How to Succeed in Graduate School?

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What does it take?

- Plan
- Motivation
- Training
- Keep calm and execute the plan
What makes Grad School Different?

• Unstructured nature
• Lack of information about what you should spend your time on
• What exactly should you be learning? (6-9 credits per semester!)
• I have to do research – what does that mean? How to find a topic?
• I have to write a paper/dissertation/thesis – how do I start?
Staying Motivated!

FOR the RIGHT REASONS

Pursue your Passions
NEWTON'S THREE LAWS OF GRADUATION

First published in 1679, Isaac Newton’s "Procrastinare Unnaturalis Principia Mathematica" is often considered one of the most important single works in the history of science. Its Second Law is the most powerful of the three, allowing mathematical calculation of the duration of a doctoral degree.

SECOND LAW

"The age, \( a \), of a doctoral process is directly proportional to the flexibility, \( f \), given by the advisor and inversely proportional to the student's motivation, \( m \)."

Mathematically, this postulate translates to:

\[
\text{age}_{\text{PhD}} = \frac{\text{flexibility}}{\text{motivation}}
\]

\( a = \frac{F}{m} \)

\( \therefore F = m \cdot a \)

This Law is a quantitative description of the effect of the forces experienced by a grad student. A highly motivated student may still remain in grad school given enough flexibility. As motivation goes to zero, the duration of the PhD goes to infinity.

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Plan

Find an Adviser

- Based on your interests
- Career aspirations
- Track record – your QOL depends on your adviser
- Interact (set up regular meetings) and learn
- Clearly identify and agree to expectations
What is Research?

Etymology: Middle French *recherche*, from *rechercher* to go about seeking

1: careful or diligent search

2: studious inquiry or examination; *especially*: investigation or experimentation aimed at the discovery and interpretation of facts, revision of accepted theories or laws in the light of new facts, or practical application of such new or revised theories or laws

3: the collecting of information about a particular subject
Research Topic

• Identify a “good” problem
  – Read, Read and Read
  – Know what is “good”
  – Understand impact
  – Something your adviser is interested in

• Even if the problem is identified for you
  – Read, Read and Read
Training

• Work on background skill set
  – Skills for life
  – Analytical/Mathematical/Statistical
  – Implementation/Simulation
  – Engineering Design
• Foster Critical Thinking skills
  – Proofs
  – Hardware/software Debugging
• Take courses for the right reasons
Execute

• Doing the research
  – Break larger problems into smaller problems
  – Start with simplifying assumptions
  – Build fundamental understanding on the small scale problem
  – Start relaxing the assumptions and increasing the scale
Execute

• Doing the research – 4 Ps
  – Passion – be committed and excited about your work
  – Patience – Research is unpredictable
  – Perseverence – Do not give up or settle for less
  – Planning - Pay attention to detail
    • Giving Credit
    • Correctness
    • Completeness
• Not always easy – challenge yourself
Daily Grind - Things to practice

- Be on time
- Be prepared
- Be organized
- Be honest and truthful
- Be curious and creative
- Be an independent thinker
- Be a good team mate
“Immobilizing Shoulds” not helpful for progress [Chapman88]
- Should have a great topic, should finish in n years, should work 10-12 hours
- Insecurity, anxiety and boredom are natural feelings
- Find a sympathetic ear
- Make time to pursue your hobbies!
- Exercise!
Good researcher - more than coming up with brilliant ideas and implementing them!

“No Tale is so good that it can’t be spoiled in the telling”
Spread the word!

- Publications – 5th P
  - Evaluation of your work
  - Validation your work
  - Get feedback
  - Improve confidence – establishes you as a member of the research community
  - Send your work to quality journals and conferences
- Quality more than Quantity
Technical Paper Tips

I read your draft of the paper for the conference. Great work!

...I just made a few minor alterations...

Uh...um...you...you rewrote the whole paper, sir...

Ah, yes, well... I didn't want you to embarrass yourself on your first paper.

'thanks...

I think...

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Hook the reader!

The reader of the paper should be able to answer the following questions:

• What is the basic problem area?
• Why is this problem area important?
• What question(s) did you address?
• Why is this (are these) question(s) important?
• How well did your proposed techniques work?
• What ideas do you have for future work?
• What are your contributions to the field and what is the work drawn from previous research?
Networking

- Attend conferences
- Discuss ideas with peers
- Make connections (helpful for jobs)
- Learn by observation
Technical Presentation Tips
• Thoughtful
• Engaging
• Clear

Study role models

Practice, Practice and Practice

Go get an unfair advantage!
Technical Presentation Tips

• Put some time into the process
• Provide an outline
  – Tell ’em what you are going to tell ’em (preview)
  – Tell ’em (the talk)
  – Tell ’em what you told ’em (summarize)
• Introduce the problem area and motivate your work
• Give an overview of prior approaches
• Provide specific goals and objectives
  – Highlight the new work
Technical Presentation Tips

- Listen carefully to questions and comments
- Have someone else look over your talk
- Spell/Grammar Check

Use this as both showcasing and a learning opportunity!
Take home message!

- Be motivated
- Plan properly
- Train hard
- Execute

Independent problem solver who understands the “Discipline of Research” and is a world renowned expert in his/her chosen area of work!

Enjoy the Process!