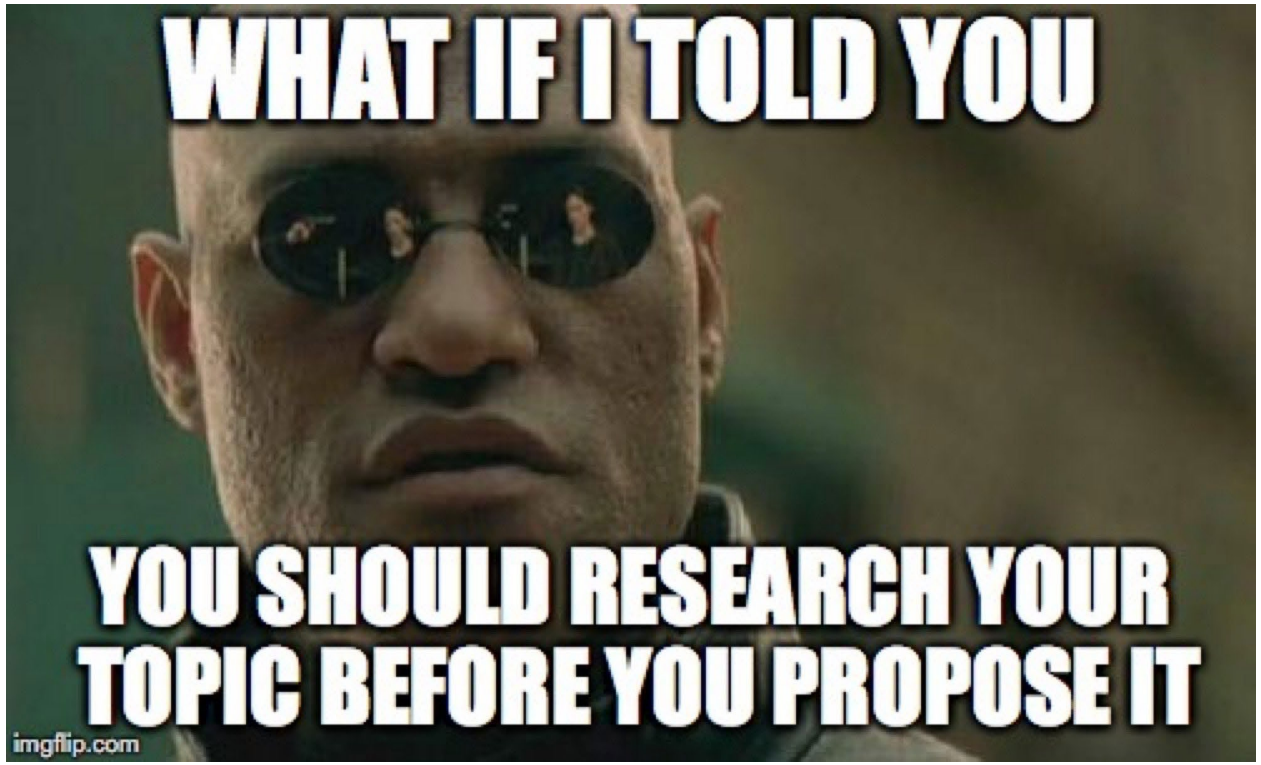
M3D1:
Brainstorm ideas for Research proposal presentation

1. Prelab discussion
2. Discuss research proposal ideas with your co-investigator!



Logistics for Research proposal presentation

- Due date: slides uploaded to Canvas by 12p on presentation date

- Completed with co-investigator (laboratory partner)
- Verbal / visual presentation with 12-minute time limit

- Goal: propose a novel project that involves concepts / techniques from the field of biological engineering

How to choose a topic?

- Should be tangentially related to 20.109 topics / concepts / methods
- Should include aspects of biology- and engineering-based research
- Should *not* be a current UROP project

- **We are engineers: we measure, model, make, manipulate!**
  - Build a biologically-derived device
  - Create a new model system or organism
  - Genetically engineer a new biologically-based technology
  - Use a new method or technology to produce a database that addresses a biologically or environmentally important problem

How to define a research goal?

- Problem-driven
  - I am interested in a problem and want to solve it using a technology based in biological engineering
- Technology-driven
  - I interested in a technology based in biological engineering and I want to apply it to a problem

- Either way your project should generate something tangible!

How to ensure the research goal is novel?

- Look at the most recent discoveries related to your topic
  - What is the most recent advancement?
  - What do other scientists say is a still unanswered question?

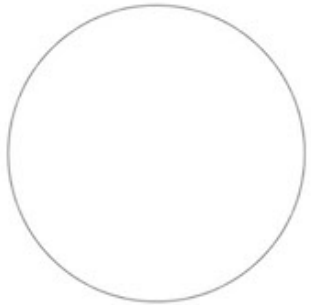
- Review the most recent literature on your topic
  - Read the Discussion/Future Works section to identify knowledge gaps
  - Find review papers as authors will often point to knowledge gaps
  - _____ review [sort by date] - pubmed

- Consider how to fill the knowledge gap!

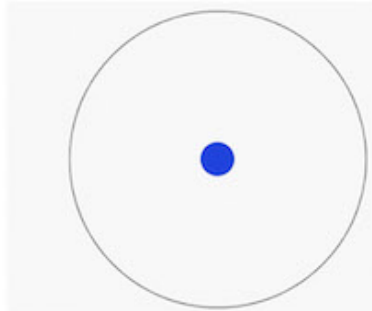
How will the research project be presented?

- What is the research goal?
- How will the research goal be achieved?
  - Provide 2-3 specific aims that address research goal
  - Include specific information on what experiments will be performed
- What are alternative approaches for key experimental steps?
- What are the ethical implications of experiments / research outcome?

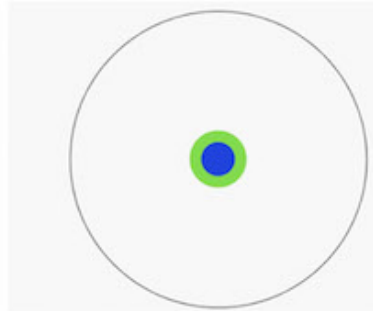
Imagine a circle that contains all of human knowledge:



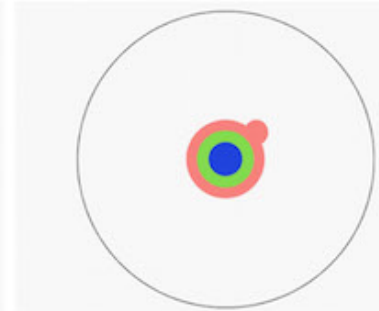
By the time you finish elementary school, you know a little:



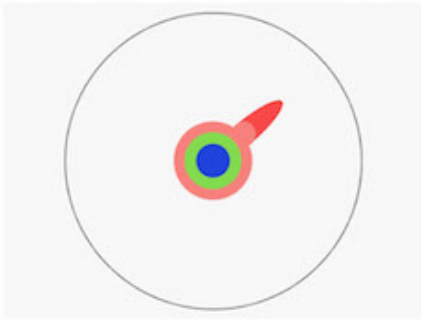
By the time you finish high school, you know a bit more:



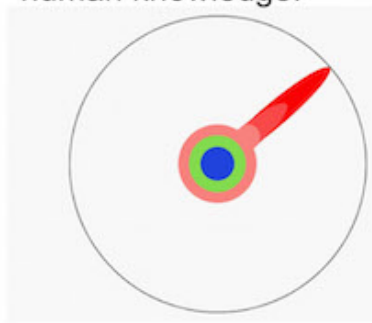
With a bachelor's degree, you gain a specialty:



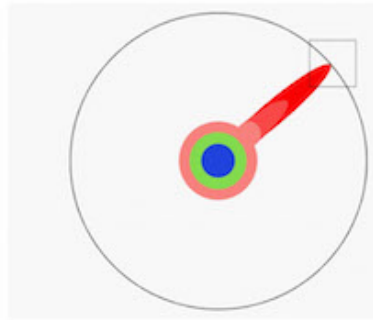
A master's degree deepens that specialty:



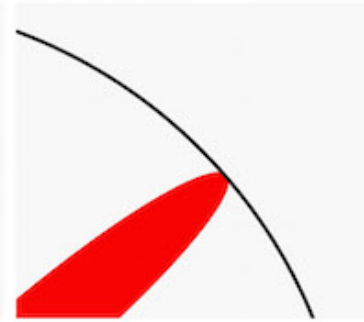
Reading research papers takes you to the edge of human knowledge:



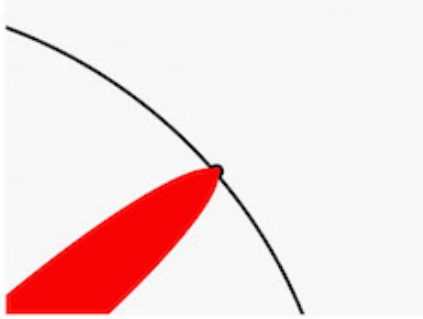
Once you're at the boundary, you focus:



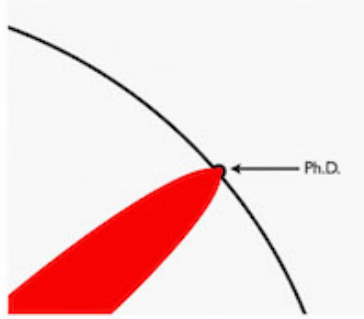
You push at the boundary for a few years:



Until one day, the boundary gives way:

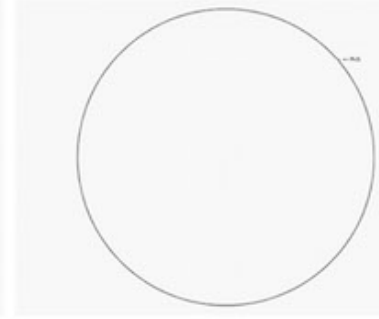


And, that dent you've made is called a Ph.D.:



Of course, the world looks different to you now:

So, don't forget the bigger picture:



Keep pushing.

For today…

- Discuss common interests with your co-investigator
- Draft the research question / goal for your project

For M3D2…

- Answer question prompts about your project
- Prepare 3-5-minute pitch that you will present in the next laboratory session
  - No visuals, just a brief explanation of the research goal and how your project will address the research goal.