7 Habits of Highly Effective Researchers

Ryan Elliott

ryell24@uw.edu

University of Washington

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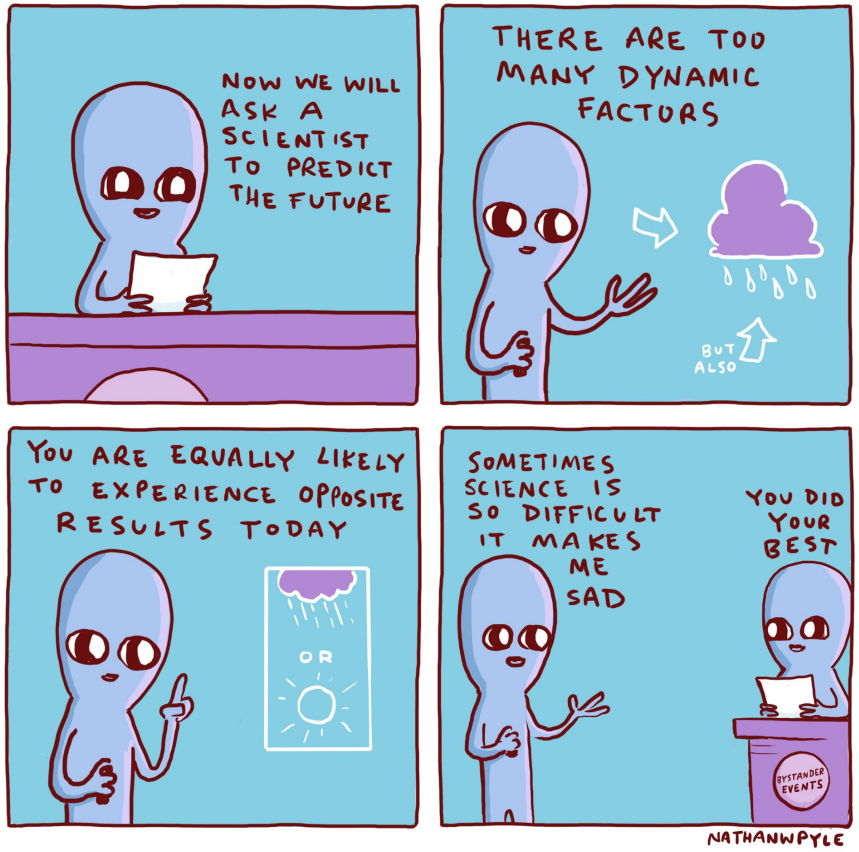
Overview

- This presentation is merely a collection of thoughts about doing engineering research, so please don't take it as gospel.
- Feel free to pick and choose the things you find worthwhile.



1. Learning the trade

- It's not possible to build something beautiful without first knowing how to build something sturdy.
- Becoming a crafts(wo)man is an essential first step in making any meaningful research contribution in engineering.
- Taking classes and reading papers in your application domain, or slightly outside, is an essential first step.
- Getting your hands dirty with real projects accelerates this process, *if* you bring your shovel!

2. Sharpening your tools

- "A craftsman is only as good as his tools."
- The corollary is that powerful tools are only powerful if you know how to use them!
- Critical tools: LaTeX, git, cloud backup (e.g., dropbox or github), a text editor of your choice.
- Using version control will improve the reproducibility of your results and make your work easier to manage.

3. Reviewing academic papers

- Reviewing academic papers allows you to peer "through the looking glass" and see what being on the other side of the process is like.
- The golden rule applies to reviewing papers: Do unto others as you would have them do unto you.
- Do your best to ignore who wrote the paper. Treat every submitter the same, irrespective of their publication history.
- If you truly feel a paper should be rejected, recommending "revise and resubmit" doesn't do anyone any favors.

4. Getting to the revision stage

- Academic papers should be written in such a way that anyone with the requisite mathematical background could follow the key ideas.
- Don't try to do too much. Papers that try to do 6 things at once usually end up doing none of them well.
- It is *essential* to be aware of and cite important related work, and not doing so can be disqualifying.
- "Tell me a story." A good paper has a through line. Kirschen's formula: Why? How? What? So what?

5. Responding to reviewers

- Responding to reviewers is like waiting tables when your customers don't like what you brought them.
- The customer is *always* right, and it's your job to do whatever is necessary to satisfy them.
- Even when they're not right, bend over backward to make them feel like they are.
- Respond to *every* action item, no matter how small, with a proportionate addition or modification.

5. Responding to reviewers: What *not* to do

- The following is a modified example inspired by past experience.
- Reviewer note:

  My main quip is with the formulation itself, and hence, my suggestion to revise and resubmit. It is unclear how the proposed framework compares with one where all constraints can be solved together. Without such a comparison, the mechanism appears rather ad hoc.

- My boneheaded response:

  We know of no master formulation that preserves the key features of the one proposed in the paper. We feel that a benchmark comparison with a semi-related problem would run the risk of being misleading; however, we do recognize the development of an equivalent master problem as a interesting avenue for future research.

5. Responding to reviewers

- The reviewer's *main feedback* was that they didn't have confidence in the proposed method.
- It's as if they said, "This chicken doesn't look fully cooked to me, I don't trust the preparation method."
- And I basically told them, "Too bad, we don't want to make it any other way."
- This is totally wrong and almost got our paper rejected. Take it back to the kitchen and redo it the right way!

6. Learning from failure

- Failure is not the opposite of success; it's part of it.
- If you're doing your job correctly, you will frequently encounter adversity and occasionally fail.
- "Pain is knowledge, rushing in to fill a gap." -*Jerry Seinfeld*.
- An important key to being a successful researcher is not allowing yourself to stay stuck. Pedal harder!

7. Taking care of yourself

- Doing engineering research, especially a PhD, is *hard*.
- For many people, this is part of the appeal of pursuing a PhD in the first place, seeing it as a kind of mental Mount Everest.
- A good advisor is like a sherpa, guiding you up the mountain. They'll do everything they can to keep you safe, but the rest is up to you.
- Try to take it one day at a time, and focus on what you can do that day to bring you closer to your goal.

7. Taking care of yourself

- Doing a PhD can push you into a dark place. Feeling anxious or depressed isn't a sign of weakness.
- As Daniel said last year, "You are not your dissertation."
- Do the little things like drinking enough water and going to bed early. Find a physical outlet like running, swimming, or biking.
- Stay connected with the outside world. Friends and family can help remind you that you have intrinsic value.
- If you need help, please tell someone. Nothing is more important than your well-being.
- You can access the UW mental health resources here:
  - UW Mental Health Resources [link]
  - Crisis Clinic [link] (24/7 at 866-427-4747)

Summary

1. Learn the trade
2. Sharpen your tools
3. Review academic papers
4. Get to the revision stage
5. Respond to the reviewers
6. Learn from failure
7. Take care of yourself
8. (Bonus) Perform in crunch time!