

Elements of a successful graduate career

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References

- **Skill development in graduate education.** Roy Parker, 2012, Molecular cell.
- **How to choose a good scientific problem.** Uri Alon, 2009, Molecular cell.
- **For prospective graduate students.** Steven Lavalle. University of Illinois.
- **Elements of a successful graduate career.** Bill Freeman. MIT
- **Some Modest Advice for Graduate Students.** Stephen Stearns. Yale university
- **Design for learning.** Stephen Stearns. Yale university
- **How lucky can one be? A perspective from a young scientist at the right place at the right time.** Ronald Vale, 2012, Nature medicine.
- **The importance of education.** Obama. 2009, Wakefield High School in Arlington, Virginia
- “A Ph.D. is not enough---A guide to survival in science”
- “Making the Right Moves: A Practical Guide to Scientific Management”
- “At the Helm: A Laboratory Navigator”
- “Advice for a Young Investigator”
- “Advice to a Young Scientist”

Why do u want to pursue a graduate study?

- In order to obtain a degree, a decent job
- I don't know why
- My parents want me to
- I want to dedicate myself to scientific research
- For fun and for curiosity
-

A vivid example by Ronald vale

- I was intrigued by...
- It was a beautiful experiment that...
- I wondered...
- I was immersed in the science...
- ...hanging on tight, and enjoying the scientific ride of my life.
- I gained tremendously from their unique personalities...
- Thinking of science as a grand adventure makes it fun and allows unexpected things to happen, in terms of both scientific outcomes and your personal career

Right time, right place, and a right team

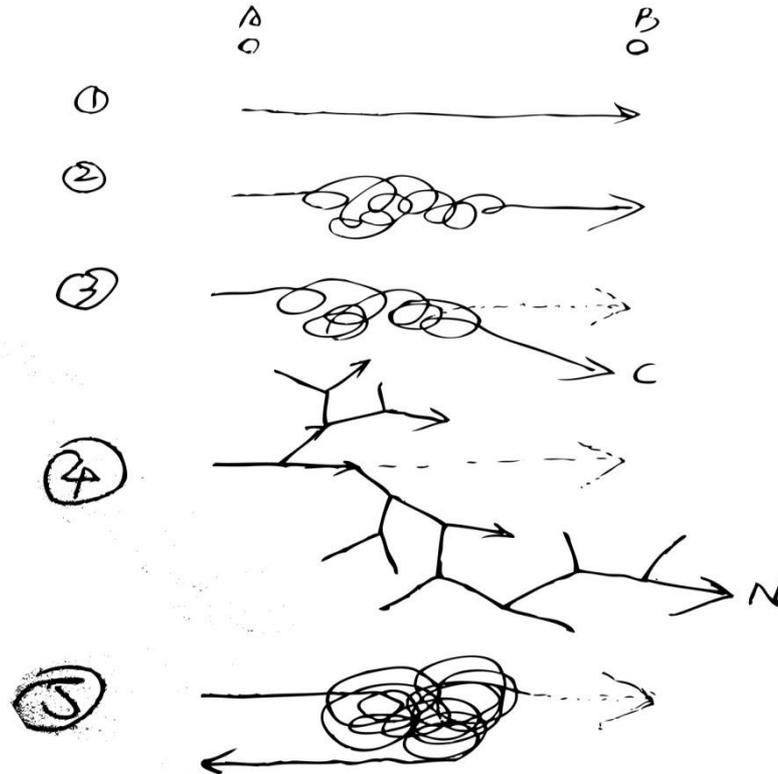


Students vs. Mentors



Qualities: Curiosity + Logic + Personalities + Skills

The logic of critical thinking



Personalities (high EQ)

What follows is probably the most famous list of personality traits in Psychology. In 1968 Norman Anderson came up with the 555 personal characteristics (listed below) and had hundreds of students rank order the 555 words from most desirable (**Note the top 4 are Sincere, Honest, Understanding, and Loyal**) to most distasteful (**the last 4 are cruel, mean, phony, and liar**). The order of the list below represents the average of the students' rating. Here is the reference if you would like to read Anderson's original article:

Anderson, N. H. (1968). **Likableness ratings of 555 personality-trait words**. Journal of Social Psychology, 9, 272-279.

This list may assist you in determining some of your personal qualities that you may not have thought of otherwise.

1. Sincere	112. Inventive	223. Proud	334. Silly	445. Misfit
2. Honest	113. Wholesome	224. Sensitive	335. Submissive	446. Uninteresting
3. Understanding	114. Congenial	225. Moralistic	336. Unstudious	447. Scornful
4. Loyal	115. Cordial	226. Talkative	337. Preoccupied	448. Antisocial
5. Truthful	116. Experienced	227. Excited	338. Tense	449. Irritable
6. Trustworthy	117. Attentive	228. Moderate	339. Fearful	450. Stingy
7. Intelligent	118. Cultured	229. Satirical	340. Unromantic	451. Tactless
8. Dependable	119. Frank	230. Prudent	341. Absent-Minded	452. Careless
9. Open-Minded	120. Purposeful	231. Reserved	342. Impractical	453. Foolish
10. Thoughtful	121. Decent	232. Persistent	343. Withdrawn	454. Troublesome

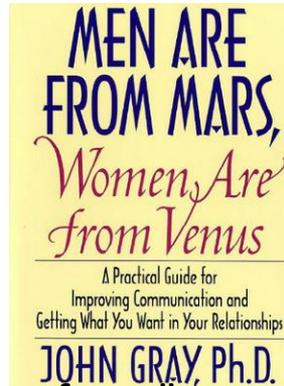
Personalities (high EQ)

- Enthusiasm/passion + willingness
 - Independence + team spirit
 - Purposefulness + open mind
 - Determination/courage/fearlessness/gut
 - Hard worker/persistence/stubbornness
 - Patience + flexibility
 - Imagination + creativity
 - Confidence
- Enthusiasm/passion
 - Purposefulness + open mind
 - Confidence
 - Creativity
 - Vision
 - Leadership: be supportive + be caring

For students

WHY

For mentors



Know yourself and know your enemy, and you will never be defeated. "The Art of war"

ASK YOURSELF

For students

- Q1: how can you expect to be a independent scientist making important contributions without knowing the current status of a field?
- Q2: are you willing to trust your overly busy mentor with your career fate?

For advisors

- Q1: what your students like in science? Basic understanding or applied work? Exploratory or hypothesis-driven?
- Q2: are your students motivated by visual aesthetics or abstract ideas? Techniques or logical proofs?
- Q3: what scientist do they admire?
- Q4: what do your students like in life out of science?

Graduate TRAINING

- A complex process: equal emphasis on skill development and scientific discovery
- A nurturing environment: aims to maximize the potential of students as scientists and as human beings

CURIOSITY

LOGIC

PERSO
NALITY

Skills



Starting points

Research mechanics

New ideas

Broad Background

Materials & Methods

Paper Review

Experiment design

Communication

New problems

New insights

Computational & experimental

Read/evaluate/integrate

Plan/execute

Oral/written

Interest/feasibility

Summary notes

Personal efile

Laboratory protocol

Paper/poster/presentation

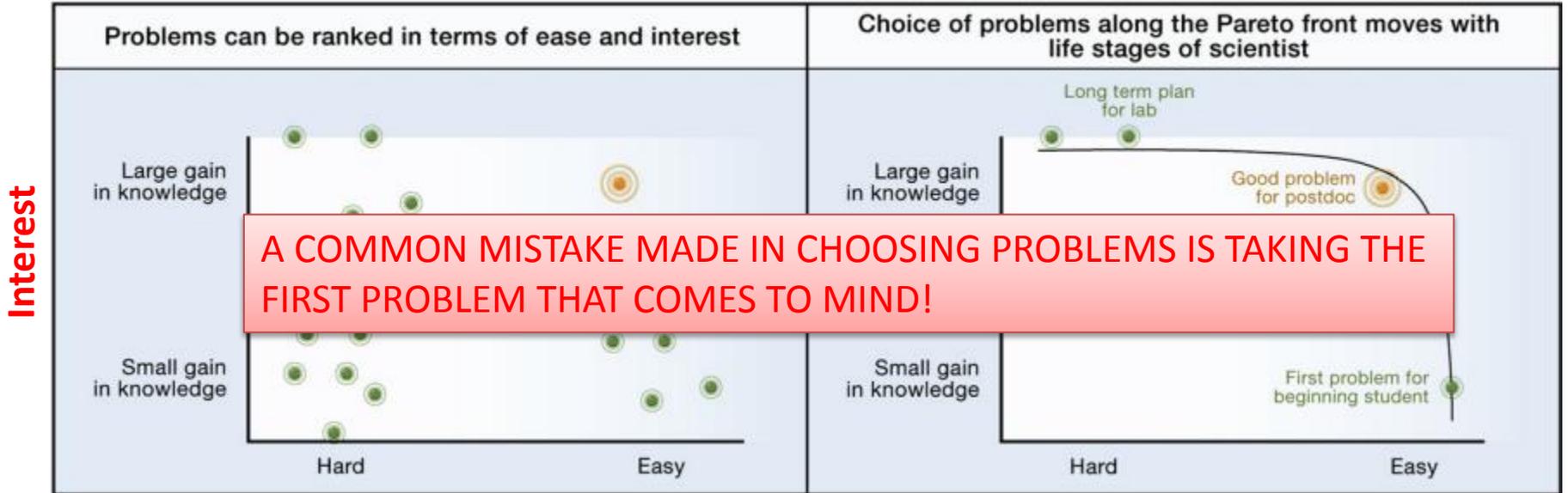
3 months rule

Publish or Perish



How to choose?

For beginning PIs; a grand challenge that can be divided into many good and small projects



Feasibility

- Q1: If u r the only person on earth, which of these problems would u work on?
- Q2: When asked to describe your research to an acquaintance, how does it feel?

The so-called low hanging fruits; a positive feedback to bolster their confidence

Knowledge Network

Check list

1)

2)

3)

....

Some Lessons

10 lessons from Ronald

- ① Find a good mentor
- ② Pick an important question
- ③ Seek adventure
- ④ Read the literature but don't be crippled by it
- ⑤ You don't need a fancy lab to do good science
- ⑥ Work hard, play hard, and squeeze in time to do your own things
- ⑦ Persistence is more important than brilliance
- ⑧ No project is immune from mistakes
- ⑨ Don't be afraid to change your life plans (from medicine to molecular biology)
- ⑩ Science is moving fast, hold on and enjoy the ride!

9 lessons from Stephen

- ① Always prepare for the worst (plan for alternatives)
- ② Nobody cares about you (you are on your own, and you had better get used to it)
- ③ You must know why your work is important (your PhD work will shape your future. It is your choice of a field in which to carry out a life's work)
- ④ Psychological problems are the biggest barrier (if you don't watch out, the pressures of course work, family problems, language requirements and who knows what else will push you around like a large, docile molecule in Brownian motion. There are a lot of interesting things to do in life besides being a scientist, and in some the job market is a lot better. If science is not turning you on, perhaps you should try something else)
- ⑤ Avoid taking lectures, they are usually inefficient (right now, you need to learn how to think for yourself. This requires active engagement, not passive listening)
- ⑥ Write a proposal and get it criticized
- ⑦ Manage your advisors (keep your advisors aware of what you are doing, but do not bother them)
- ⑧ Start publishing early (do not expect your first paper to be world-shattering)
- ⑨ Publish regularly, but not too much (go for quality, not for quantity; a paper that is not cited is time and effort wasted)

From Obama

- **The story of America isn't about people who quit when things got tough. It's about people who kept going, who tried harder, who loved their country too much to do anything less than their best.**
- It's the story of students who sat where you sit 250 years ago, and went on to wage a revolution and found this nation. Students who sat where you sit 75 years ago who overcame a Depression and won a world war; who fought for civil rights and put a man on the moon. Students who sat where you sit 20 years ago who founded Google, Twitter and Facebook and changed the way we communicate with each other.
- **So today, I want to ask you, what's your contribution going to be? What problems are you going to solve? What discoveries will you make? What will a president who comes here in twenty or fifty or one hundred years say about what all of you did for this country?**
- Your families, your teachers, and I are doing everything we can to make sure you have the education you need to answer these questions. I'm working hard to fix up your classrooms and get you the books, equipment and computers you need to learn. But you've got to do your part too. **So I expect you to get serious this year. I expect you to put your best effort into everything you do. I expect great things from each of you.** So don't let us down – don't let your family or your country or yourself down. **Make us all proud. I know you can do it.**
- Thank you, God bless you, and God bless America.



I wish you every success in your
New Year

