# What They Forgot to Teach You About R

R-Ladies, November 2019

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rstats-wtf.github.io/wtf-2019-rladies-seattle/

# Day 1, morning
# Project-oriented workflow

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# What *Did* They Forget to Teach You?

# Everything else

Statistical analysis

Deep
Thoughts

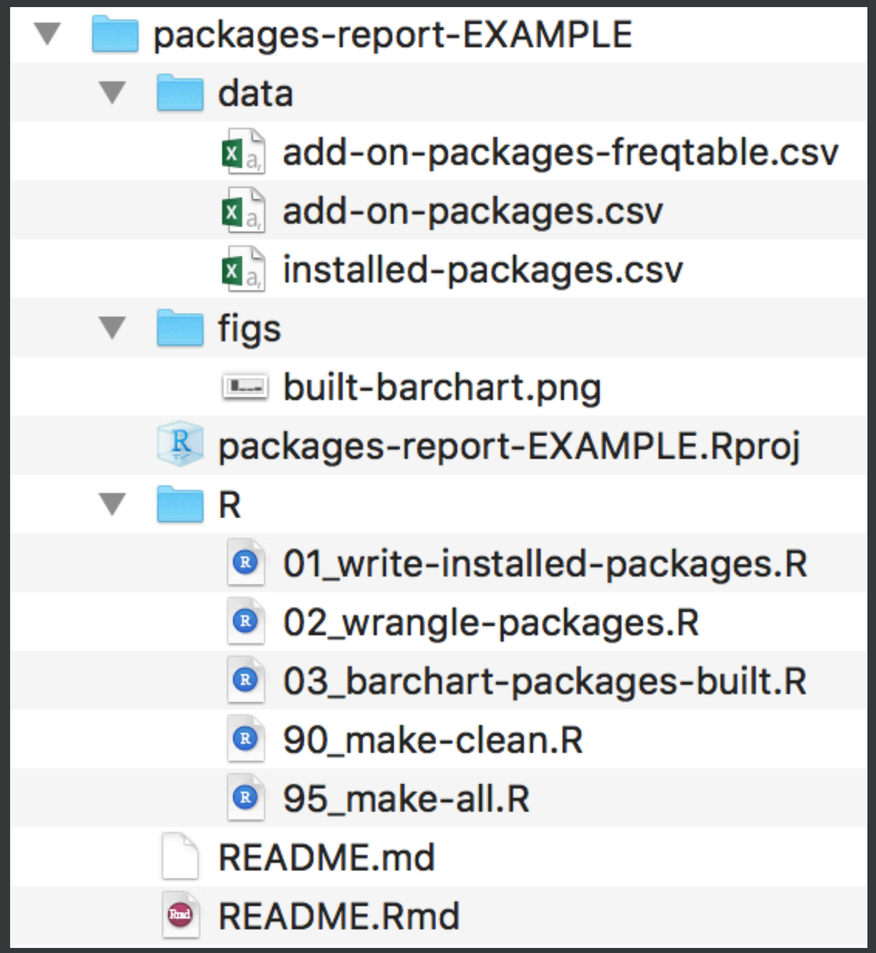
# Be organized

do this as you go, not "tomorrow"

but also don't fret over past mistakes
raise the bar for *new* work

# Be organized

self-explaining >>> wordy, needy explainers




>>>

file salad

+ an out-of-date README

**Good enough practices in scientific computing**

Wilson, Bryan, Cranston, Kitzes, Nederbragt, Teal

https://doi.org/10.1371/journal.pcbi.1005510

**http://bit.ly/good-enuff**

# Day 1 Practical Example: Explore your R installation

R package = the natural unit for distributing R code

base R ≈ 14 base + 15 recommended packages
ship with all binary distributions of R

can use right out of the box:

```
library(lattice)
```

CRAN has ~13K additional packages

install, then attach:

```
install.packages("devtools")
library(devtools)
```

And then there's GitHub ...

install via devtools, then attach:

```
devtools::install_github("jimhester/lookup")
library(lookup)
```

Where do packages live locally?

By default, in the default library

```
.Library
```

All libraries for current session:

```
.libPaths()
```

All installed packages:

```
installed.packages()
```

```
install.packages("usethis")
library(usethis)
use_course("rstd.io/wtf-explore-libraries")
```

```
install.packages("usethis")
library(usethis)
use_course("rstd.io/wtf-explore-libraries")
```

Pick one to open and flesh out:

```
01_explore-libraries_spartan.R
01_explore-libraries_comfy.R*
```

* worst case, there's always `jenny`

```
install.packages("usethis")
library(usethis)
use_course("rstd.io/wtf-explore-libraries")
```

Stay relaxed.

We will refine this code and where it lives soon enough.

You want to leave rough edges and gaps to address later.

work on challenge

Deep
Thoughts

Adopt a project-oriented workflow

Why?

- work on more than 1 thing at a time
- collaborate, communicate, distribute
- start and stop

Adopt a project-oriented workflow

How?

- dedicated directory
- RStudio **P**roject
- Git repo, probably syncing to a remote

If you do this at the top of your scripts, Jenny Bryan might set your computer on 🔥:

```
setwd("C:\Users\jenny\path\that\only\I\have")
rm(list = ls())
```

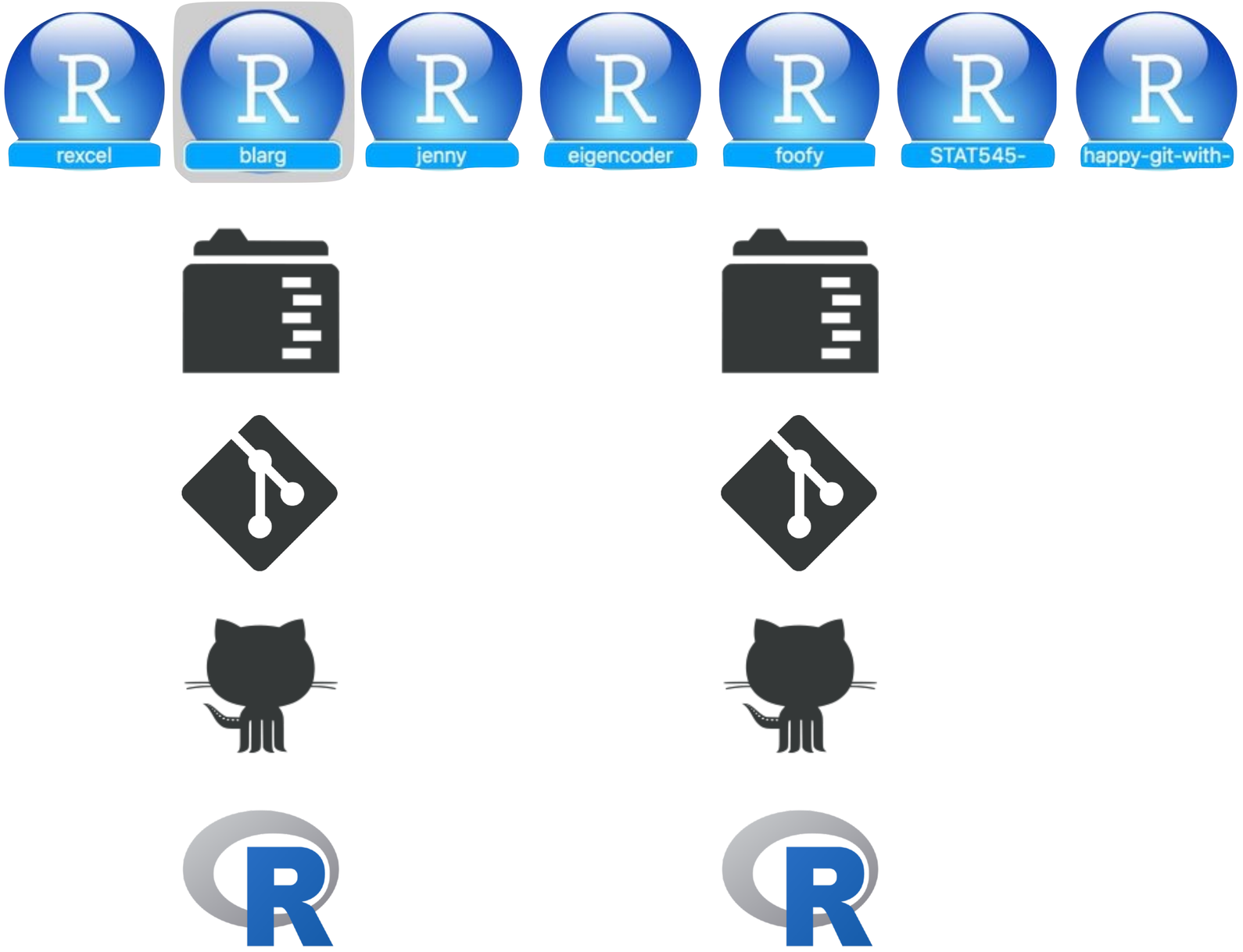
Project-oriented workflow designs this away:

https://www.tidyverse.org/articles/2017/12/workflow-vs-script/

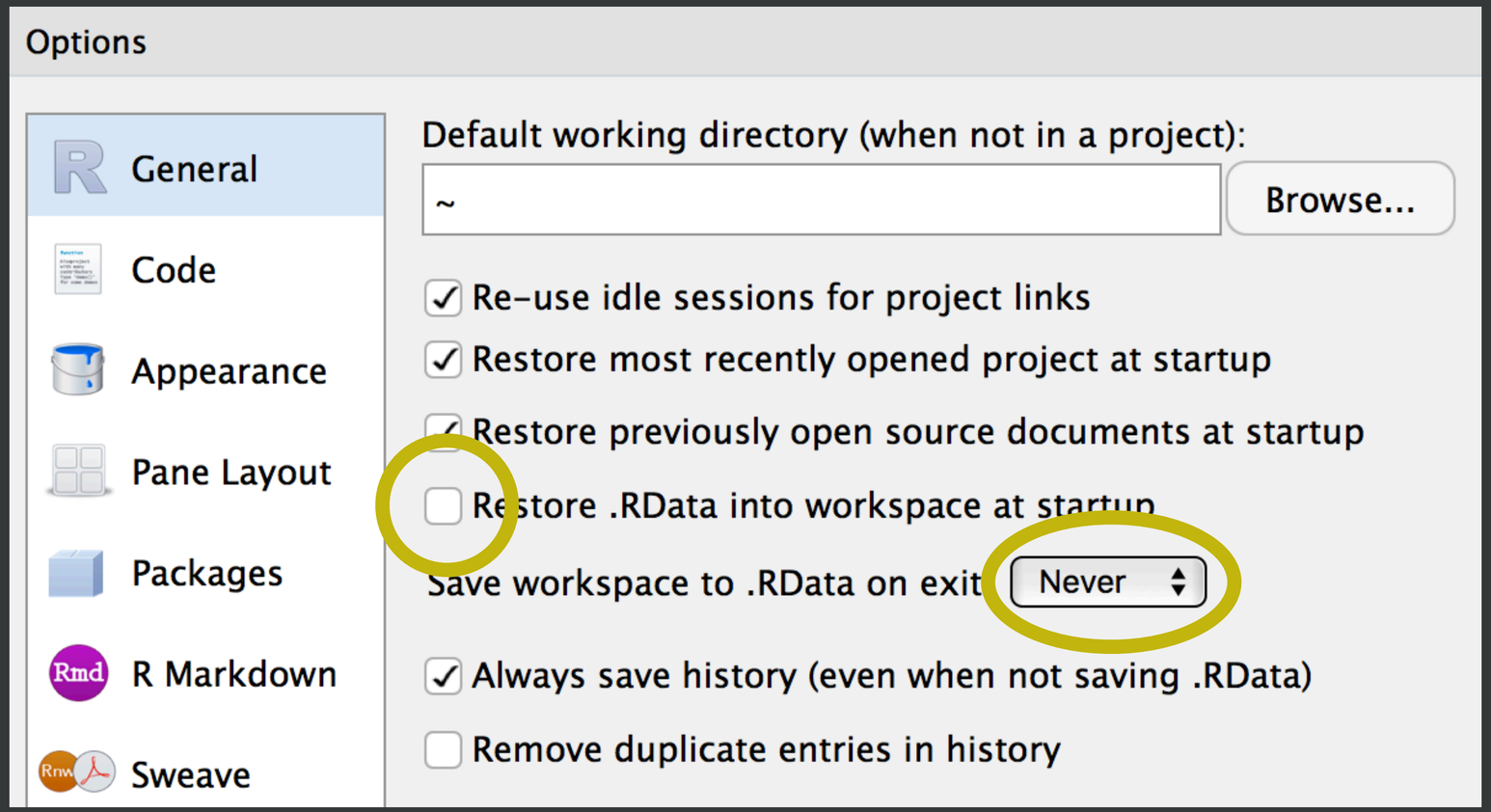
https://whattheyforgot.org ← see "A holistic workflow"

# What does it mean to be an RStudio **P**roject?

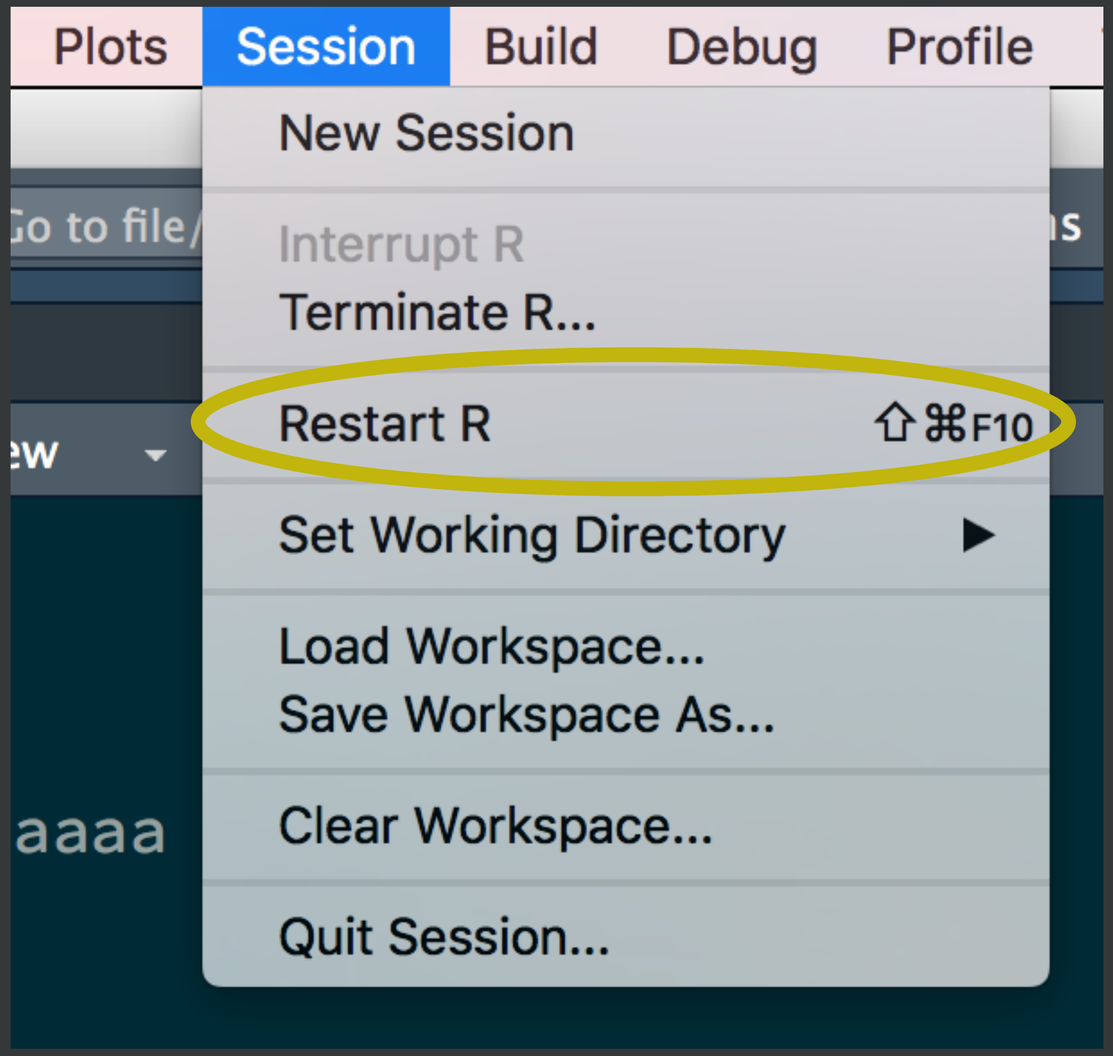
- RStudio leaves notes to itself in `foo.Rproj`
- Open Project = dedicated instance of RStudio
  - dedicated R process
  - file browser pointed at Project directory
  - working directory set to Project directory


rexcel
blarg
jenny
eigencoder
foofy
STAT545-
happy-git-with-

# Use a "blank slate"



# Restart R often



## Project initiation: the local case

Pick one and do this now!

New folder + make it an RStudio Project

- `usethis::create_project("~/i_am_new")`
- RStudio > New Project... > New Directory > New Project

Make existing folder into an RStudio Project

- `usethis::create_project("~/i_exist")`
- RStudio > New Project... > Existing Directory

break here?

Deep
Thoughts

# Practice "safe paths"

# Practice "safe paths"

relative to a stable base

use file system functions,

not `paste()`, `strsplit()`, etc.

# Do you know where your files are?

What is working directory?

# We Sent Freddie to the Stratosphere

preserved thanks to the Wayback Machine

Our second launch was supposed to be The One, but we ran into a critical issue with some of our code.... The code worked fine as we were testing on command line since the location of PHP was known by our shell, but once the code was added to cron for automation, the **location of PHP wasn't known, and the scripts continuously failed to send.**

```
install.packages("fs")
install.packages("here")
```

fs = filepath handling

here = project-relative paths

# Examples of a stable base

- Project directory
  - `here::here("data", "raw-data.csv")`
  - `here::here("data/raw-data.csv")`
- User's home directory
  - `file.path("~", ...)`
  - `fs::path_home(...)`
- Official location for installed s/w
  - `library(thingy)`
  - `system.file(..., package = "thingy")`

I have nothing against absolute paths.
Some of my best friends are absolute paths!
But don't hard-wire them into your scripts.
Instead, form at runtime relative to a stable base.

```
> (GOOD <- fs::path_home("tmp/test.csv")
[1] "/Users/jenny/tmp/test.csv"

> (BAD <- "/Users/jenny/tmp/test.csv")
[1] "/Users/jenny/tmp/test.csv"
```

# Practice "safe paths"

Use the here package to build paths inside a project.

Leave working directory at top-level at all times, during development.

Absolute paths are formed at runtime.

```r
library(here)
#> here() starts at <snip, snip>/here_here
system("tree")
#> .
#>  └── one
#>      └── two
#>          └── awesome.txt

here("one", "two", "awesome.txt")
#> [1] "<snip, snip>/here_here/one/two/awesome.txt"
cat(readLines(here("one", "two", "awesome.txt")))
#> OMG this is so awesome!
```

```
library(here)
#> here() starts at <snip, snip>/here_here
system("tree")
#> .
#>  └── one
#>      └── two
#>          └── awesome.txt

here("one", "two", "awesome.txt")
#> [1] "<snip, snip>/here_here/one/two/awesome.txt"
cat(readLines(here("one", "two", "awesome.txt")))
#> OMG this is so awesome!

setwd(here("one"))
getwd()
#> [1] "<snip, snip>/here_here/one"
here("one", "two", "awesome.txt")
```

```r
library(here)
#> here() starts at <snip, snip>/here_here
system("tree")
#> .
#>  └── one
#>      └── two
#>          └── awesome.txt

here("one", "two", "awesome.txt")
#> [1] "<snip, snip>/here_here/one/two/awesome.txt"
cat(readLines(here("one", "two", "awesome.txt")))
#> OMG this is so awesome!

setwd(here("one"))
getwd()
#> [1] "<snip, snip>/here_here/one"
here("one", "two", "awesome.txt")
#> [1] "<snip, snip>/here_here/one/two/awesome.txt"
cat(readLines(here("one", "two", "awesome.txt")))
#> OMG this is so awesome!
```

```
ggsave(here("figs", "built-barchart.png"))
```

Works on my machine, works on yours!

Works even if working directory is in a sub-folder

Works for RStudio projects, Git repos, R packages, …

Works with knitr / rmarkdown

The here package is designed to work **inside a project**, where that could mean:

- RStudio Project
- Git repo
- R package
- Folder with a file named `.here`

`here()` does not create directories; that's your job.

Practice calling `here()` in a project to get a feel for it.

```
library(usethis)
use_course(“rstats-wtf/wtf-fix-paths”)
```

Or break here?

Deep
Thoughts

# Names matter

machine readable
human readable
sort nicely

myabstract.docx
Joe’s Filenames Use Spaces and Punctuation.xlsx
figure 1.png
homework1.R
JW7d^(2sl@deletethisandyourcareerisoverWx2*.txt

2018-01_bryan-abstract-rstudio-conf.docx
joes-filenames-are-getting-better.xlsx
fig01_scatterplot-talk-length-vs-interest.png
bryan_hw01.R
1986-01-28_raw-data-from-challenger-o-rings.txt

"machine readable"

regular expression and globbing friendly

- avoid spaces, punctuation, accented characters, case sensitivity

easy to compute on

- deliberate use of delimiters

"human readable"

name contains info on content
name anticipates context
concept of a slug from user-friendly URLs

1986-01-28_raw-data-from-challenger-o-rings.txt

"sort nicely"

put something numeric in there
left pad with zeros for constant width, nice sorting
use the ISO 8601 standard for dates
order = chronological or ... consider common sense

```
> ft <- tibble(files = dir_ls(glob = "*.R"))
> ft
# A tibble: 6 x 1
  files
  <fs::path>
1 00_filesystem-practice_comfy.R
2 00_filesystem-practice_jenny.R
3 00_filesystem-practice_spartan.R
4 01_explore-libraries_comfy.R
5 01_explore-libraries_jenny.R
6 01_explore-libraries_spartan.R
```

👍 file names

```
> ft <- tibble(files = dir_ls(glob = "*.R"))
> ft
# A tibble: 6 x 1
  files
  <fs::path>
1 00_filesystem-practice_comfy.R
2 00_filesystem-practice_jenny.R
3 00_filesystem-practice_spartan.R
4 01_explore-libraries_comfy.R
5 01_explore-libraries_jenny.R
6 01_explore-libraries_spartan.R
```

Anyone can guess at file's purpose

```
> ft %>%
+   filter(str_detect(files, "explore"))
# A tibble: 3 x 1
  files
  <fs::path>
1 01_explore-libraries_comfy.R
2 01_explore-libraries_jenny.R
3 01_explore-libraries_spartan.R
```

Easy to filter in R (or the shell or whatever)

```
> ft %>%
+   mutate(files = path_ext_remove(files)) %>%
+   separate(files, into = c("i", "topic", "flavor"), sep = "_")
# A tibble: 6 x 3
  i     topic                flavor
* <chr> <chr>                <chr>
1 00    filesystem-practice  comfy
2 00    filesystem-practice  jenny
3 00    filesystem-practice  spartan
4 01    explore-libraries    comfy
5 01    explore-libraries    jenny
6 01    explore-libraries    spartan
```

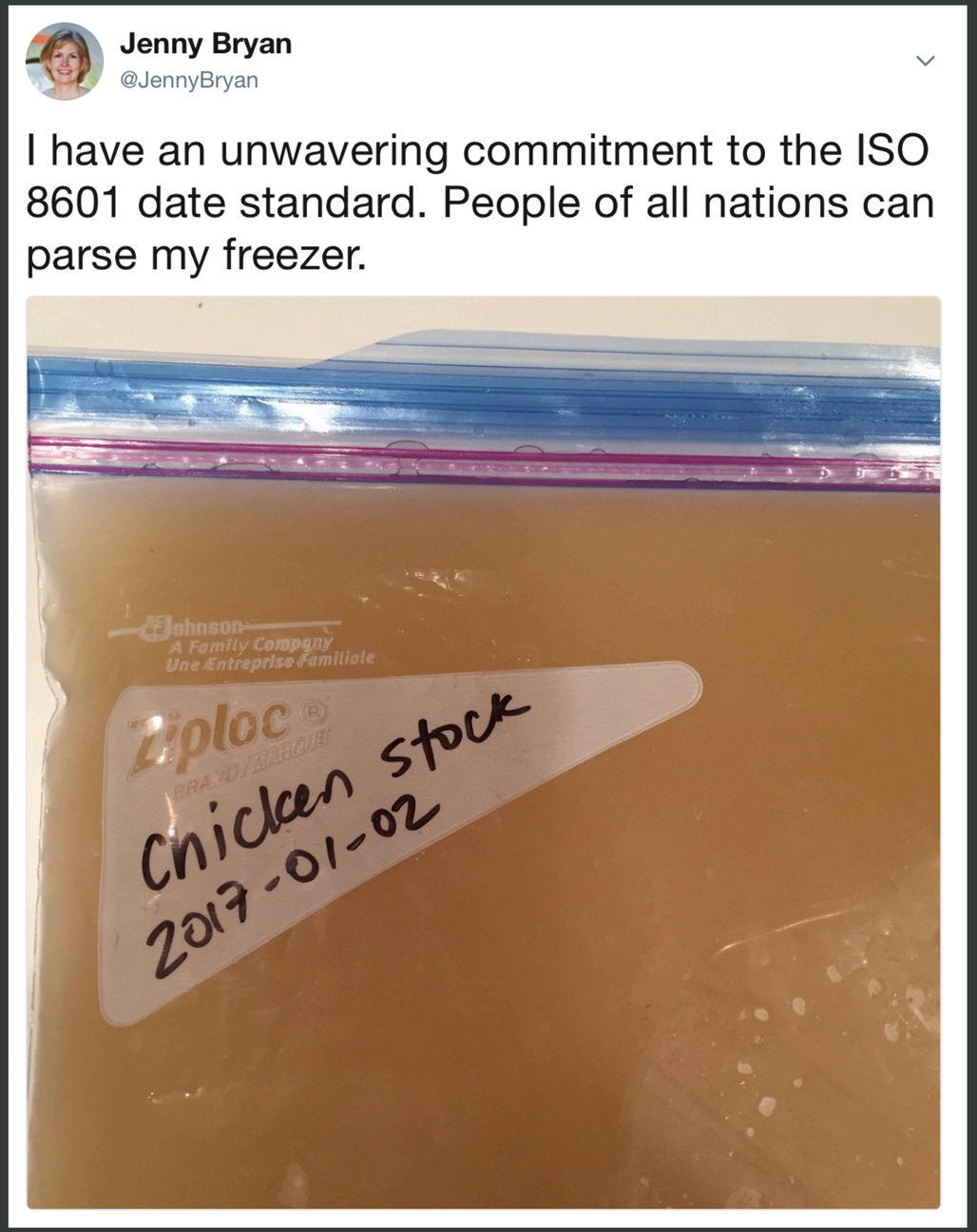
Intentional use of delimiters = meta-data easy to recover

"_" delimits fields

"-"delimits words so my eyes don’t bleed

```
> dirs <- dir_ls(path_home("Desktop"), type = "directory")
> (dt <- tibble(dirs = path_file(dirs)))
# A tibble: 2 x 1
  dirs
  <fs::path>
1 day1_s1_explore-libraries
2 day1_s2_copy-files
```

Sorts in the same order as you experience in real life




# YYYY-MM-DD

# ISO 8601

# Names matter

machine readable
human readable
sort nicely

# Names matter

easy to implement NOW

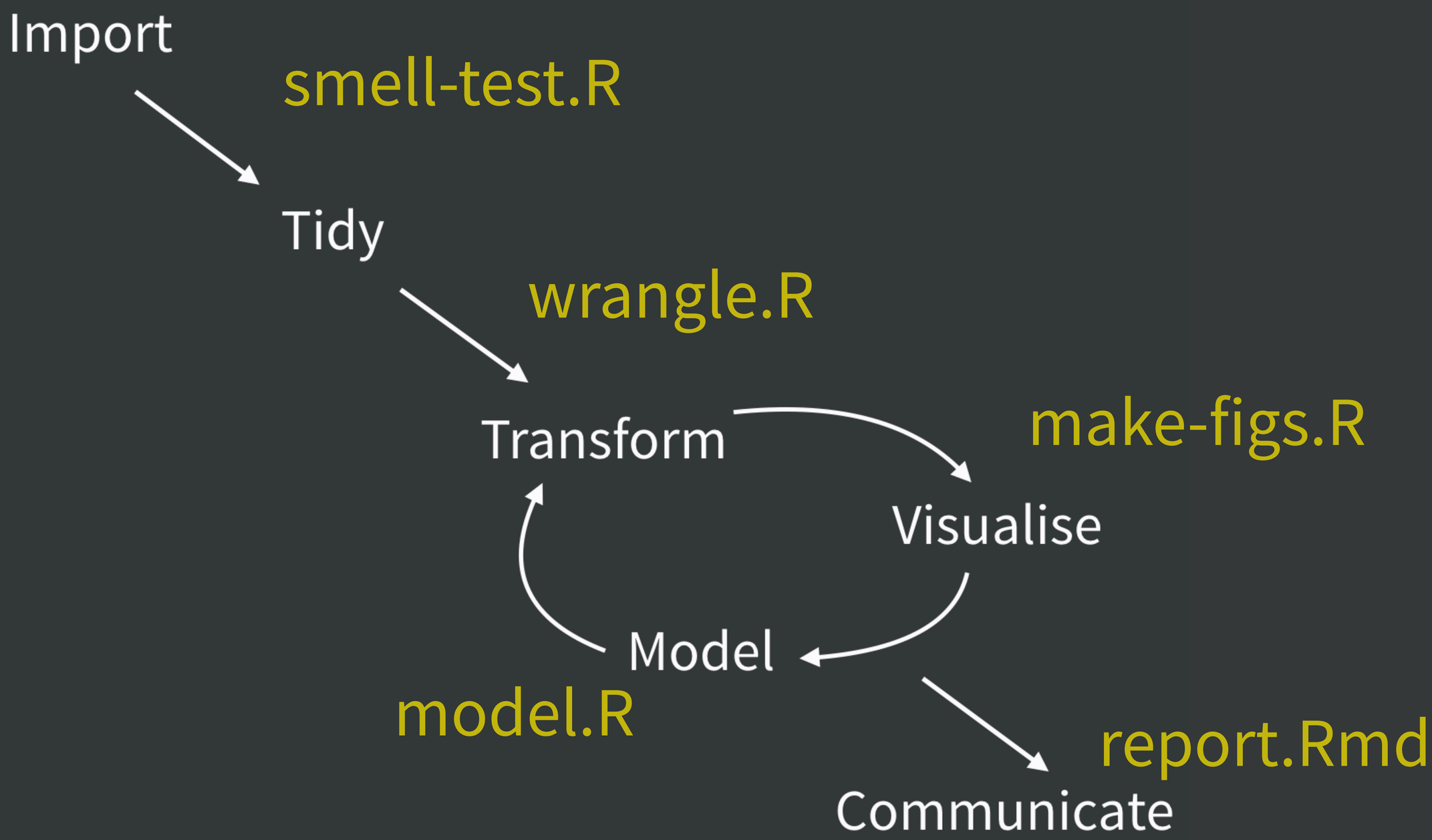
payoffs accumulate as your skills evolve and projects get more complex

Deep
Thoughts

# beware of monoliths

# break logic & output into pieces

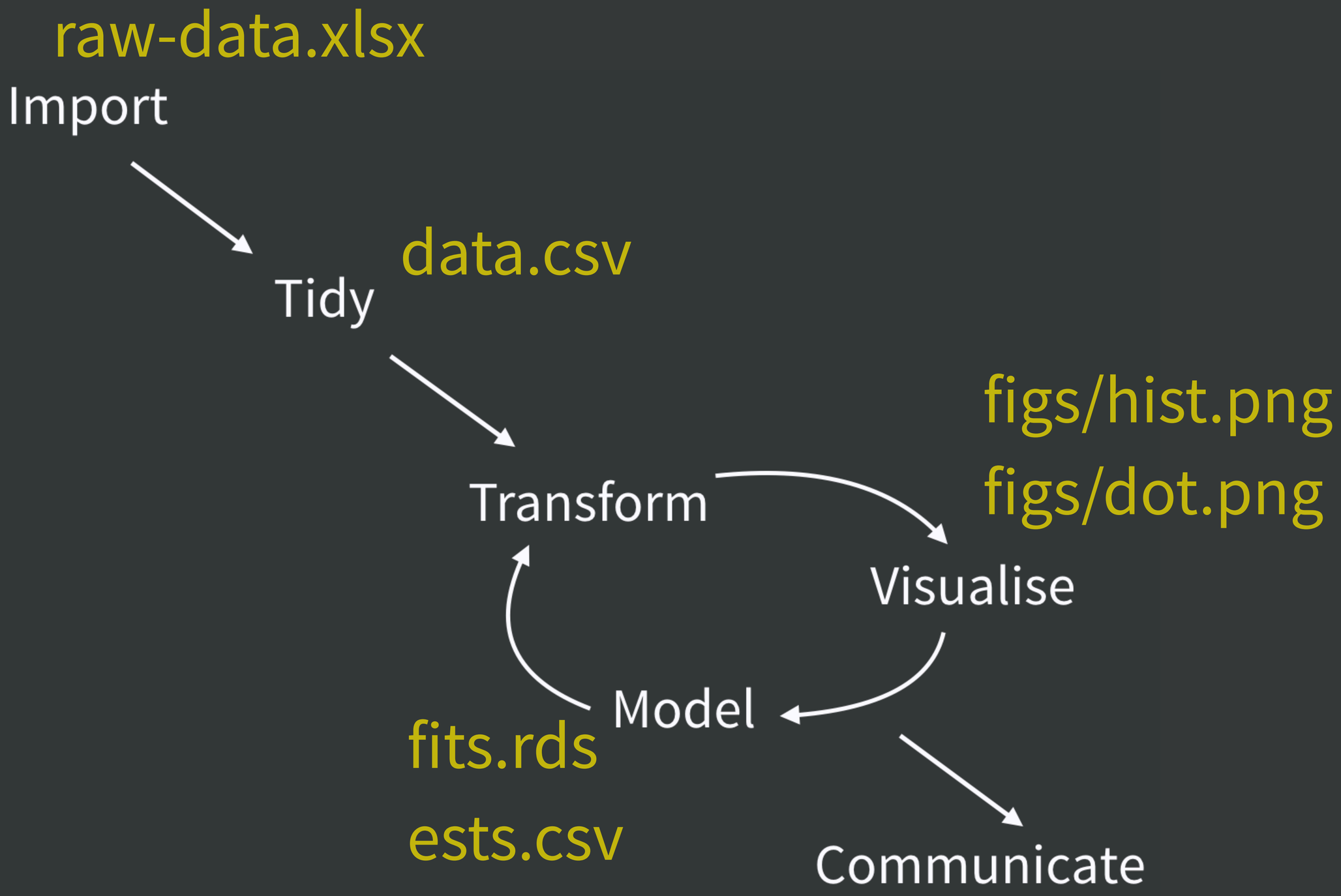
smell-test.R
wrangle.R
model.R >>> everything.R
make-figs.R
report.Rmd


Import
smell-test.R
Tidy
wrangle.R
Transform
make-figs.R
Visualise
Model
model.R
report.Rmd
Communicate

raw-data.xlsx
data.csv
fits.rds
ests.csv

>>>

.Rdata


raw-data.xlsx
Import
Tidy
data.csv
Transform
figs/hist.png
figs/dot.png
Visualise
Model
fits.rds
ests.csv
Communicate

| Input | Code | Output |
|---|---|---|
| raw data | `smell-test.R` | wisdom |
| raw data | `wrangle.R` | `data.csv` |
| `data.csv` | `model.R` | `fits.rds`<br>`ests.csv` |
| `data.csv`<br>`fits.rds`<br>`ests.csv` | `make-figs.R` | `figs/*` |
| `figs/*`<br>`ests.csv` | `report.Rmd` | `report.html`<br>`report.docx`<br>`report.pdf` |

a humane API
for your analysis

```
library(usethis)
use_course("rstd.io/wtf-packages-report")
```

- you know the drill
- download to same location as previous
- should open as RStudio project
- if not, you can make it an RStudio project

# Project initiation strategies, the local case

New folder + make it an RStudio Project

- `usethis::create_project("~/i_am_new")`
- RStudio > New Project... > New Directory > New Project

Make existing folder into an RStudio Project

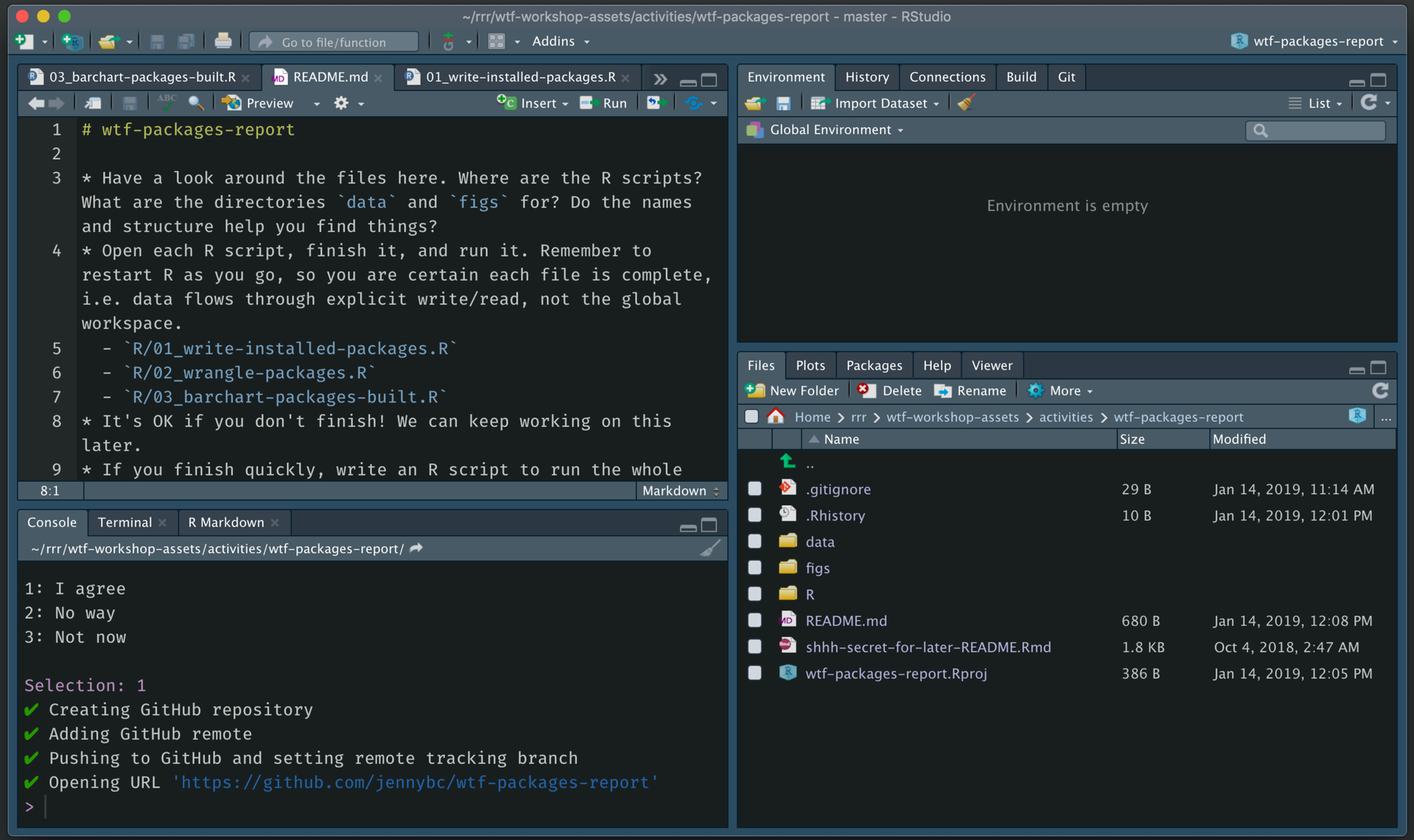
- `usethis::create_project("~/i_exist")`
- RStudio > New Project... > Existing Directory

You should now be in RStudio,
in the new RStudio Project named
wtf-packages-report.

How to launch an RStudio Project?

- double-click on .Rproj file
- use *File* > *Open Project* and friends
- use Project drop down in upper right corner
- Alfred trick 😉

# We are here!


~/rrr/wtf-workshop-assets/activities/wtf-packages-report - master - RStudio
Go to file/function
Addins
wtf-packages-report
03_barchart-packages-built.R
README.md
01_write-installed-packages.R
Preview
Insert
Run
1 # wtf-packages-report
2
3 * Have a look around the files here. Where are the R scripts? What are the directories `data` and `figs` for? Do the names and structure help you find things?
4 * Open each R script, finish it, and run it. Remember to restart R as you go, so you are certain each file is complete, i.e. data flows through explicit write/read, not the global workspace.
5 - `R/01_write-installed-packages.R`
6 - `R/02_wrangle-packages.R`
7 - `R/03_barchart-packages-built.R`
8 * It's OK if you don't finish! We can keep working on this later.
9 * If you finish quickly, write an R script to run the whole
8:1
Markdown
Console
Terminal
R Markdown
~/rrr/wtf-workshop-assets/activities/wtf-packages-report/
1: I agree
2: No way
3: Not now
Selection: 1
✔ Creating GitHub repository
✔ Adding GitHub remote
✔ Pushing to GitHub and setting remote tracking branch
✔ Opening URL 'https://github.com/jennybc/wtf-packages-report'
>
Environment
History
Connections
Build
Git
Import Dataset
List
Global Environment
Environment is empty
Files
Plots
Packages
Help
Viewer
New Folder
Delete
Rename
More
Home > rrr > wtf-workshop-assets > activities > wtf-packages-report
Name
Size
Modified
..
.gitignore 29 B Jan 14, 2019, 11:14 AM
.Rhistory 10 B Jan 14, 2019, 12:01 PM
data
figs
R
README.md 680 B Jan 14, 2019, 12:08 PM
shhh-secret-for-later-README.Rmd 1.8 KB Oct 4, 2018, 2:47 AM
wtf-packages-report.Rproj 386 B Jan 14, 2019, 12:05 PM

work on challenge
README.md has instructions