

PhD, the University, and Everything



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Finally answered!



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1. Introduction

Writing a PhD thesis can be frustrating:

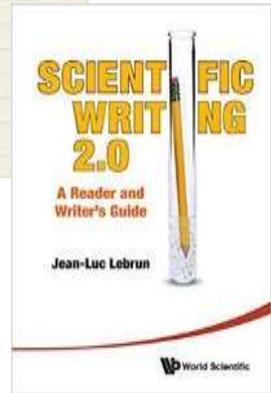
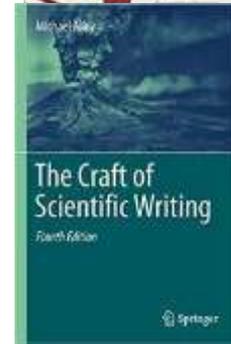
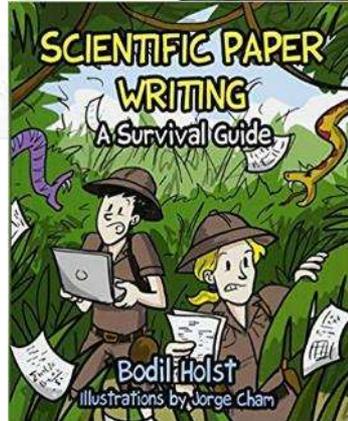
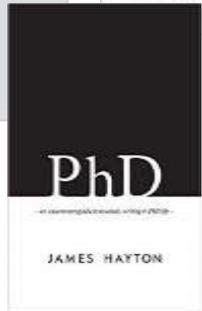
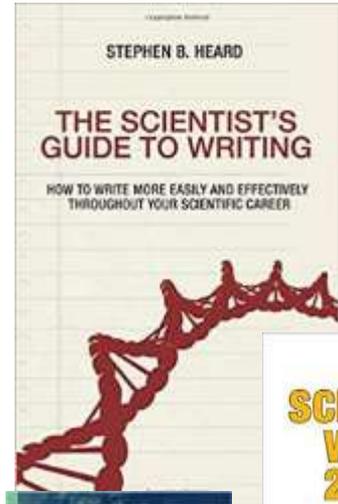
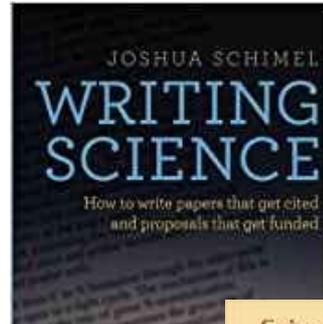
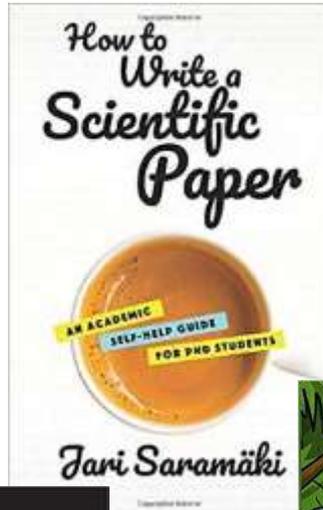
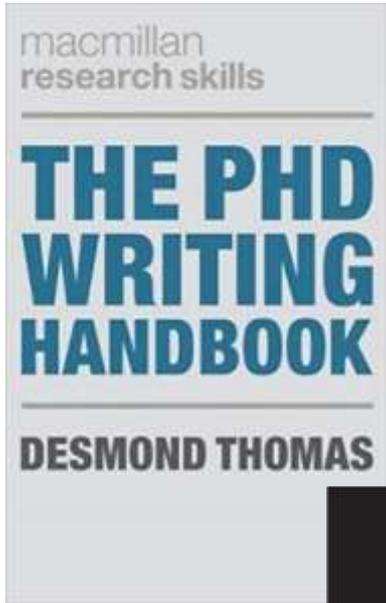
- There is pressure from all sides
- Everybody asks about progress
- But they do not really care
- There is not enough progress
- This one crucial proof doesn't work
- Your advisor never has time for you
- The advice you get is not very helpful
- Your latest submission was rejected
- The non-scientific tasks are too much
- Time is running out

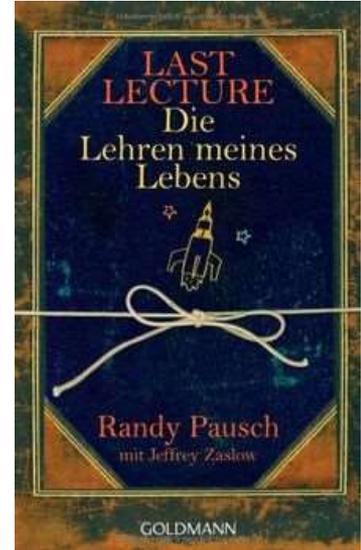
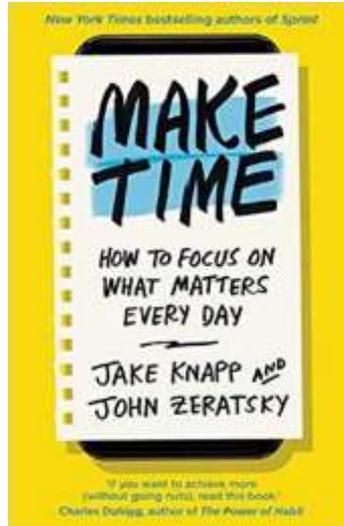
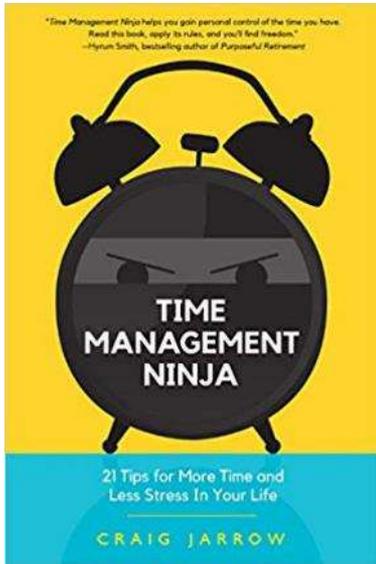
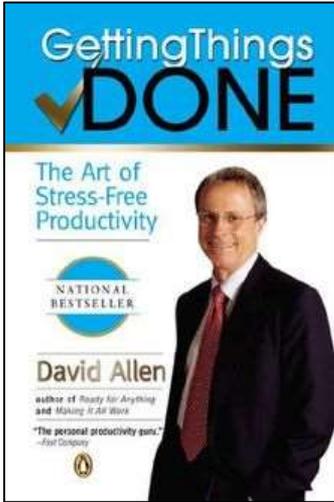
Relax and think about
what you really want!

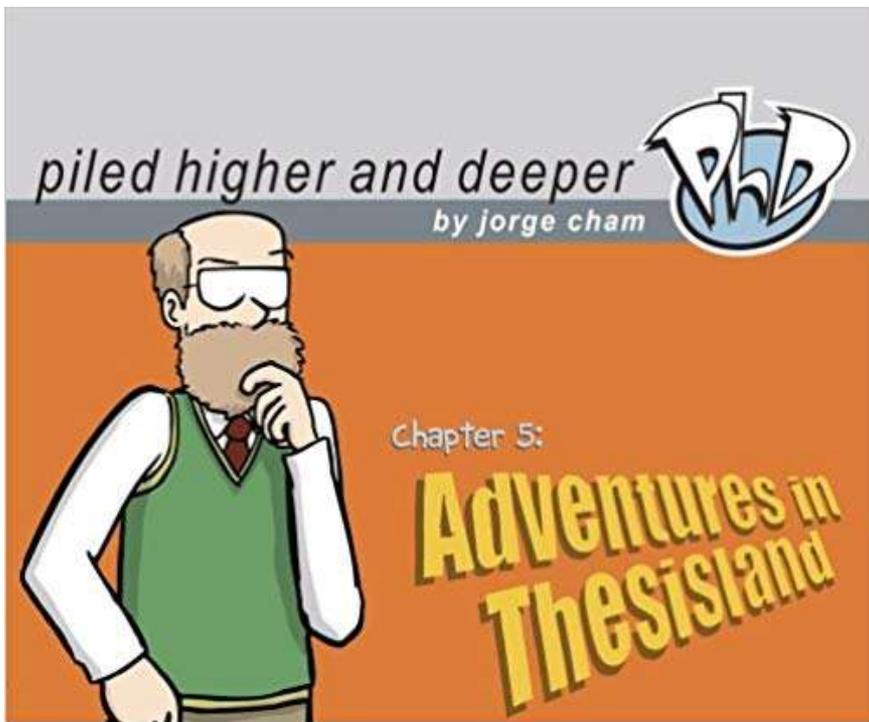
Some Challenges in Writing a Thesis

- Financing
 - finding a source to sustain yourself can be a problem, but:
 - if you're here, you've probably managed that.
 - if there is a problem to extend a contract / grant:
usually your supervisor will be able to find a solution. Talk to her/him!
- Life – Work – PhD – Balance
 - teaching / project work tends to grow on its own, fills up all empty spaces, but:
 - you can try to separate the areas!
 - recall your Master's thesis time: You did manage that as well!
- Finding a topic for your thesis
 - finding a research niche can be difficult, but:
 - you are not starting from scratch!
 - ask yourself: which topic are you genuinely interested in? what is your background from which to take off? what is the research context in your group?

2. Related Work







3. Terms and Definitions

- We will talk about expectations, motivations, goals and ambitions
 - what do you want to achieve?
 - why is this important?
 - who is involved?
- We will not talk about technical aspects of writing
 - sentence structure
 - topic sentences
 - text styles and editors
 - literature management systems
 - choosing conferences and journals

(at least not very long)

What is the Meaning of a PhD ?

- For the author
 - satisfying the own curiosity
 - accomplishing something big
 - receiving recognition from others
 - advancing in science
 - achieving a formal qualification
- For the subject
 - answering some significant scientific question
 - extending the frontier of knowledge
 - opening up new perspectives to the field
- For society
 - making the world a better place

Some Known Facts

- Most important is a **topic that you are genuinely interested in**
 - a PhD on something you don't really care about means setting yourself up for tedious and frustrating periods where you can't draw on intrinsic motivation to keep you going.
- A **good work environment** greatly increases productivity
 - one that emphasizes collaboration rather than harsh competition, where colleagues help each other, interesting conversations happen by the coffee machine, technology and bureaucracy work as they should, etc. You can contribute to that!
- **Mental health issues** are a big problem in academia
 - grad students have a substantially increased risk of developing anxiety and depression compared to the general population. Get help early!
- **Procrastination** and diversion
 - can lead to getting overwhelmed with tasks and projects that are only marginal to your thesis. Saying "no" is a useful skill here...

4. Viewpoints – Students

- A non-representative poll „what are enablers and obstacles to a PhD“?

Enablers:

- Strong / solid knowledge of CS
- Interest in programming
- Courage, patience
- Working on the weekend
- Good time management skills
- Communication and presentation skills
- Interesting and motivating research topics
- Setting and sticking to targets
- Passion for the research area
- Creativity, making your subject personal
- Self-management, literature management, etc.
- Good network of fellow students, social support from friends and family

Obstacles:

- Insufficient skills and knowledge
- Research may be boring and time-consuming
- Trouble to find a new idea to publish
- Lack of motivation, believe, fitting subject
- Doubt about the scientific contribution
- Lack of feedback (e.g., from reviewers), differing ideas in the supervision team
- Too much time with teaching and project work
- Roadblocks/ dead ends in the chosen approach
- Unforeseen personal challenges (children, ...)
- Organizational problems, e.g., with software
- Lack of focus / drive, changing priorities
- Lack of self-organisation

Viewpoints – Advisors

- „What are enablers and obstacles to a PhD“?

Enablers:

- Curiosity, thinking out of the box
- Mathematical abstraction, knowing when to be precise, methodical thinking
- Persistence, diligence, willingness to improve
- Experience in teaching & student supervision
- Writing skills, ability to organize & transform ideas into papers, interaction with co-authors
- Communication and presentation skills
- Good research culture & working group
- Sufficient funding
- Ability to dig deeply into the literature
- Concrete research questions to start with

Obstacles:

- Exaggerated self-expectations, perfectionism
- Procrastination, bad time-management
- Preconceived ideas
- Sloppy ideas, failure to abstract the essence
- Lack of formal rigour
- Not enough communication with the supervisor
- No interaction with future thesis reviewers

Observation:

- There is quite a discrepancy in the viewpoints
- Most obstacles are easy to avoid
- Most enablers can be trained

Viewpoints – Advisors

- „What do you expect from an ideal PhD student?“

- Stimulating discussions on the research topic
- Critical mind-set w.r.t. literature and supervisor's / own suggestions
- Quickly acquiring autonomy: finding relevant literature, coming up with proposals, independent learning
- Ability to abstract from examples
- Elaborating ideas into papers
- Enthusiasm, Stamina
- Communication skills, being able to present own ideas
- Ability to work in a team, integration into the group, curiosity towards what others are doing

- Some background knowledge of the field
- Willingness to experiment (get hands dirty)
- Ability to install software, some programming experience, being able to deal with technology
- Doing what (s)he is paid for (project / university work)
- Following advice (e.g., about reading papers, writing style, etc.)
- Coming prepared for meetings, getting to the point
- Secondary virtues: punctuality, being prepared to work overtime during critical periods, time management

Viewpoints – Reviewers

- Reviewer acts as quality assurance for your thesis
 - Checks whether the thesis conforms to the generally acknowledged standards in the field
 - Grading is secondary
- Make sure to point out why your thesis should be accepted:
 - what are the main insights and / or innovations?
 - what is known now that wasn't known before?
 - how did you improve on the state of the art?
 - why did you succeed where others have tried?
- It is a good idea to state this as explicitly as possible!

Umberto Eco: How to write a thesis

- *"Your thesis is like your first love. It will be difficult to forget. In the end, it will represent your first serious and rigorous academic work, and this is no small thing."*
- **You are not Proust.** Do not write long sentences. If they come into your head, write them, but then break them down.
- **You are not e. e. cummings.** Cummings was an American avant-garde poet who is known for having signed his name with lower-case initials. Naturally he used commas and periods with great thriftiness, he broke his lines into small pieces, and in short he did all the things that an avant-garde poet can and should do. But you are not an avant-garde poet.

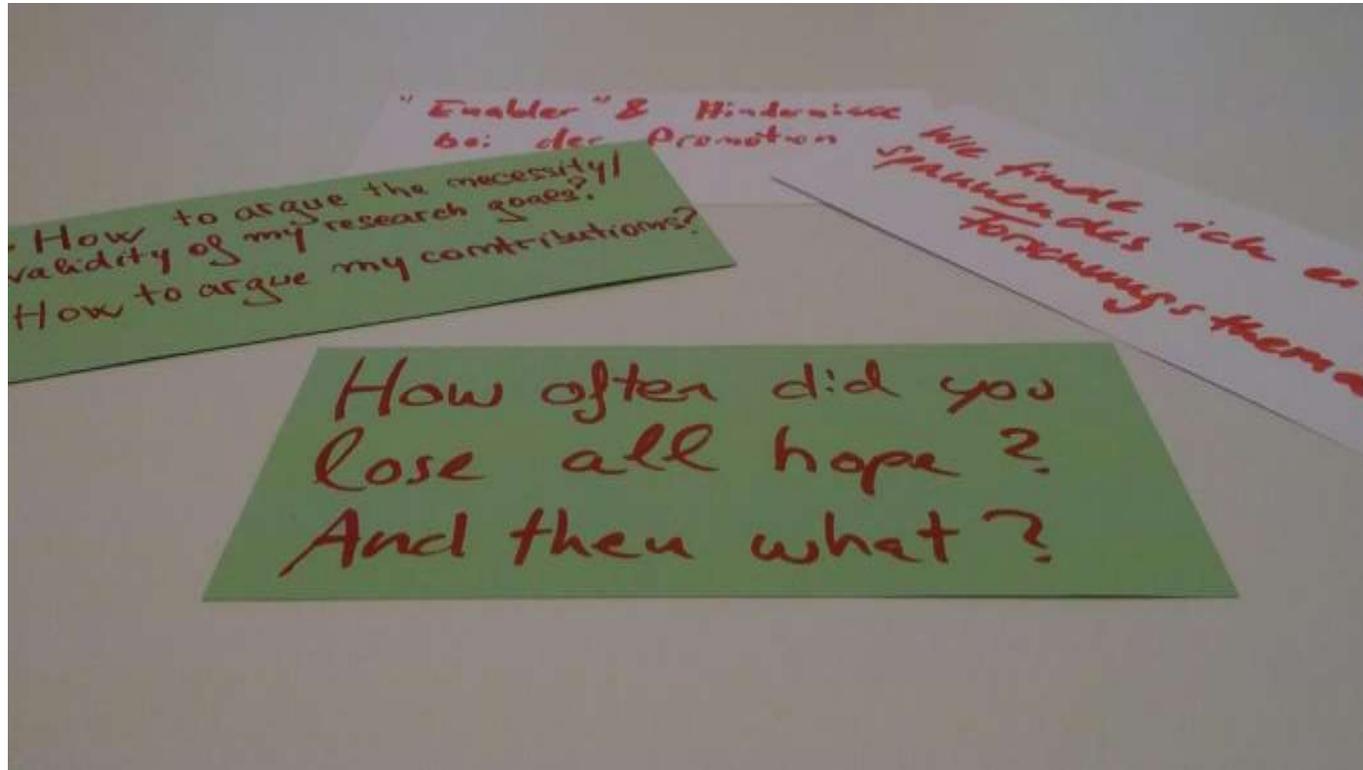
<https://thereader.mitpress.mit.edu/umberto-eco-how-to-write-a-thesis/>

Umberto Eco (continued)

- ***Do not insist on beginning with the first chapter.*** Perhaps you have more documentation on chapter 4.
- ***Always define a term when you introduce it for the first time.*** If you do not know the definition of a term, avoid using it. If it is one of the principal terms of your thesis and you are not able to define it, call it quits. You have chosen the wrong thesis (or, if you were planning to pursue further research, the wrong career).
- ***Use the advisor as a guinea pig.*** You must ensure that the advisor reads the first chapters (and eventually, all the chapters) far in advance of the deadline. His reactions may be useful to you. If the advisor is busy (or lazy), ask a friend. Ask if he understands what you are writing. Do not play the solitary genius.

5. Administration and Support

- People in administration are important to keep things going
 - They are neither your slaves nor your bosses
 - You are neither the first nor the last one with this particular request
 - Everything you do or don't do may backfire at you
- My personal attitude is:
Surviving in the administrative jungle is the student's responsibility, not mine
- Know the responsibilities
(in particular: don't blame people for problems which are beyond their cognizance)
- Be polite, but be also persistent



Colleagues, Friends and Family

- They want to help you – give them a chance!
- Talking to outsider usually helps
 - not only on „meta“-topics, but also on the contents
 - explaining a problem can be a step to the solution
 - can you explain your problem in one minute?
- Why not organize a seminar on PhD writing at your university?
- Sometimes also taking a break can solve knots in the brain

6. How to Write a CS Thesis

“Each large journey begins with the first step”

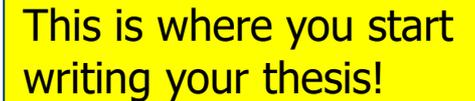
- In CS that means:
Each PhD thesis begins with a first paper
 - Formerly, a PhD thesis was requested to be a huge monolithic body of text
 - Nowadays, it is a coherent collection of related research results
- The more the contents has been reviewed before, the better
- If you have 3-5 substantial contributions (in good journals or conferences), then it is easy to compile them into a good thesis
 - I personally don't like “cumulative theses”, but the situation at your institution may be different – check with your advisor (*not* with the regulations)
 - The difference is artisanal: common terminology, literature, introduction, ...

A Typical ToC

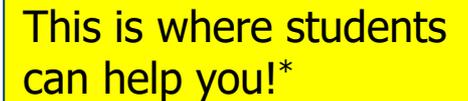
Front matter

1. Introduction
2. Related work
3. Terms and definitions
4. Technical contribution #1 (from paper #1)
5. Technical contribution #2 (from paper #2)
6. Technical contribution #3 (from paper #3)
7. Implementation and experimental results
8. Summary and conclusion

End matter



This is where you start writing your thesis!



This is where students can help you!*

* but remember:
NEVER on the critical path!

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7. Life after Ph.D.

- If you've just graduated, you have reached a peak in life
 - Probably you will get several offers from people who want to hire you
 - Probably you will be thinking what to do with the rest of your life
- You have to decide: academia or industry?
 - For industry, the PhD usually is the starting point of a leadership career
 - For academia, the PhD is just the entry point into a wide world of research
 - You might also think about technology transfer organisations like Fraunhofer

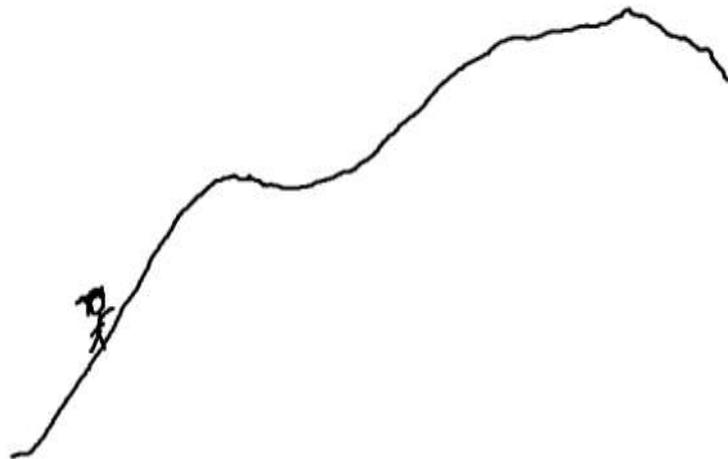


Academia or Industry?

- For **industry**, the content of your PhD work probably is irrelevant – they want your skills in abstract thinking, persistence and stress-endurance
 - you will be expected to take responsibility (for a group, for a project, for a business)
 - salary is usually (much) higher than in academia
 - ask yourself: What is it I want to do? Where do I want to be five years from now?
- To stay in **academia**, you should strive for a postdoc position in your area, where you can widen your spectrum (not the same, not completely new)
 - academic life can be hard, competition is fierce, you have to move around
 - but it gives you the privilege to *choose your own topic*, which no industry job can offer
 - ask yourself: Did I enjoy research? Was it a pleasure or a pain in the neck to write scientific papers? Do I have a burning desire to find out new things? Is it my life's ambition to solve hard scientific questions? Do I like teaching?



a peak ...



... might not be
what it appears to be!

8. Conclusion

- Writing a PhD thesis is a challenge, but also an adventure
- Often, expectations are quite different from what you think
- There are some simple rules which can greatly ease the process
- Rely on your social network (in life, not on Facebook) for help
- For writing a thesis, write some conference / journal papers first
- After graduation, many exciting new challenges will appear

Thank you for your attention!