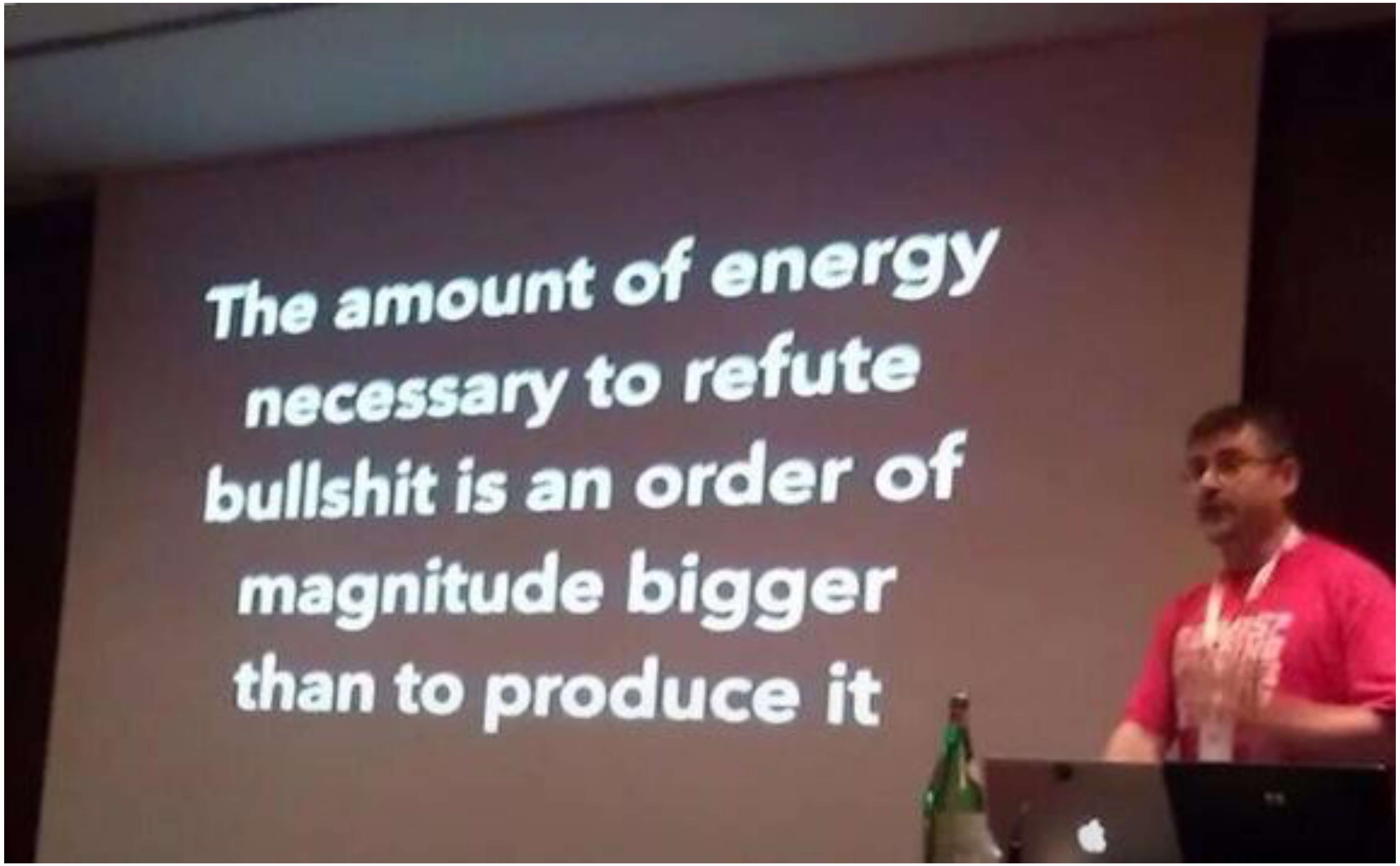
```
# reimagined-goggles
Demo project created from raukR, which happens in

This is a line I wrote locally.

This is a line I wrote on GitHub in the browser!
```

```
# reimagined-goggles
Demo project created from raukR, OK to delete later

This is a line I wrote locally.

This is a line I wrote on GitHub in the browser!
```


them
you
origin
pull
push

The Nuclear Option

- What if you've made a huge mess and you just can't fix it?
- Official answer: git reset.
- Unofficial answer: burn it all down 🔥



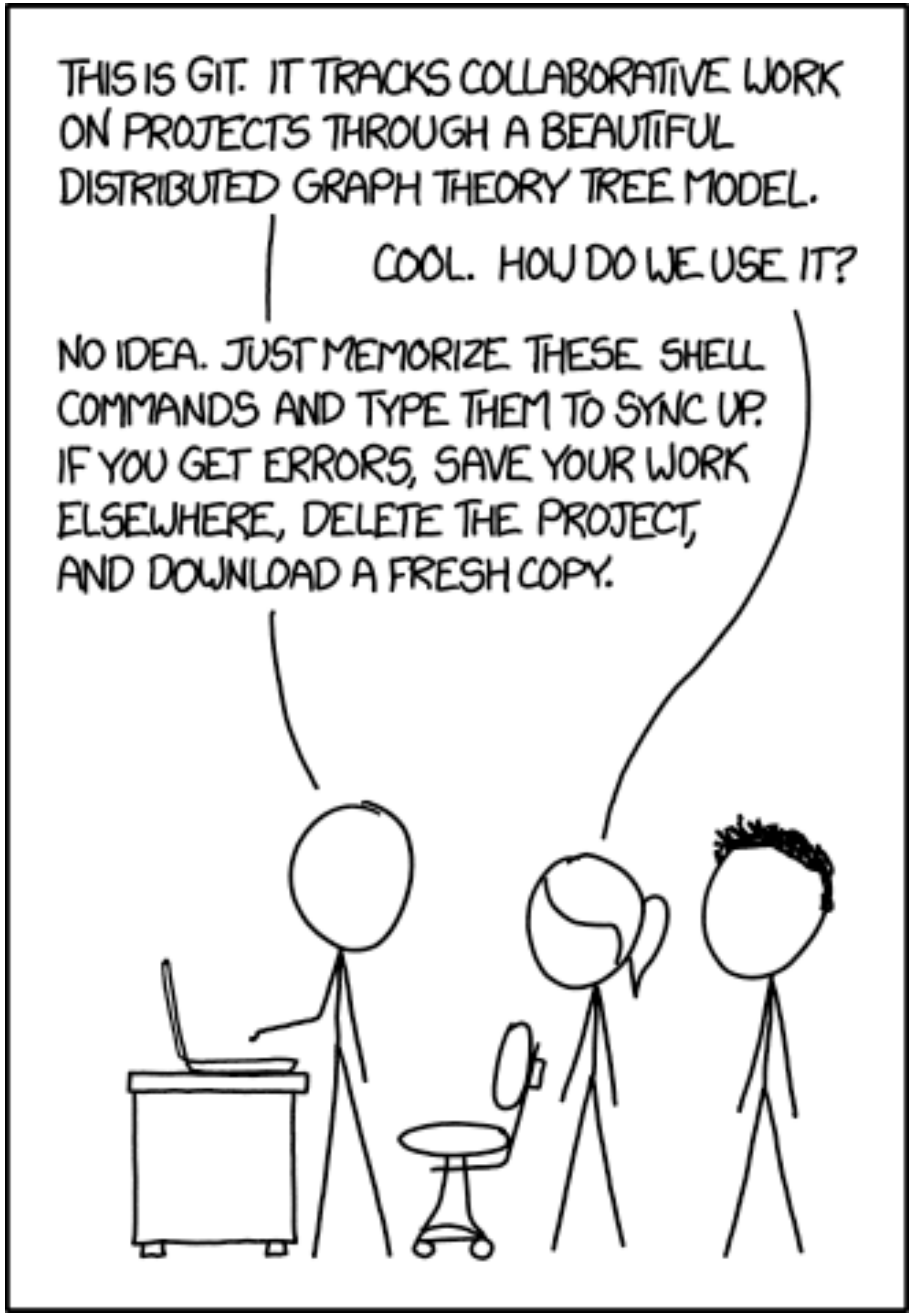
The amount of energy necessary to refute bullshit is an order of magnitude bigger than to produce it

- Alberto Brandolini

The amount of Git skilz necessary to fix a borked up repo is an order of magnitude bigger than to bork it.

Me

BURN IT ALL DOWN


THIS IS GIT. IT TRACKS COLLABORATIVE WORK ON PROJECTS THROUGH A BEAUTIFUL DISTRIBUTED GRAPH THEORY TREE MODEL.
COOL. HOW DO WE USE IT?
NO IDEA. JUST MEMORIZE THESE SHELL COMMANDS AND TYPE THEM TO SYNC UP. IF YOU GET ERRORS, SAVE YOUR WORK ELSEWHERE, DELETE THE PROJECT, AND DOWNLOAD A FRESH COPY.

🔥 requires you have a remote repo in a decent state!
Commit early, commit often! And push!
It's your safety net.

Rename local repo to, e.g. "foo-borked".

Re-clone to a new, clean local repo, "foo".

Copy any files that are better locally from "foo-borked" to "foo". Commit. Push. Carry on.