How to be a successful computational scientist.

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Best Practice #1: never show them your data.

No one can disagree with your results if you don't give them access to your data.

Be sure not to back up your data, as this makes it difficult to claim that you've lost it.

Only keep the intermediate stages of your data around. That way you have plausible deniability: "Oh, that's not the final data set. We fixed that inconsistency."

When people leave the lab, urge them to take their data with them. Then lose their e-mail addresses.

Best Practice #2: do not, under any circumstances, communicate clearly.

Do not document your code or data. If you must, use a language other than English. This minimizes the chance of someone discovering a flaw in your logic.

Make sure that no one author is responsible for the entire contents of a paper. This will make it impossible for people to ask detailed questions of the authors.

Keep as much information as possible in an opaque format like Word or Numbers, that cannot be searched or opened by everyone.

Never write details in e-mails. Assume that someone will obtain all your e-mail someday.

Best Practice #3: never release your code.

Even if your logic is sound, your code may not be. This way, no one will ever find out.

Use multiple programming languages, even (or especially) if you don't know them well. The only people who know more than one programming language don't know enough biology to argue with your results.

If no one has your source code, no one can use it to do their own science and scoop you.

Best Practice #4: judge computational science by results, not quality.

As long as you're producing good results, who cares if they're right?

Best Practices #1, #2, and #3 ensure that no one will ever be able to tell if your results are correct.

...but seriously...

- It's hard to do good computational science.

  (I hope I've conveyed that)

- But it can be a lot of fun.

- It's just another way to do science, after all.

- Just think about what could go wrong and plan accordingly!

The Trouble with Replication

- Most research is never replicated exactly, but rather reproduced (qual/quant similar results on different data). That's OK.
- However, on occasions when people have tried, most research (estimates range to over 88%) *cannot* be replicated. That's not OK.

- Consider: that last statement is about *cancer research*…

- **You cannot build on a shaky foundation.**

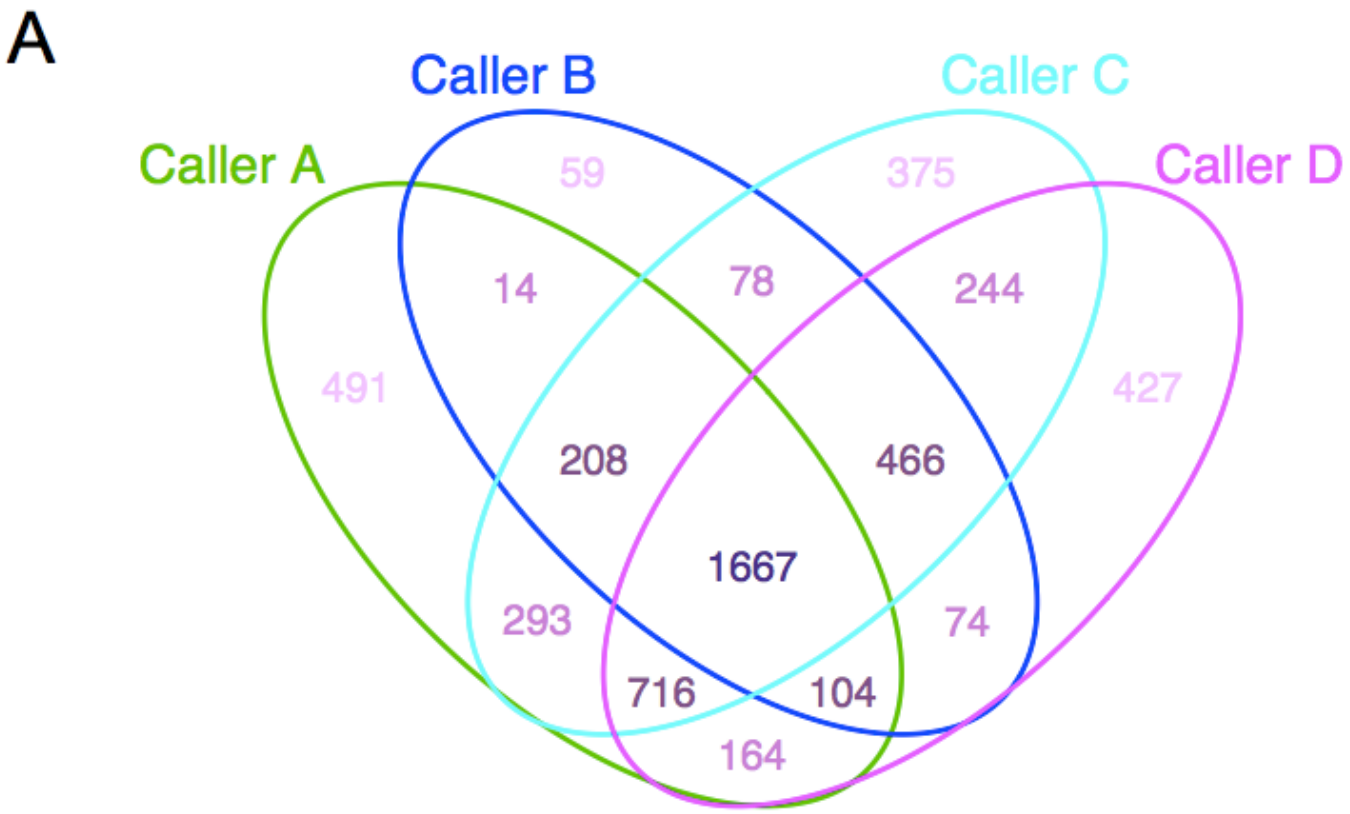
Towards responsible conduct of computational research: some proposed principles

1. Computation is part & parcel of the research.

2. All inputs to the computational process need to be recorded & relayed as part of publication, incl data (in as raw a state as possible) and analysis parameters.

3. The goal is to allow replication by reviewers and readers.

It's easy to be nihilistic about computing "correctness"



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…but just because it's not entirely *right* doesn't mean it's not useful.

- Document what you did computationally.
- Make sure that your data and analysis support your actual conclusions.
- Run it by some computational colleagues before submitting.
- …and most people will miss this stuff anyway.

What next?

In person training:

- Data Carpentry
- Software Carpentry

Continued learning:

- Find an online community! Twitter, BioStars, SeqAnswers…

Grad School/Jobs:

- Lots of opportunities here!

Terminate your instances!!

(Last but not least)