How to not dig yourself into a hole

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An ounce of strategy

Even idealists may allow themselves to indulge in some occasional strategic thinking.

For instance, when choosing thesis problem(s) to work on:

- Choose problems that are interesting not only to you but also to others.
- Be willing to adapt / compromise if you are stuck. Move the bullseye.
- It is okay to be attracted to an ambitious problem (a “holy grail”), but also keep some “holy goblets” in rotation on your queue.
- Think ahead to the conference talk you would give if your current endeavor pans out. Is there an audience for the topic, and will your result be interesting to present?
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Include career development in your strategy

Decide whether you are set on academia or would also be interested in Industry. Learn about various jobs available in academia and the levels of competition. Is geography important to you? Is settling down important?

Academia:

- TT at a Research University (not a direct option but a possible longterm goal)
- Postdoc
- TT at a liberal arts college
- Comprehensive University
- instructor at a research university
- visiting professor at a university

Think ahead:

- Decide what longterm lifestyle you want, and rank your options.
- Share this information with your advisor.
- This will inform your timeline and perhaps influence your research plans and side projects.
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S. Krantz, “A mathematician’s survival guide”

-definitely worth reading: short, engaging, and insightful.
-for a Mathematician, Krantz is refreshingly opinionated / authoritative.
-he addresses a lot of tough questions. (I agree with him on most points but not everything.)
You will need to specialize and dig deep, but don’t dig yourself into a hole!

- Talk about your work with fellow grad students.
- Present in the GSS.
- Present results at conferences.
- Look for opportunities to learn a new method that might be relevant for your problem.
- Be open about sharing partial progress (at least at conferences involving your advisor’s network), and asking experts whether their approach might be useful for you.
- Continue taking (interesting and potentially relevant) courses after passing quals, but not too many (say, one course per semester, occasionally none, and occasionally two).

(footnote) In this presentation I had suggested not being afraid to attempt problems that have been stated in published papers, while Dr. Locke suggested an opposing approach of developing one’s own problems and conjectures through a creative process. I actually think that can be an effective (and exciting) strategy, but one that deserves extra scrutiny about whether the questions will be interesting to others.
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Le $f$ and $g$ be two integrable functions on $[0, 1]$ with

$$\int_0^1 f = \int_0^1 g = 1.$$  

Show that there is some interval $I \subset [0, 1]$ such that

$$\int_I f = \int_I g = \frac{1}{2}.$$  

The obvious approach (of continuously moving the endpoints) does not work (unless $f$ is further assumed strictly positive).

The problem requires an indirect approach, for instance using a topological argument based on the winding number principle.

The moral: branch out a bit, for instance, if you are going to study, say, integral equations in your thesis, you might want to branch out beyond measure theory and functional analysis and learn some topology (maybe degree theory and fixed point theory). (This doesn’t mean learn a random combination of a bunch of areas–look for one or two sensible topics that hold promise as secret weapons on your thesis topic.)
some uplifting words about procrastination from an essay by Paul Graham:

“A lot of the pain of being a [grad student] is being aware of one’s own procrastination. But this is actually a good thing. You’re at least close enough to work that the smell of it makes you hungry.”

He contrasts this with the experience of having an established career (post grad school):

“...the danger of responsibilities is not just that they can consume a whole day, but that they can do it without setting off the kind of alarms you’d set off if you spent a whole day sitting on a park bench.”

...in other words, it is fine if it takes you an entire day to get the activation energy required to dive into an intense project.

It is a long-distance race.
Not all heroes are good role models (but some are)

Read Terence Tao’s blog!

https://terrytao.wordpress.com/career-advice

(something you can do while you’re procrastinating)
I’m an Analyst (versus Algebraist). How do you eat your corn?

I’m a Physicist (versus a Logician). I often think in pictures (worrying about formalizing a proof later).

I’m a frog (versus a bird). I’m drawn to enticing problems rather than developing / unifying theories. I look for interesting problems where I might be able to offer a new angle.

I’m attracted to research areas with opportunities to apply methods from one school to problems from another. For instance:

- Random algebraic geometry
- Conformal mapping techniques in free boundary problems
- Analytic Combinatorics
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