Graduate School

Computer Science Colloquium

Williams College

11/16/2018

GRADUATE SCHOOL

- WHAT IS IT?
- HOW TO BE SUCCESSFUL?
- WHY SHOULD I GO?
- HOW DO I GET IN?

CS Graduate School Is **Free***

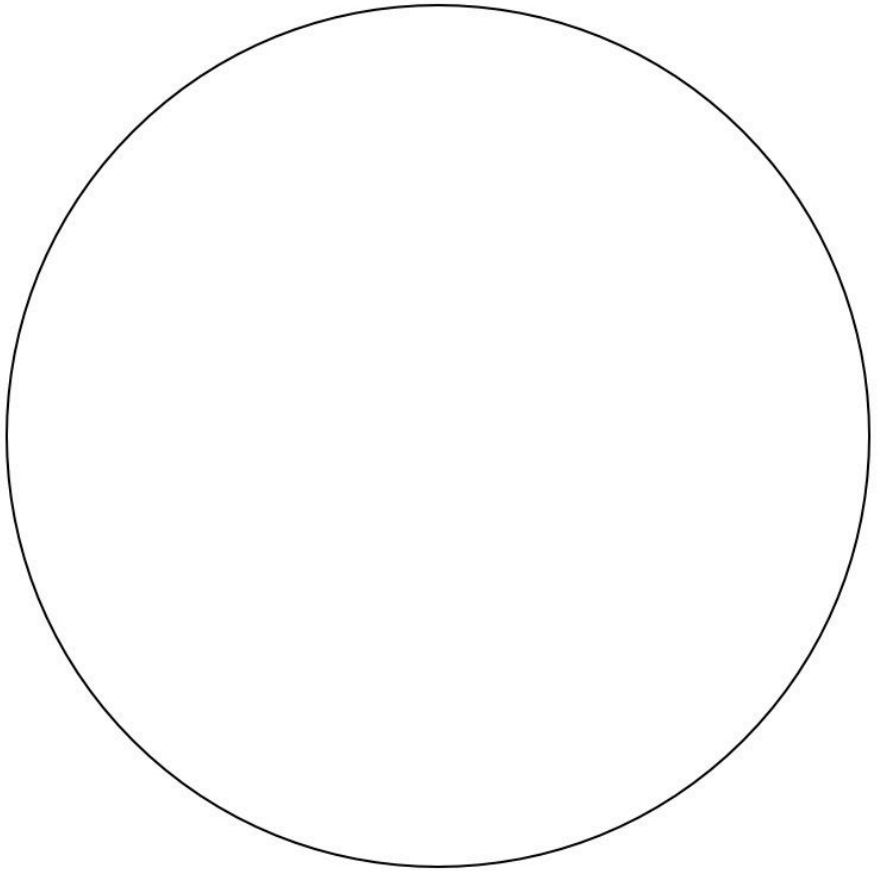
- Terminal/Professional Master's Degree paid for by your employer
  - ex: Lockheed Martin, others?
  - * Typically have to agree to work for employer for x more years in return
  - * Work full-time, attend school part-time
- Research Master's Degree paid for by the university + stipend
  - ex: Princeton's computer science master's, Carnegie Mellon's master of language technologies, etc.
  - * Tuition+stipend is paid for by a professor, for whom you do research
- PhD paid for by the university + stipend
  - ex: any reputable computer science PhD program
  - * Tuition+stipend is paid for by a professor, for whom you do research

* But it does require your time & effort, compensated at lower rates than industry.

What is a PhD?

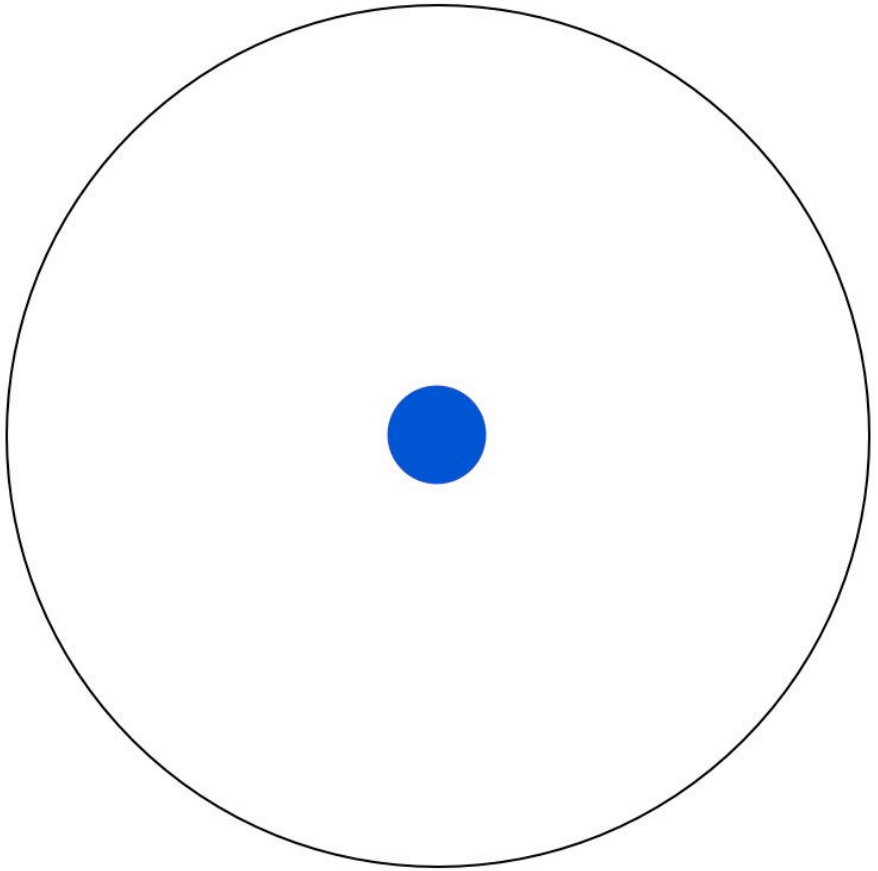
RESEARCH

Imagine a circle that contains all of human knowledge:



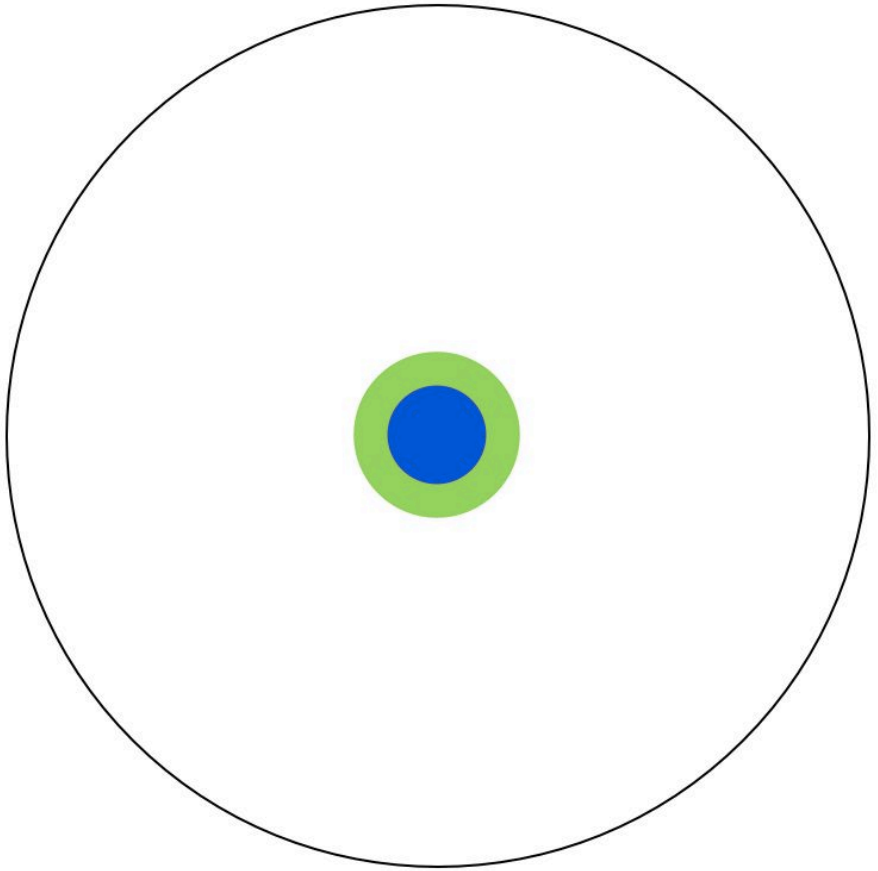
http://matt.might.net/articles/phd-school-in-pictures/

By the time you finish elementary school, you know a little:



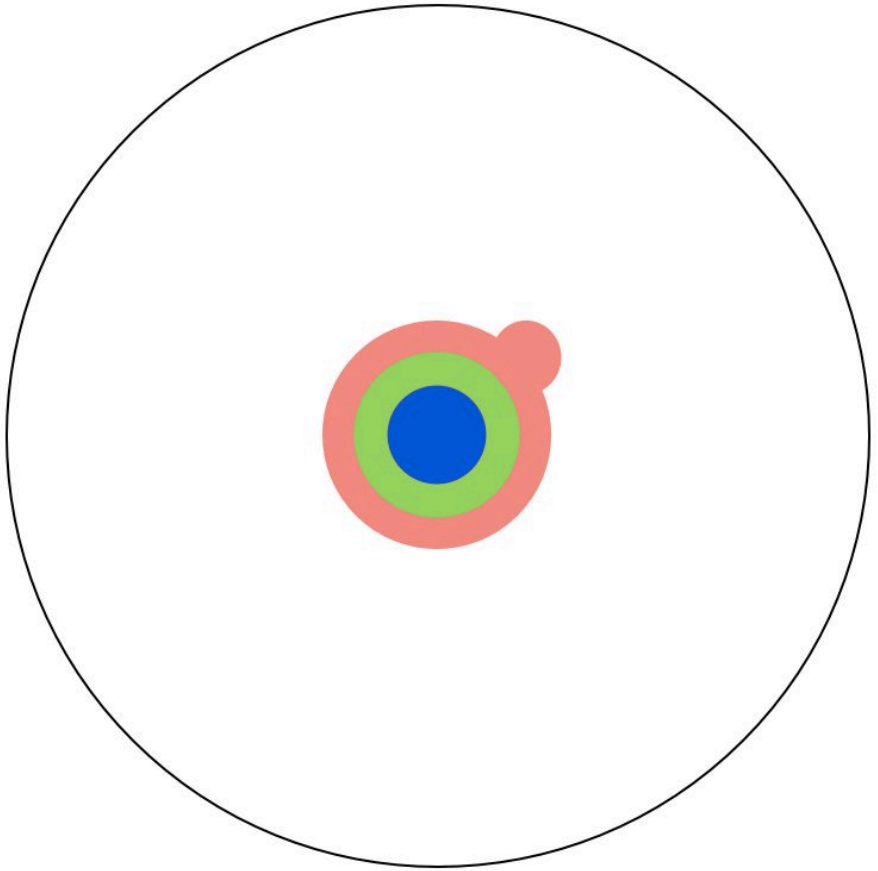
http://matt.might.net/articles/phd-school-in-pictures/

By the time you finish high school, you know a bit more:



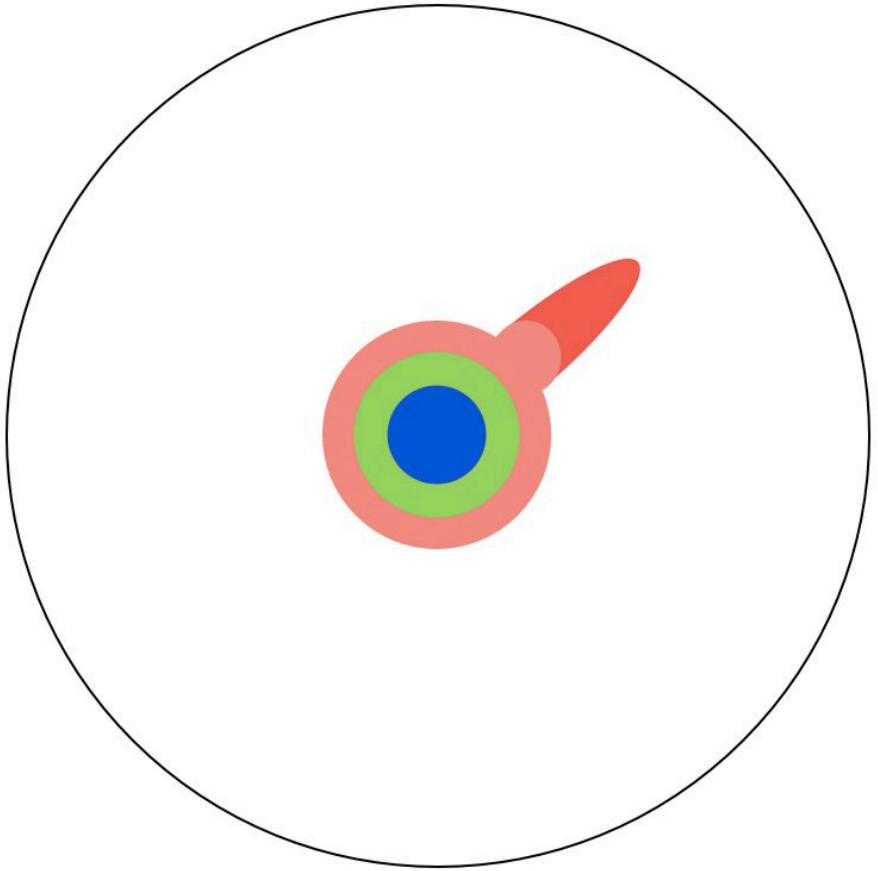
http://matt.might.net/articles/phd-school-in-pictures/

With a bachelor's degree, you gain a specialty:



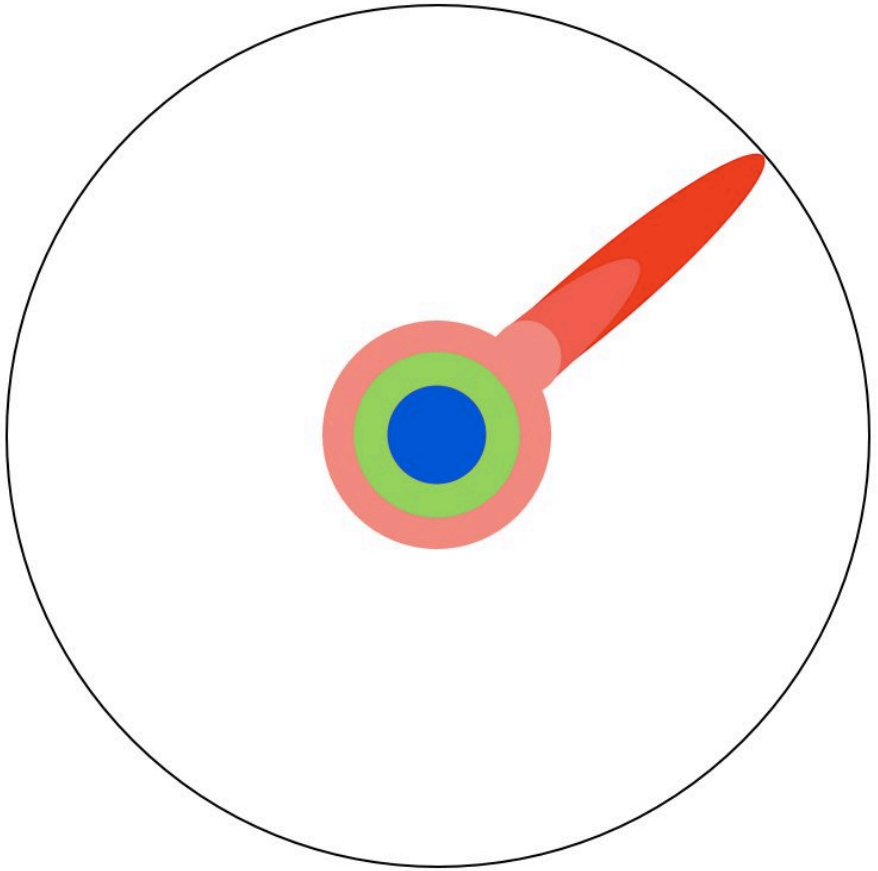
http://matt.might.net/articles/phd-school-in-pictures/

A master's degree deepens that specialty:



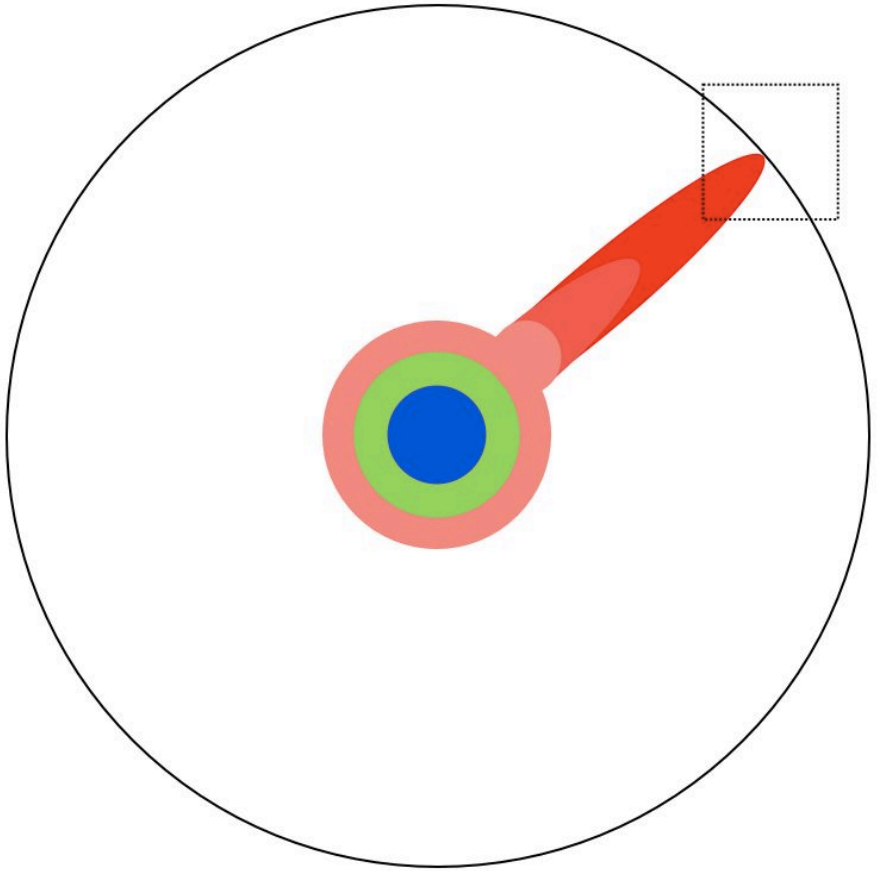
http://matt.might.net/articles/phd-school-in-pictures/

Reading research papers takes you to the edge of human knowledge:



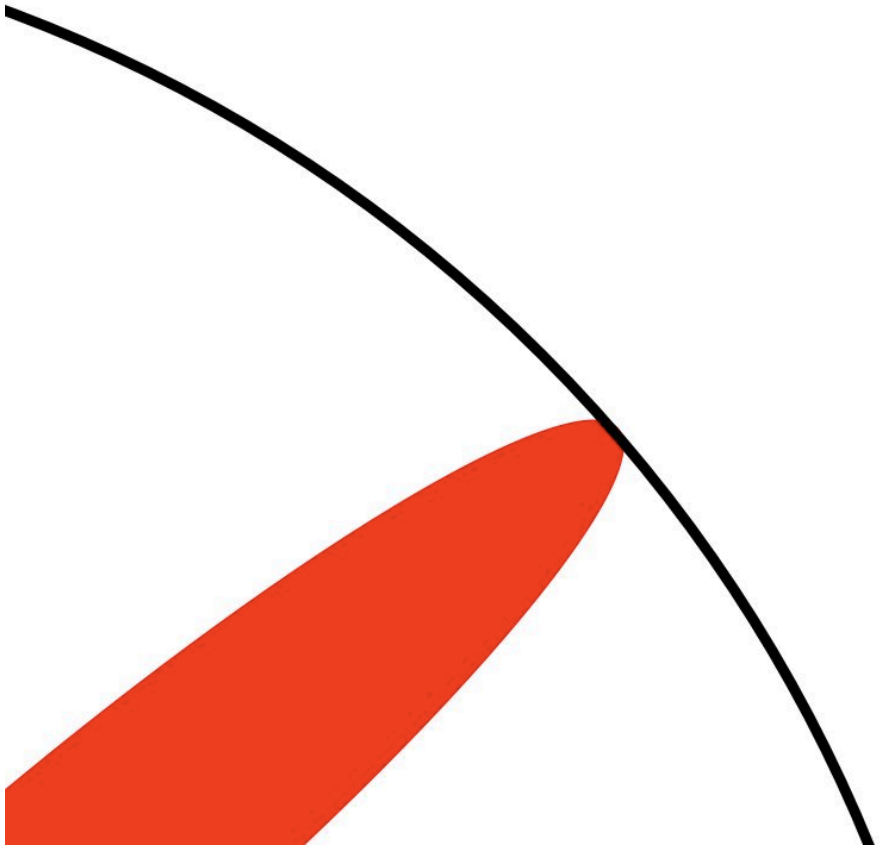
http://matt.might.net/articles/phd-school-in-pictures/

Once you're at the boundary, you focus:



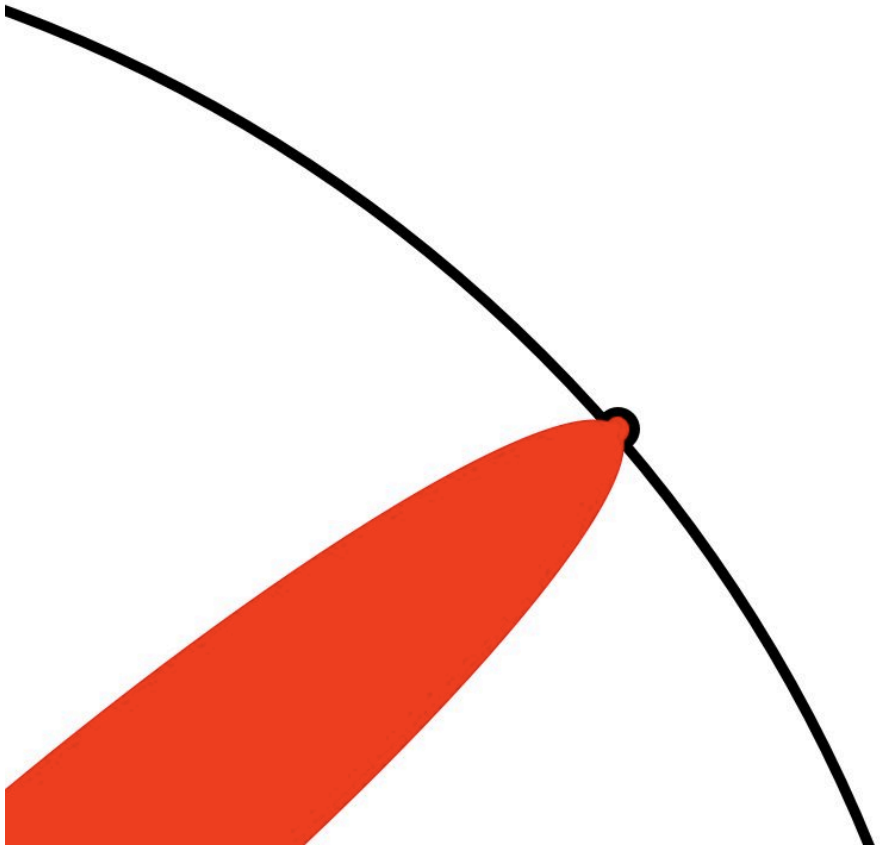
http://matt.might.net/articles/phd-school-in-pictures/

You push at the boundary for a few years:



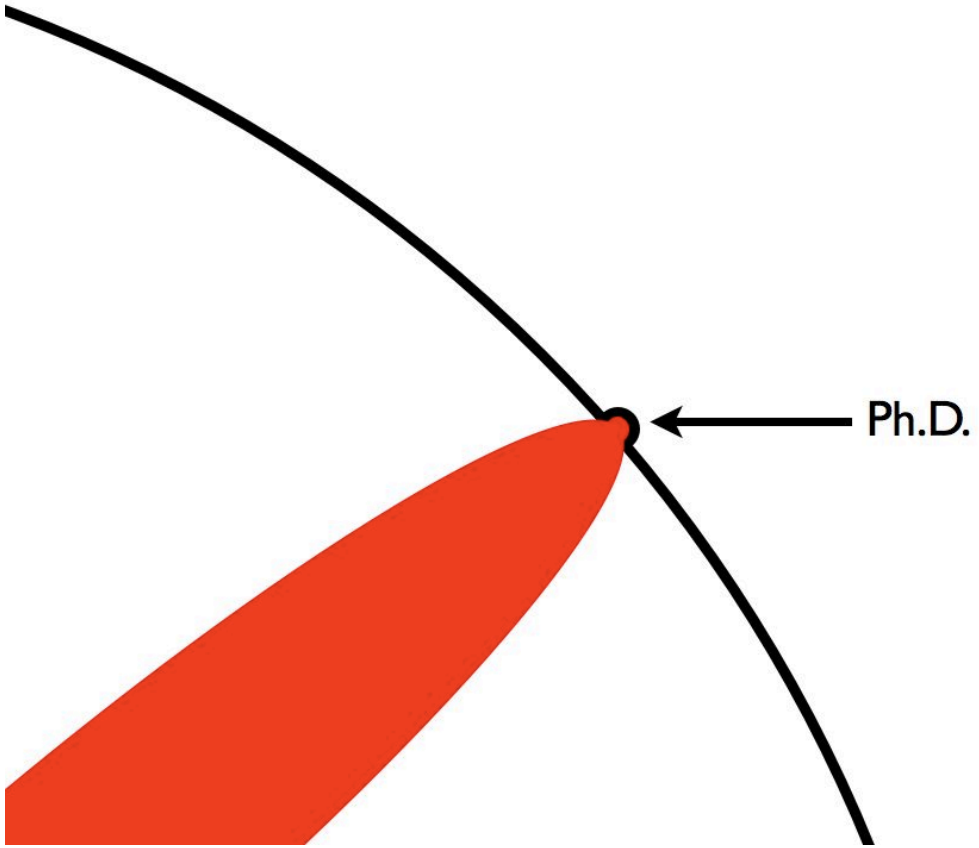
http://matt.might.net/articles/phd-school-in-pictures/

Until one day, the boundary gives way:



http://matt.might.net/articles/phd-school-in-pictures/

And, that dent you've made is called a Ph.D.:



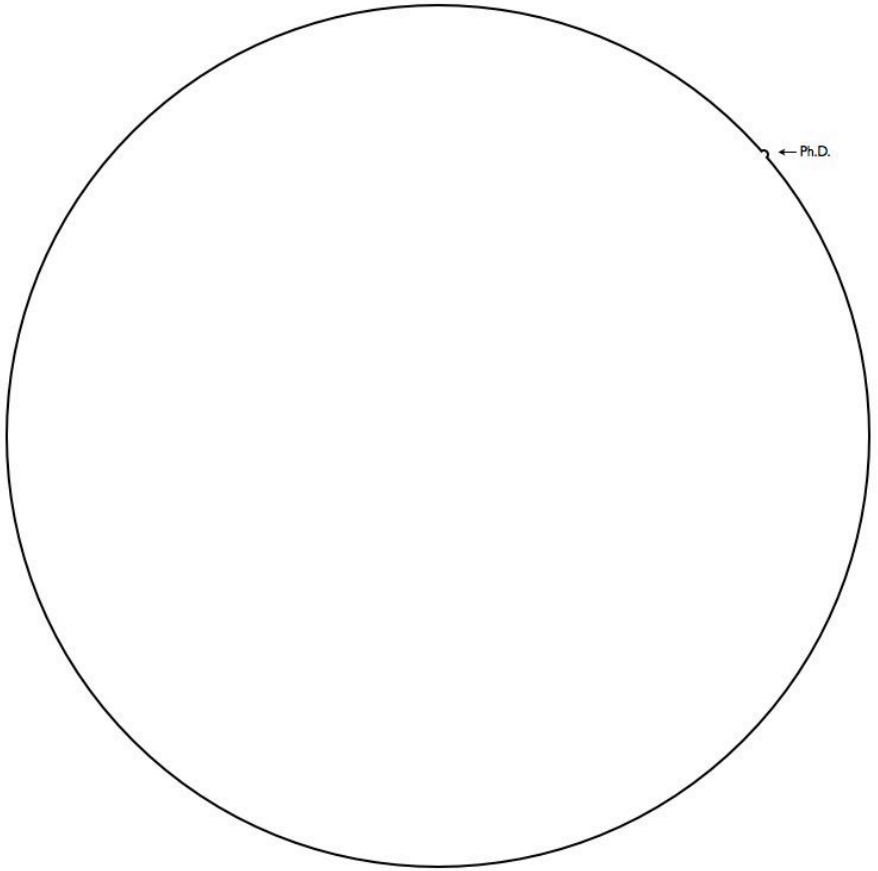
http://matt.might.net/articles/phd-school-in-pictures/

Of course, the world looks different to you now:

http://matt.might.net/articles/phd-school-in-pictures/

So, don't forget the bigger picture:

Keep pushing.



http://matt.might.net/articles/phd-school-in-pictures/

Dissertation Titles

…by some familiar names…

1. “Optimizing System Software Using B^e-trees”
   - Bill Jannen
2. “Spreadsheet Tools for Data Analysts”
   - Dan Barowy
3. “Leveraging Educational Technology to Overcome Social Obstacles to Help-seeking”
   - Iris Howley
4. “Distributed Application Management”
   - Jeannie Albrecht
5. “Type Systems for Object-Oriented Intermediate Languages”
   - Steve Freund
6. “Specifying Communication for Massively Parallel Ensemble Machines”
   - Duane Bailey
7. “Automorphism Groups of Block Designs”
   - Bill Lenhart

Additional Notes:
(PhD)

- You do not need a master's degree to pursue a PhD
  - Most (USA) PhD programs give you a master's on your way to the PhD
- PhDs typically take 5-7 years
  - Outside of the USA, this is often shorter
  - …because you don't take as many classes, and typically do not get a master's
- Stipends
  - NSF GRFP stipend is currently "$34,000 along with a $12,000 cost of education allowance for tuition and fees" (US Citizens)
  - CMU's student government posts self-reported stipends here. ~$33k

Logisitical Notes:
(PhD)

- Some PhD programs have a qualifying exam, partway through the program
  - Some do not
- Some programs have you TA to fund your stipend + tuition
  - Some guarantee your funding, and don’t require teaching to fund yourself
- Some have you pair up with a PhD advisor the first semester
  - Some wait longer

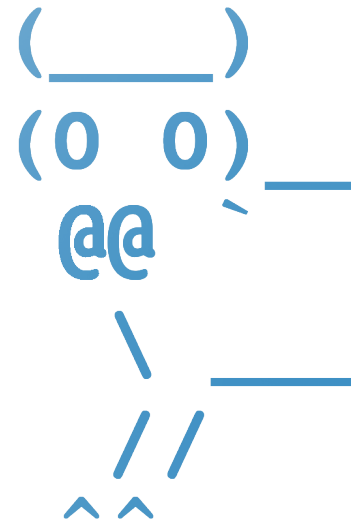
How to be successful in a PhD program?

Liberal Arts++

- Williams students may have taken fewer computer science courses than someone from a large research university

BUT

- Williams students will be stronger in problem solving, computer science theory, and communication skills
- You will catch up fast.



How to be successful in a research program?

- Need to move away from defining one's self worth by success
  - Grades don't matter so much in a PhD program
  - As you try more challenging things, you will experience more failures + rejections
    - Research is not always solve-able
- Reviewers/Advisors can be harsh
  - Reframe: Feedback is a gift of someone else's time, difficult to find!
- Hard work + persistence

“10 Easy Ways to Fail a PhD”

1. Focus on grades or homework
   - Grades do not matter in grad school
2. Learning too much
   - Too much breadth!
   - Do research!
3. Expecting perfection
4. Procrastination
   - 2 & 3 often => 4
5. Go rogue too soon/too late
   - Need independence at right time!
6. Treat PhD like school *or* work
7. Ignoring your committee
   - They approve your PhD…
8. Aiming too low
   - No room for uncertainty
9. Aiming too high
   - You don’t need to cure cancer!
10. Miss the real milestones

http://matt.might.net/articles/phd-school-in-pictures/
(We do not agree with everything on this list)

Acquiring the PhD

"The Real Milestones"

- Most schools require coursework, [qualifying exam,] thesis proposal, thesis defense, and dissertation document

- In some schools, the dissertation is three good publications connected by a (perhaps loosely) unified theme
  - At other schools, this works differently

Why should I go?

Reasons to Pursue a PhD

- Opens up new job opportunities that allow you to have significantly more control over what you work on
- Provides additional training in a subject you're passionate about
  - Switching fields? Specializing? Going deeper?
- You enjoy learning
- You'd like to contribute to humanity through generating knowledge
- You want to be a professor or a research scientist

Reasons to Pursue a Master's Degree

- Opens up new job opportunities that allow you to have marginally more control over what you work on
- Provides additional training in a subject you're passionate about
  - Switching fields? Specializing? Going deeper?
- You enjoy learning
- You'd like to earn a higher salary

How do I get in?

What do I need to apply?

(PhD, Research Master's)

- CV/resume
  - Is it research-dense?
- Statement of purpose
  - Is it research-dense? Do you understand what a PhD application is?
- Scores (don't matter too much)
  - GPA: warning sign if too low
  - GRE: warning sign if too low
  - TOEFL > 100
- ~3 Letters of recommendation
  - Is it research-dense?

http://www.pgbovine.net/PhD-application-tips.htm

What if I don’t have any research experience?

- Have you done an independent study?
- Do you have personal projects on the side that involve reviewing existing work, building, evaluating?
- Did you do a research project in class?

- It’s best to get research experience
  - Summer research at Williams:
    - https://csci.williams.edu/computer-science-research-application-forms/
  - Research Experience for Undergrads:
    - https://www.nsf.gov/crssprgm/reu/list_result.jsp?unitid=5049
  - Deadlines are generally in February

What are the timelines?

(PhD, Research Master's)

- Example deadlines:
  - Stony Brook University: Nov 1 / January 15
  - Carnegie Mellon: December 10
  - UMass-Amherst: December 15

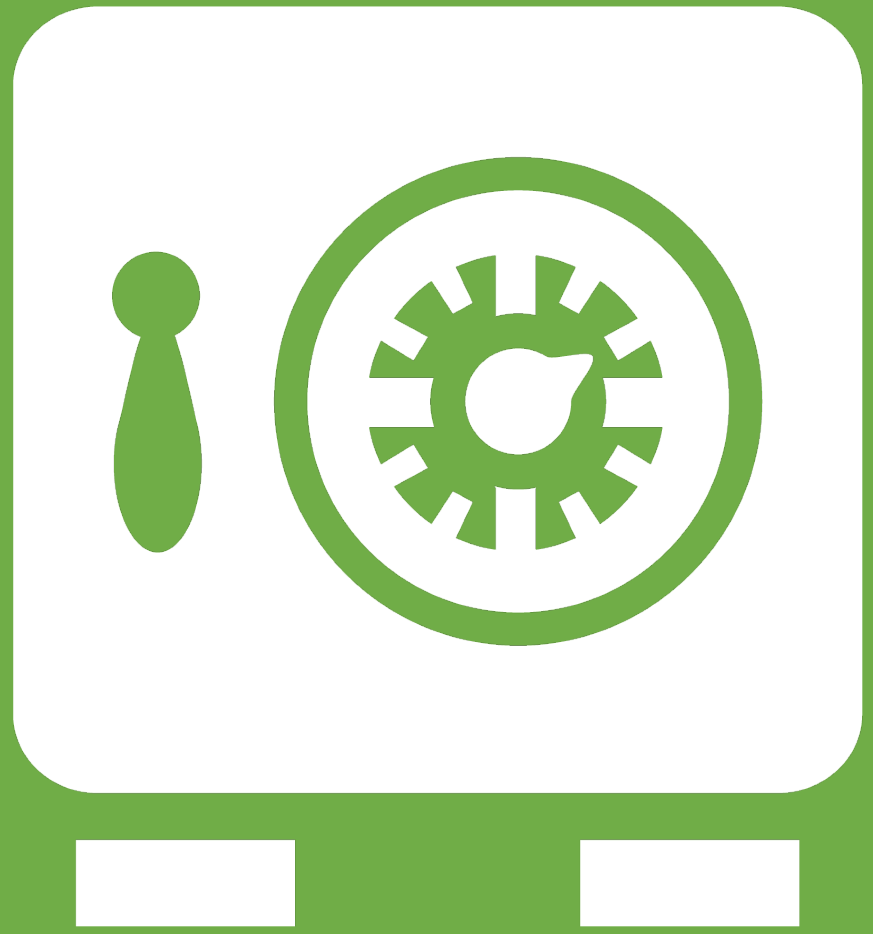
GRE General Test

- Offered ~daily in Albany & Springfield
  - Slots book up!
- Takes ~2 weeks to be sent (computer-delivered)
  - ~6 weeks (paper-delivered)

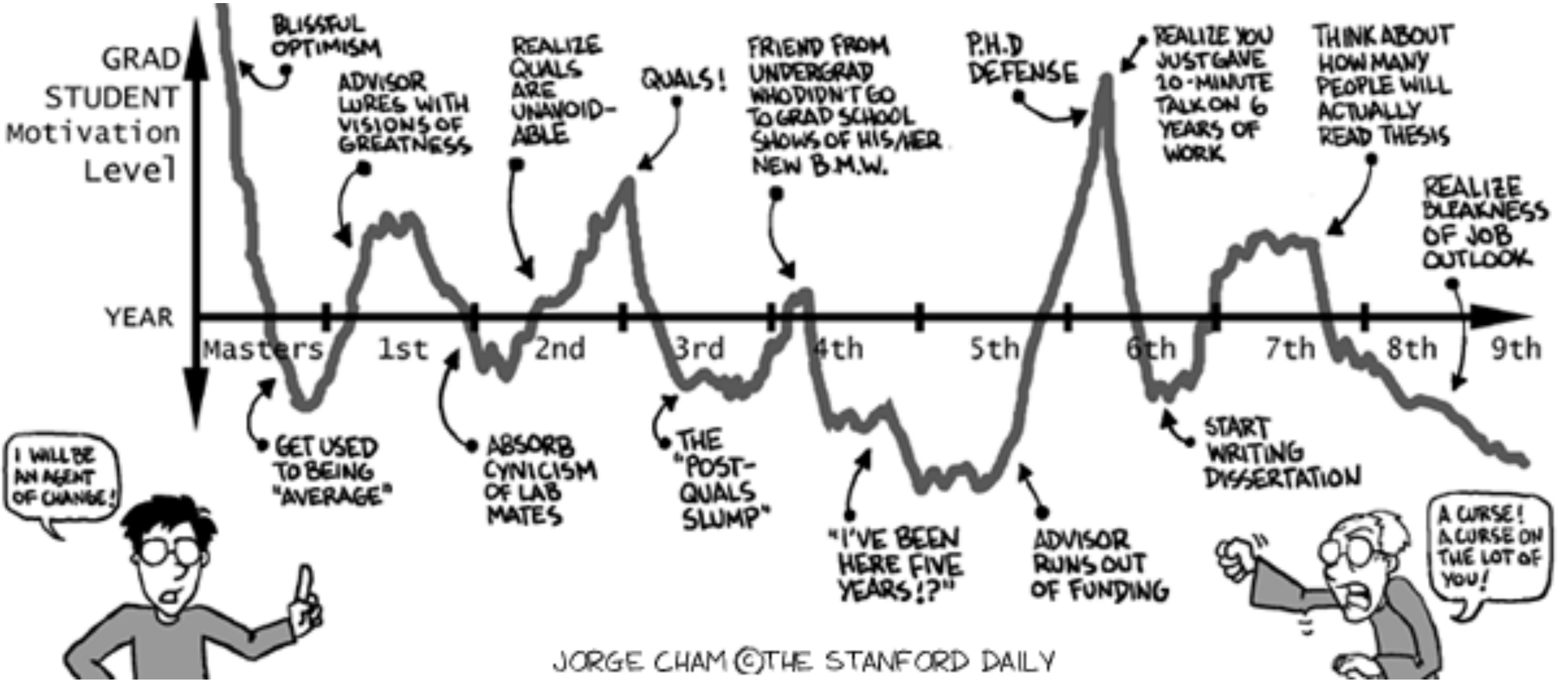
https://www.ets.org/gre

Additional Resources

- Berchenko-Kogan, 2012. "What do grad students in math do all day? Do they just sit at their desk and think?" *Quora*.
- Patterson, 2001. "How to have a bad career in research/academia," *CRA Academic Careers Workshop*.
- Jason Hong's thoughts on breaking away from the undergrad mentality.
- Pain, 2017. "PhD students face significant mental health challenges," *Science Careers.*
- Lord, 2004. "A guide to PhD graduate school: How they keep score in the big leagues," *The Compleat Academic: A Career Guide*.
- Guo, 2006. "Advice for Ph.D. Program Applications," *Personal Website.*
- Chidambaram, 2018. "Useful links for applying to PhD programs," *Personal Website*



Leftover Slides



http://phdcomics.com/comics/archive.php?comicid=125

“Tenured Professor Rogers Talks About: Imposter Syndrome”

“The weather is beautiful today. I took some time to sit outside in between classes.

But even though it was sunny and the people around me looked happy, I was a little sad today. Do you know why I was sad?”

You desperately want to know why he was sad; it is difficult to imagine him being sad about anything.

https://medium.com/@cfiesler/tenured-professor-rogers-talks-about-imposter-syndrome-229e0a546ac1

“Tenured Professor Rogers Talks About: Imposter Syndrome”

“I was a little sad because I had a journal article rejected today. I got the email right before lunch, and it could have ruined my whole day. But do you know what I did?”

He walks over to the table and sits down. “I opened up the document, and then I re-saved it again, this time as ‘revised article.’ Do you know what revised means? It’s just another way of saying ‘even better.’

So now I am writing an even better article. Isn’t that exciting?”

https://medium.com/@cfiesler/tenured-professor-rogers-talks-about-imposter-syndrome-229e0a546ac1