Some Tips for Succeeding (Surviving) a Graduate Program and Beyond

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Some tips for surviving a graduate program

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What is the research?

- A graduate program is a training to be a researcher
- Research is a systematic and organized process of investigation aimed at discovering, interpreting, and revising knowledge. It involves gathering, analyzing, and interpreting data to answer questions, solve problems, or develop new understanding in various fields
- Study and research are *different:* the study knows the answer, but research does not know the answer yet
- Even a supervisor *does not know* the answer to your research
- A supervisor may *misunderstand* the results of your research

What is the research?

- Standing on the shoulders of giants: To build on the achievements of our predecessors (i.e., previous research) to understand things from a higher perspective or to make new discoveries.
- You need to learn a lot to reach the frontier of research
- Why are the supervisors better than you?
- Because supervisors know many research basics (previous research) and have experience, i.e., have learned a lot.

How to choose research problems?

- It is better based on your interests; without motivation, you can not proceed with it
- In most cases, the supervisor will give a research problem.
- My group case:
  - I present around 3 different research problems. Then the student chooses one
  - After this research project is finished, students can do any research by themselves.
  - Some student continues the extension of a current research project, some student starts a different one
- Other group case:
  - For around half a year, students read supervisor-suggested review papers to understand the current unsolved problem.
  - Students choose what research problem to do by themselves.

How to choose research topics?

- Fundamental problems: they are an interesting research topic, but it would be difficult to get results within a PhD period unless you are very smart
- Hot research topics: they make a high citation count in a short period. But it is also competitive (the same research topic will be done by other groups)
- Low-hanging fruit research: it is relatively easy to do within a short period. Good for the first research of a graduate student.

- Usually, we do not know how difficult this research problem is (but we may expect from previous experiences)

How to approach research?

- Starting research first, then gaining basic knowledge vs learn basic knowledge first, then starting research
- Depends on personal research style
- Pay attention to the application deadline of scholarships, student grants, etc.
  - NSFC pilot program of the Research Fund for Excellent International PhD Students (RFEIPS) accepts the same project as a PhD thesis project
  - NSFC PhD student grant requests a side-project from the PhD thesis project
- Understand the requirement to get a PhD (number of papers, first/corresponding authors, journal rank, etc)
- You need to make a rough time scale for writing a paper

How to write a paper?

- When you get results, you need to think whether it is reasonable (expected) or not.
- If it is a correct and new finding, you start to think about how to write a paper (discuss with supervisors)
- My paper writing style:
  1. Make figures
  2. Think a narrative (story) of paper (purpose, research approach, results, discussions)
  3. Start writing from a research approach (methods)
  4. Useful to make a presentation
- Use AI tools functionary (grammar check, spell check)
- Decided which journal you want to submit to. If you try *Nature* or *Science* like a commercial journal, the writing style is *different* than a normal scientific journal

Learn how to deal with rejection

- After writing a paper and submitting it to the journal, the next stage is review
- The review process is the toughest time for researchers
- You may get many concerns and tough questions from reviewers
- Unfortunately, you may have a rejection of a paper
- Rejection is common (not only you). Do not think about it seriously. Just bad luck. Simply go to the next journal
- Around 80% of researchers have experience with the rejection of their papers

How to be a good researcher

- Not consisting of one research topic
- Make a broader interest (expands your interests)
- Gain a broader knowledge
    - Attend many seminars (many possibilities in online), even if it is not related to your research
    - Read many papers, check arXiv (paper archive) every day, and participate journal club
    - Discuss with many colleagues (students, postdocs, faculty in & out of your institute)
    - Understand what is the hot topic in your research field
- The most important and difficult thing is finding a good research topic (research impact, difficulty, expected time)

Collaboration

- Make a collaboration (expand your research network)
- Important to do the research together (leading project or contribution)
- Pros & cons of joining big collaboration projects (recognition of your contribution)
- Research network is very helpful to find a future position and a person who write a recommendation letter for you

Work life balance

- Nowadays, work-life balance is very important for your health (physically and mentally)
- Need to make time for families and friends
- Doing some physical exercises (sports) and taking time for non-academic interests (hobbies)
- Keep good mental health
- Concentration for work (increase efficiency, productivity), make a daily routine
- Switch your brain (go outside, go café, go library). Do not need to stay in one place
- DO NOT compare with other colleagues (research pace is different)

PART 03

After getting PhD

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After PhD

- If you are motivated, working in an active field, have good letters and a ”typical” number of publications for your level/goal, getting a postdoc position is usually not a problem
- However, getting a good position that will put you on a more direct track to a permanent position generally requires more effort
- Academia is competitive, so you need to set your goals, understand the unsaid rules of the game, challenge yourself (in a healthy way), and think ahead.
- Like any field, success comes with hard work and training, but also strategy.

Postdoc position

There are generally various categories of postdoc positions, roughly in order of competition/prestige:

- Named Fellowships (often country or EU-wide but not institute specific), typically 2-3yr
- Fixed-term (often ~5 yr) research positions, institute-specific, often seen as “junior faculty” or “junior group leader” type positions
- Named Fellowships (institute-specific), typically 3-5yr
- “Created” Fellowships (usually institute-specific, often paid from specific projects but recast), typically 3yr
- Fixed-term research positions from grant money (project-specific), typically 2-3yr
- EU Initial Training Network type positions, typically 2yr

Applying for Fellowships

- Note: To apply for fellowships, it is generally NOT expected that you have entirely new, independent ideas all on your own yet!
- Most fellowships require a host or sometimes even someone to nominate you => critical to identify that person (ideally 6+ months ahead of the deadline).
- You may or may not work closely with this person in a fellowship (proposed project), but it's important for your career development to have a local mentor/collaborator.
- Contact that person, ask if they would be interested in being your host, send some ideas, and work together with them on the goals/ideas of the proposal.
- The earlier approach is better: your ideal host may already have been approached by someone else

Permanent position

- There are multiple paths to a satisfying career in research/academia with a permanent position
- There are many options beyond the archetypal university professor: e.g., observatories, labs, "Big Data"/Data Science/Archive center, and independent research facilities.
- Note: the EU has more options than the US for permanent, non-academic jobs. In the US these tend to be '*soft money*' positions (semi-tenured).
- Many people don't like teaching, supervising students, or committee work. Faculty often come with more pressure to constantly apply for funding.
- You need to think about what aspects of the job you enjoy and aim for that type of position that fits you best

Key point

If you are aiming for a permanent/faculty position in academia:

- Always remember why science is interesting (enthusiasm)
- You need to develop both independence and the ability of self-awareness/self-criticism
- You need to figure out how to be productive (for your target level)
- Don't rule out jobs too early, based on location (such as developing countries)
- Start preparing your application way before your first deadline (as in, ideally several months early)

Strategy

- Getting a (permanent) position comes down to: ~1/3 scientific ability, ~1/3 secondary skills (communication/writing/networking), and ~1/3 some random combination of being at the right place, at the right time, and some luck
- You can optimize your chances by spreading your net widely via having many skills, working with different communities, being open-minded, and coming up with a good strategy
- That strategy has to start with good preparation and *knowing yourself*, *knowing where you want to end up*, and *knowing what it takes to get there*!

Strategy

- Committees hiring for tenure-track/tenured positions at top-tier research institutes generally want to see:
    - *great and relevant science, independent and creative thinking, initiative, demonstrated leadership, ability to get funding, international network of collaborators, teaching/mentoring abilities, and a good fit to their program.*
- Many places also consider a good fit to the institute's “culture”, which means your behavior is very important around the onsite interview.

Strategy

- Independence: The ERC Starting Grant asks for a list of publications without your PhD advisor! Try to think about it during your PhD time (beyond your supervisor). During your PD phase, make sure to work on (some) new ideas with new people.
- Leadership: Try to be PI of some proposals, for funding or observations. Or if you are part of a large collaboration, you need to "take over" a small piece of the project/analysis and be visible as such within the group. Write a review article (recognition)! Get a collaboration prize!
- Initiative: You got an independent fellowship, you started a journal club, you initiated a new project with your advisor, or new people (who write you letters saying this), you pursued a new type of experiment/observation…
- Funding: At any level, you can win smaller competitive grants like scholarships, travel funds, summer school grants, or "best paper/poster" prizes at conferences/schools

Strategy

- Usually, institutes develop a "strategic plan" in advance, laying out the areas where they will prioritize growth and hire first if money arises
- These strategic plans may not be on the web, but they are usually available; you can ask around to find out what a given institute's likely near-future hires will be
- Keep watching for the information about big grants and government strategic plans (Decadal Survey). Which areas succeed, and guess where the hires will be a year later.
- Then, develop a strategy for appealing as a potential candidate! (attend conferences, seminar tours, etc.)

General advice

- Do NOT get hung up on the idea that you can or should do only what you did for your PhD!!
- You can switch between subtopics. It's a very good opportunity to widen your scope, learn something new, move to a different subfield, etc.
- The risk of staying in the exact same area is becoming "locked in" or "too narrow"… you will qualify for more positions if you have multiple areas of expertise
- It is very important to demonstrate independence from your advisor, so whatever you do, make sure to lead a project at least slightly different than what your PhD advisor does, somewhere during your Postdoc years!

Thanks for your attention