

Dr. Steffi LaZerte

Analysis and Data Tools for Science



BRANDON
UNIVERSITY

Last Night, Testing Saved my Life

Experiences of a biologist



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My Goals

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How I hope you'll feel about testing



[Birdstrips on Instagram](#)

Different Kinds of Testing

@steffilazerte

(According to Steffi)

Due Diligence (Data-testing)

- Double checking output as part of an analysis
- Sometimes interactive only
- Sometimes Rmd Report for posterity (and reproducibility)

Different Kinds of Testing

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Due Diligence (Data-testing)

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Automated Package Tests

- Rigorous, repeated, and automatic tests of package functionality
- Often local **and** remote (i.e. CRAN, Travis Ci, AppVeyor, [R-hub](#))

For this talk, **Testing = Automated Package Tests**

Why I Started Testing

@steffilazerte

Post-Doc on RFID project

- Summarize RFID data
 - Movement between feeders
 - Time spent at a feeder
 - etc.
- Started with small scripts
- Created my first package ([feedr!](#))



Jacob Bailey

Why I Started Testing

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- Summarize RFID data
 - Movement between feeders
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 - etc.
- Started with small scripts
- Created my first package ([feedr!](#))

But!

- My colleagues trusted me too much
- Package was getting big and worrisome
 - Mistakes
 - Breaking old code as adding new code



Jacob Bailey

How I Started Testing

@steffilazerte

- Hadley's "R packages" book chapter on Testing*
- Used [testthat](#) package
- Series of test files (e.g., `test_utils.R`) in `tests/testthat` folder

*Now [2nd edition by Hadley Wickham and Jennifer Bryan](#)

How I Started Testing

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```
test_that("check_normals() takes 'YYYY-YYYY'", {  
  expect_silent(check_normals("1981-2010"))  
  expect_error(check_normals("1981 2010"), "text string in the format")  
  expect_error(check_normals("1981/2010"), "text string in the format")  
  expect_error(check_normals(1981), "text string in the format")  
})
```



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```

- Automatically run by processes that build the package
 - R CMD CHECK, CRAN, [R-hub](#)
 - Travis CI, AppVeyor



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Why I Keep Testing

@steffilazerte

meritget



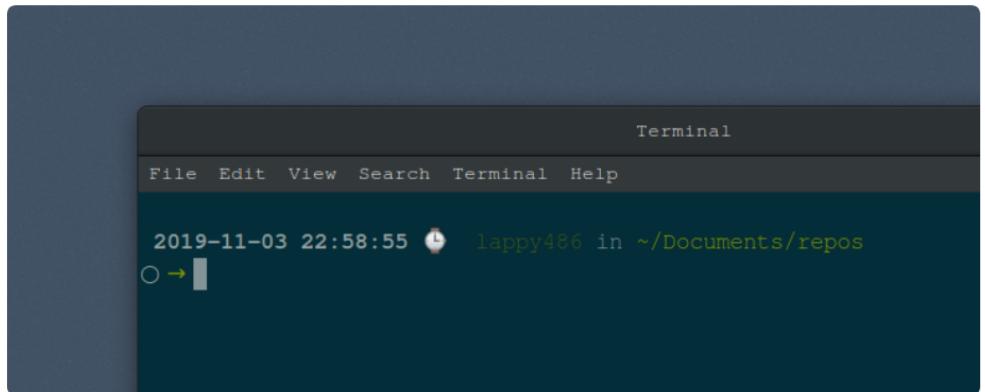
Cap'n Blackheart Bette

@cantabile



Okay, @er13_r @_lacion_ @steffilazerte @csferrie @cgranade @crazy4pi314 @rensa_co I'm gearing up for the metascience conf this week and I can't stop thinking about meritget.

Pimping my terminal is one of my meritgets. Would *love* to know yours! [jenrichmond.github.io/AMOSworkshop/...](https://jenrichmond.github.io/AMOSworkshop/)



4 6:01 AM - Nov 3, 2019



See Cap'n Blackheart Bette's other Tweets



Why I Keep Testing

@steffilazerte

meritget

A reward you get that has no value beyond the fact that it's a reward!



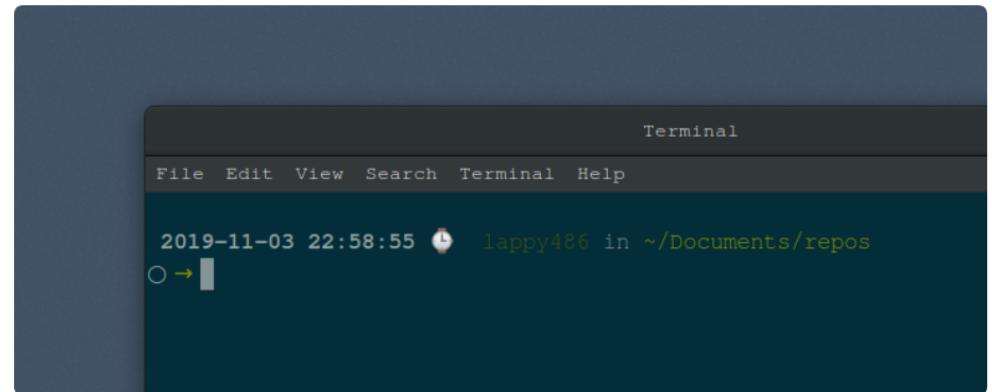
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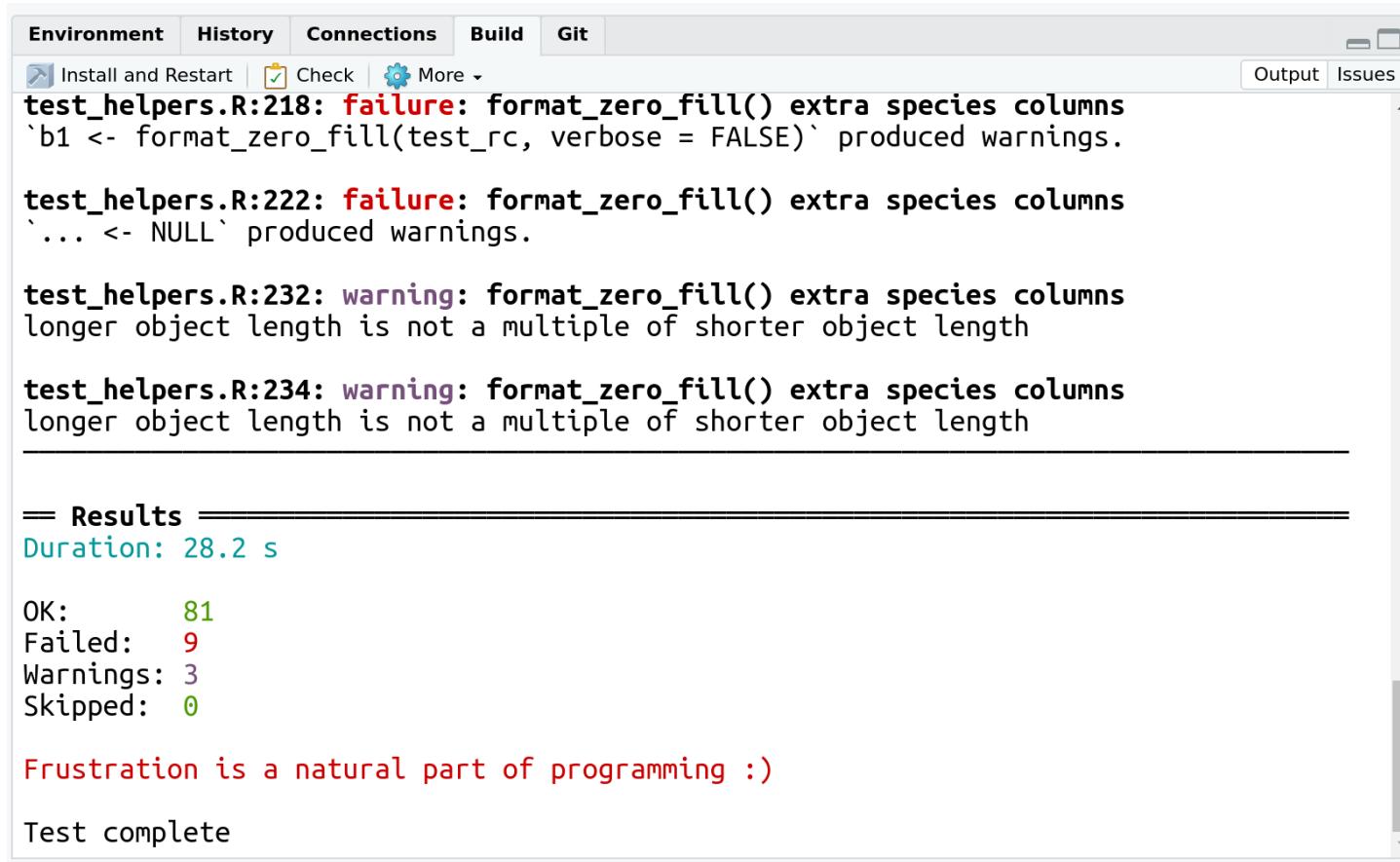
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Why I Keep Testing

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meritget



The screenshot shows a software interface with a menu bar at the top. The menu items are Environment, History, Connections, Build, Git, Install and Restart, Check, More, Output, and Issues. Below the menu, there is a scrollable text area displaying R test results.

```
Environment History Connections Build Git
Install and Restart Check More
Output Issues

test_helpers.R:218: failure: format_zero_fill() extra species columns
`b1 <- format_zero_fill(test_rc, verbose = FALSE)` produced warnings.

test_helpers.R:222: failure: format_zero_fill() extra species columns
`... <- NULL` produced warnings.

test_helpers.R:232: warning: format_zero_fill() extra species columns
longer object length is not a multiple of shorter object length

test_helpers.R:234: warning: format_zero_fill() extra species columns
longer object length is not a multiple of shorter object length
```

== Results ==

Duration: 28.2 s

OK: 81
Failed: 9
Warnings: 3
Skipped: 0

Frustration is a natural part of programming :)

Test complete

Why I Keep Testing

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meritget

```
Environment History Connections Build Git
Install and Restart Check More ▾
==> devtools:::test()

Loading naturecounts
Testing naturecounts
✓ | OK F W S | Context
✓ | 15 | APIs [6.1 s]
✓ | 104 | Checks [2.9 s]
✓ | 113 | SQLite Databases [15.0 s]
✓ | 24 | Download counts [5.0 s]
✓ | 52 | Download data [151.0 s]
✓ | 95 | Helper/Formating functions [26.2 s]
✓ | 36 | Metadata [12.9 s]
✓ | 28 | test_requests [1.6 s]
✓ | 120 | Code searches [6.9 s]
✓ | 14 | Server Calls [0.9 s]
✓ | 20 | Utility functions

== Results ==
Duration: 228.7 s

OK:      621
Failed:   0
Warnings: 0
Skipped:  0
```

Why I Keep Testing

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meritget

```
Environment History Connections Build Git
Install and Restart Check More ▾
==> devtools:::test()

Loading naturecounts
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== Results ==
Duration: 228.7 s

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```

Sometimes it tells me I'm a
Coding Rockstar!

Why I Keep Testing

@steffilazerte

meritget

30 lines (27 sloc) | 597 Bytes

```
1 # nocov start
2 praise <- function() {
3   x <- c(
4     "You rock!",
5     "You are a coding rockstar!",
6     "Keep up the good work.",
7     ":)",
8     "Woot!",
9     "Way to go!",
10    "Nice code.",
11    praise::praise("Your tests are ${adjective}!"),
12    praise::praise("${EXCLAMATION} - ${adjective} code.")
13  )
14
15  sample(x, 1)
16 }
```

<https://github.com/r-lib/testthat/blob/master/R/praise.R>

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<https://github.com/r-lib/testthat/blob/master/R/praise.R>

Why I Keep Testing

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"Testing your code can be painful and tedious, but it greatly increases the quality of your code"

testthat README on GitHub

Too many times I thought:

I don't need to test that, it couldn't have broken anything!

Why I Keep Testing

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"Testing your code can be painful and tedious, but it greatly increases the quality of your code"

testthat README on GitHub

Too many times I thought:

I don't need to test that, it couldn't have broken anything!

and was so very very wrong!

Why I Keep Testing

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Problem solving

- Took over development of a package
 - No tests to start, but really helpful to add tests as I made changes
- Bug fixing
 - Writing tests to check that bug fixes worked

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Organization

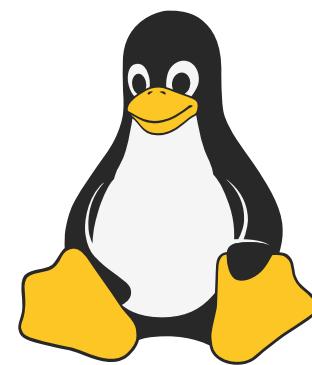
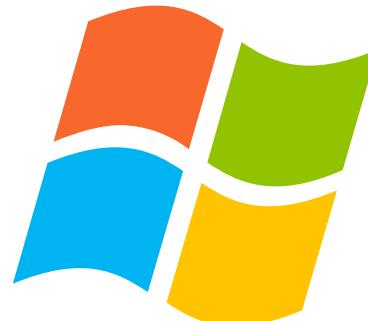
- I use testthat tests even for long-running local tests that don't run remotely
 - Keeps me organized
- Test systematically for weird/unexpected input
 - Make sure messages/warnings/errors show up where they should

Why I Keep Testing

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Remote Testing

- Testing packages on other operating systems
 - Travis Ci, AppVeyor, [R-hub](#)



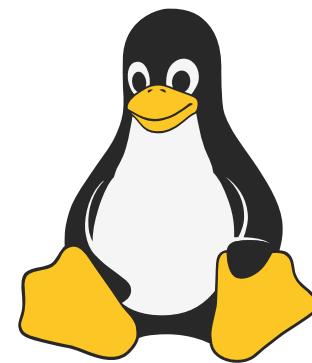
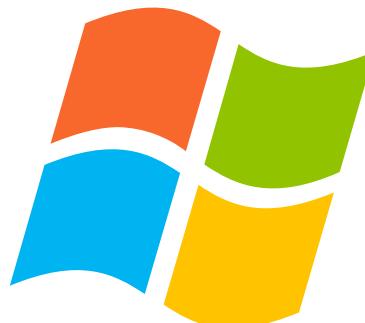
Why I Keep Testing

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Remote Testing

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Windows I'm looking at
YOU!

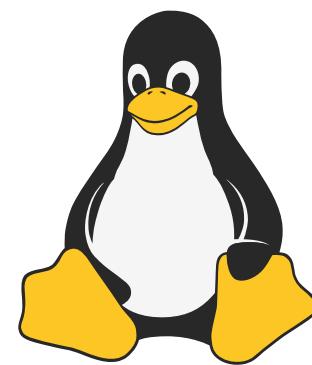
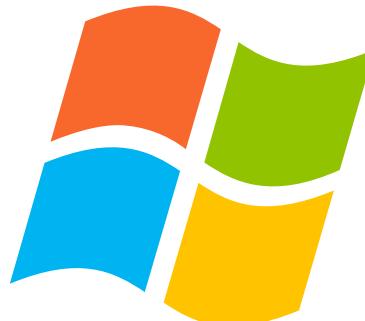


Why I Keep Testing

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Remote Testing

- Testing packages on other operating systems
 - Travis Ci, AppVeyor, [R-hub](#)
- Using CRON scheduling on Travis Ci to check on and catch changing data sources
 - e.g., run tests every couple of weeks for [weathercan](#)



Problems with Testing

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Testing tests??!?!?

- Trouble shooting tests can take time
- Sometimes need to create special (small) datasets for testing (speed up testing)
- Sometimes complex operations take time to figure out how to test



[Birdstrips on Instagram](#)

Problems with Testing

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Where it's hard to use it

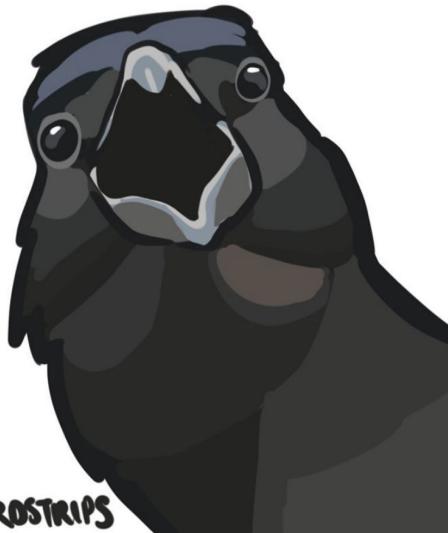
- Difficult with shiny apps
 - But see: [shinytest](#), [RSelenium](#)
- Difficult where credentials are needed
 - There are ways of adding credentials to online test suites
 - Create sample accounts with open credentials
 - Test secured credentials locally



Final Tips

@steffilazerte

- Time consuming, but worth it!
- Start slowly
- Use a coverage metric (e.g., codecov.io)
- Also test for wonky input
- Number test files so they run in order
 - e.g., `test_01_base.R`, `test_02_main.R`
- Checkout the resources in this Community Call



Final Tips

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Thank you!

Presentation Available: <https://steffilazerte.github.io/Presentations/>

Slides created with the R package [xaringan](#), using [remark.js](#), [knitr](#), and [R Markdown](#)

[Birdstrips on Instagram](#)

Compiled on 2019-12-04
BIRDSTRIPS

