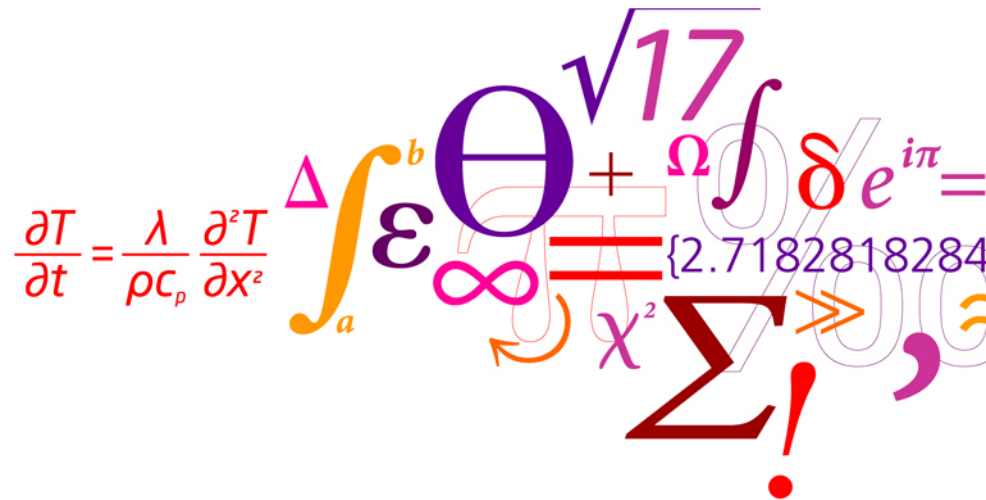


Research and Project Writing

An introduction to MSc Thesis Writing at DTU Civil Engineering



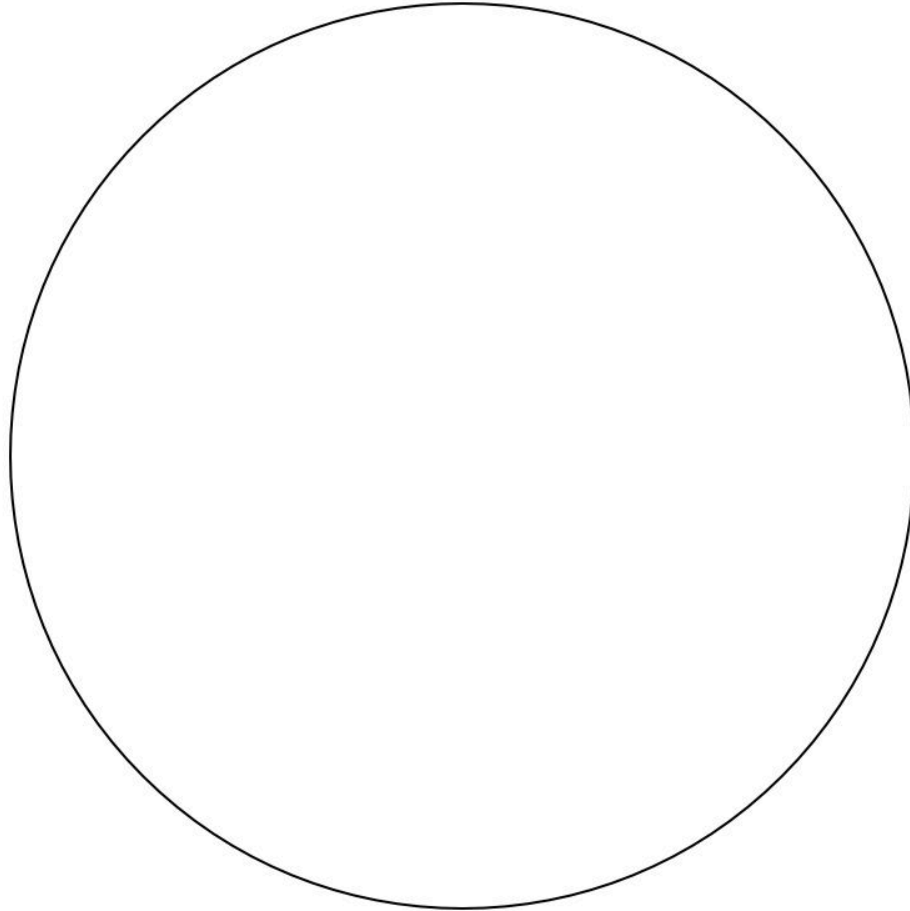
Writing your thesis

"...the only difference between Science and screwing around is writing it down."

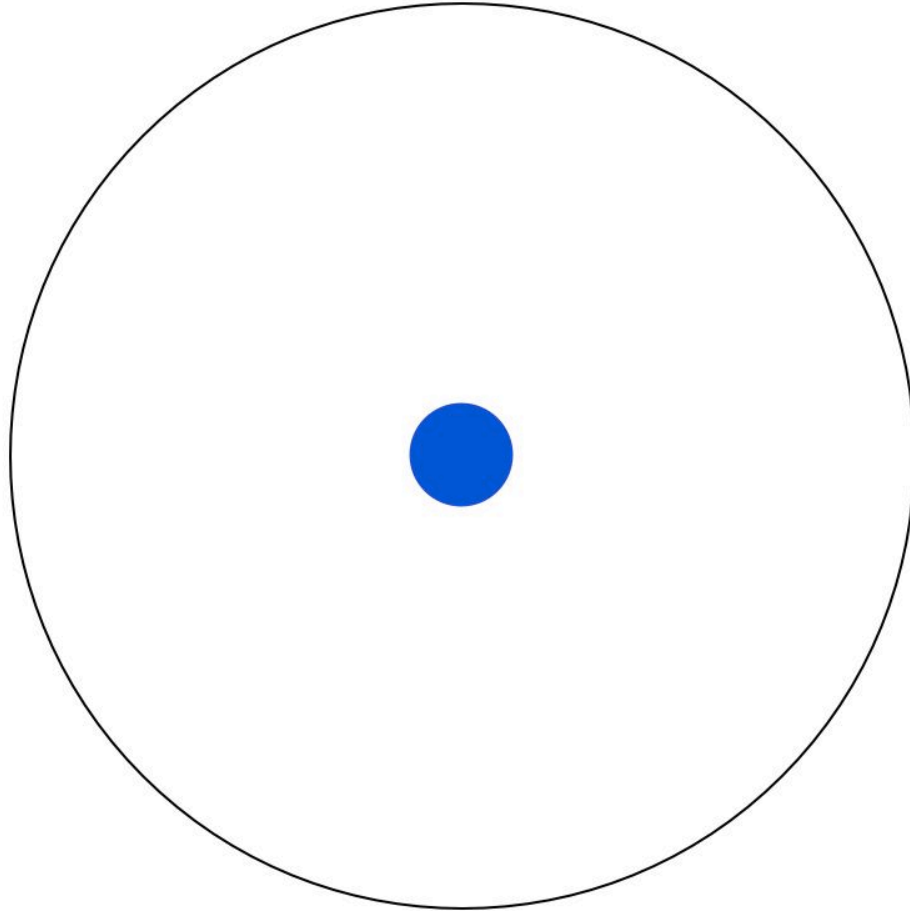
- *Adam Savage*



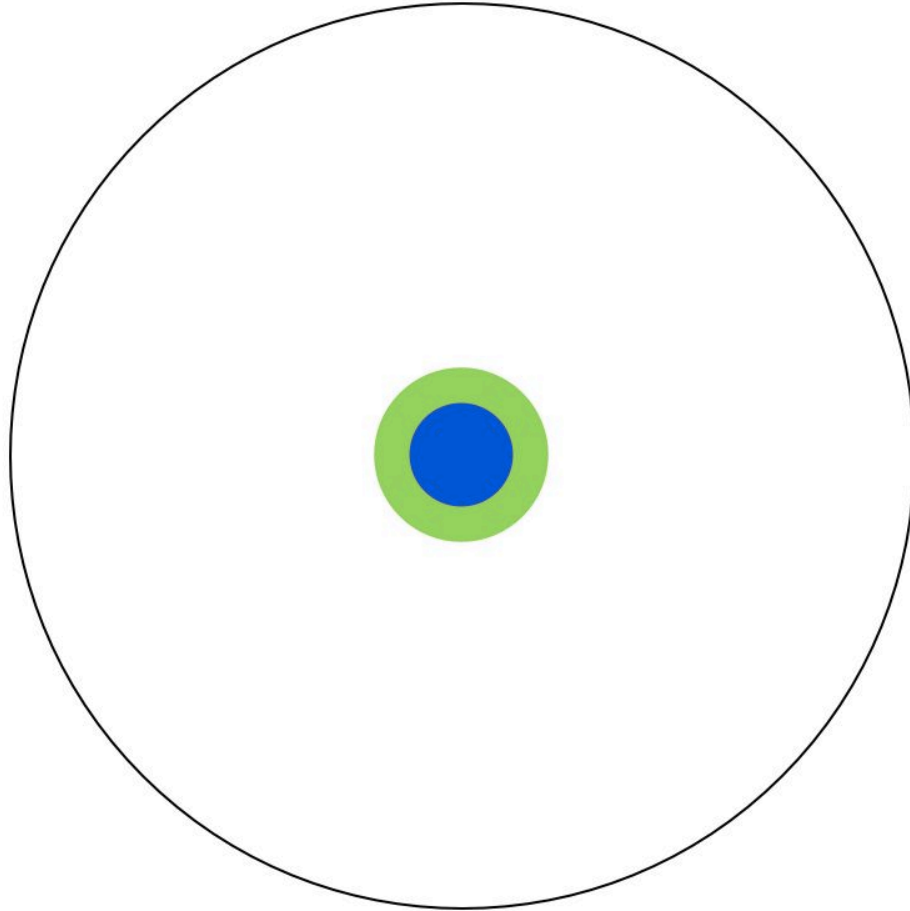
Imagine a circle that contains all of human knowledge



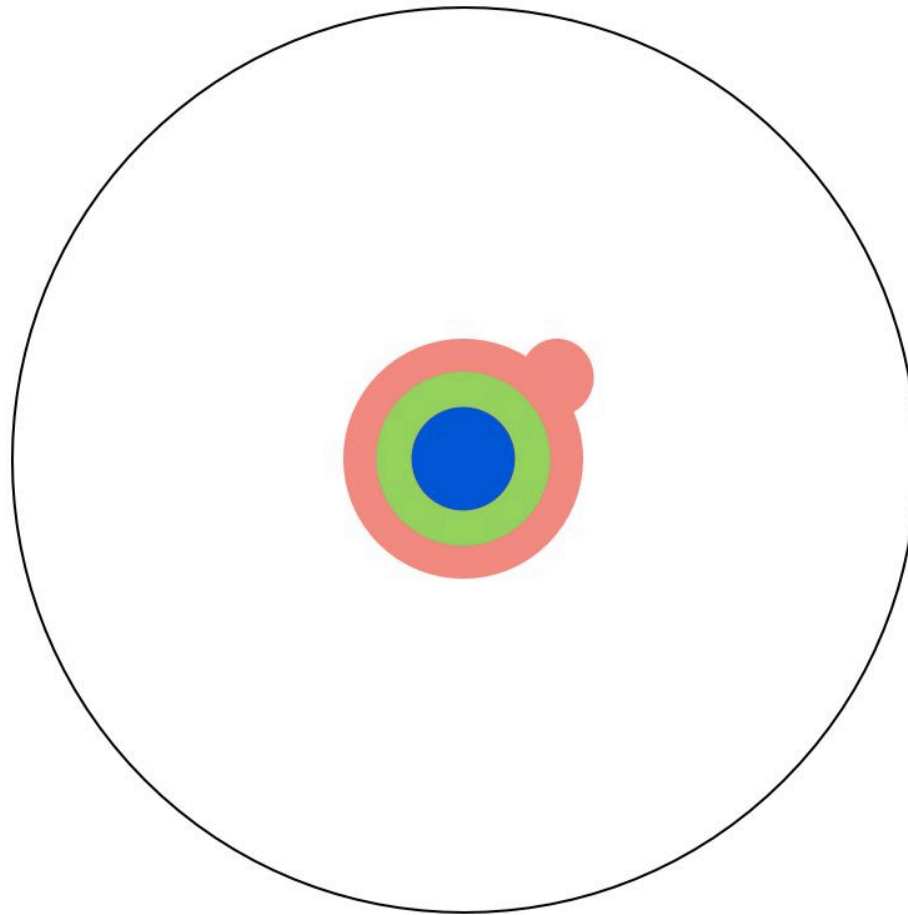
By the time you finish elementary school, you know a little



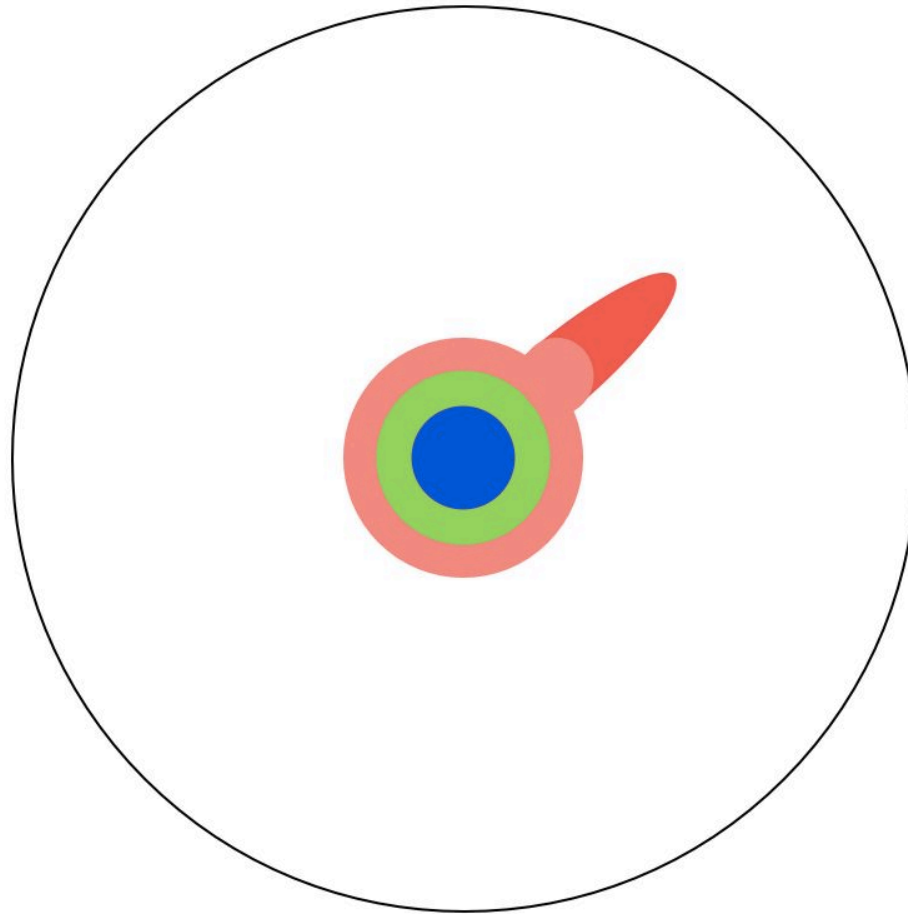
**By the time you finish high school,
you know a bit more**



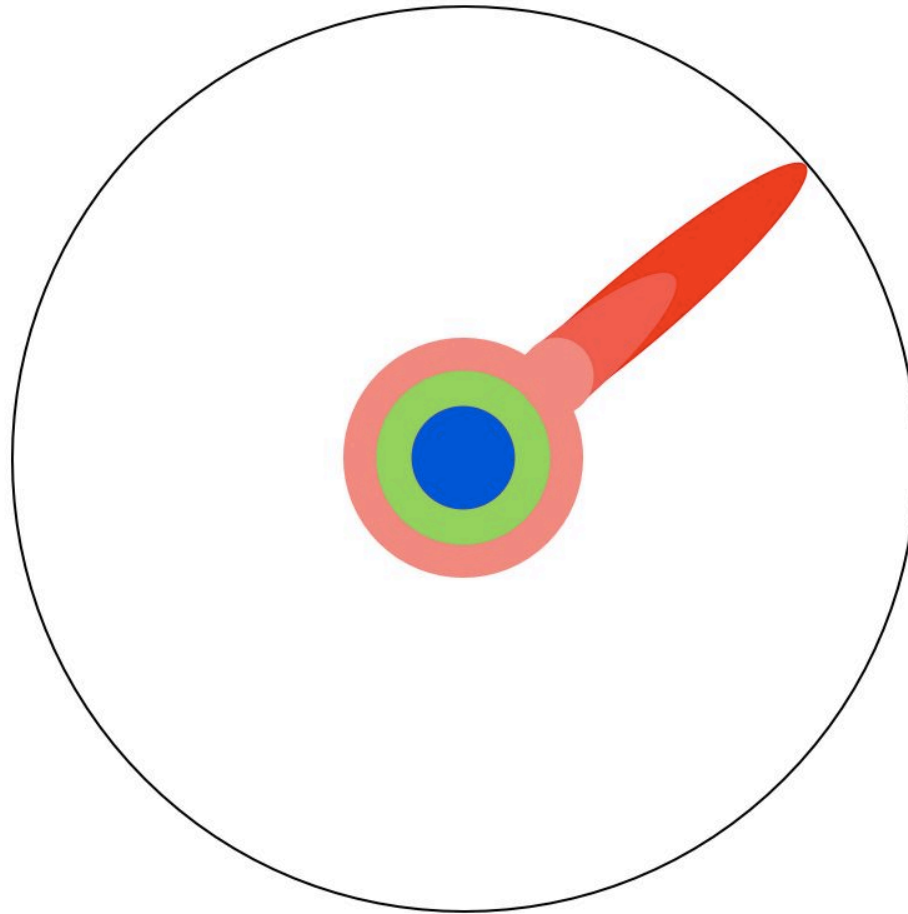
With a bachelor's degree, you gain a specialty



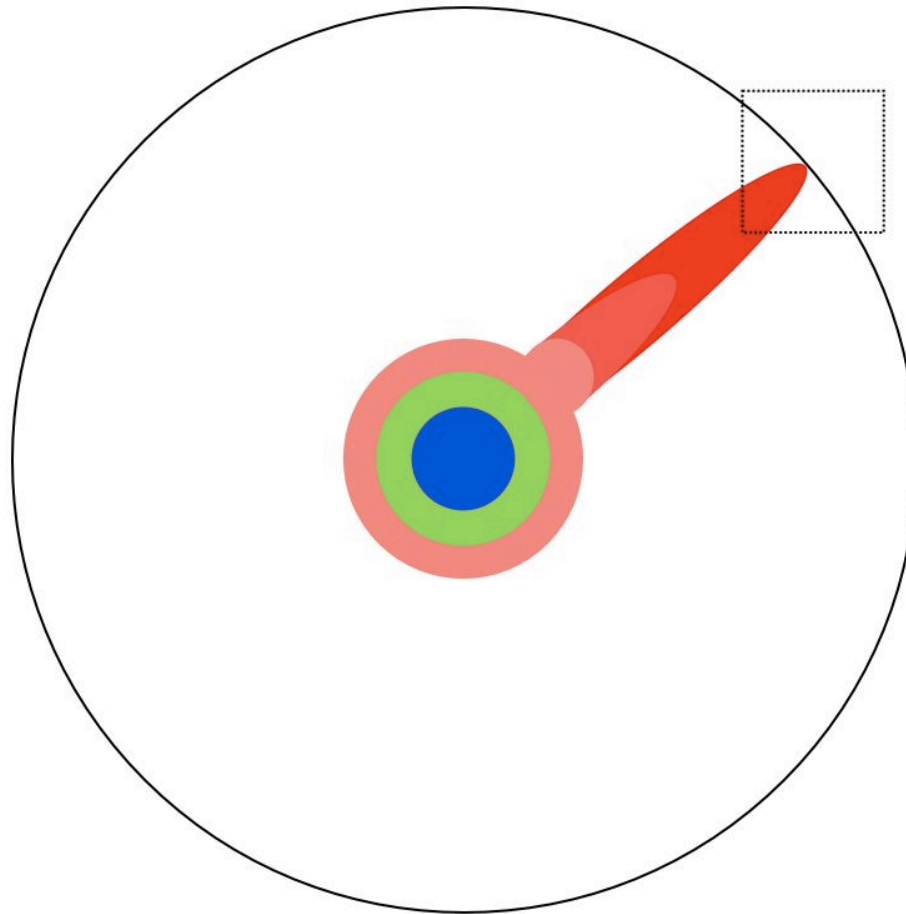
Your MSc studies extends that specialty



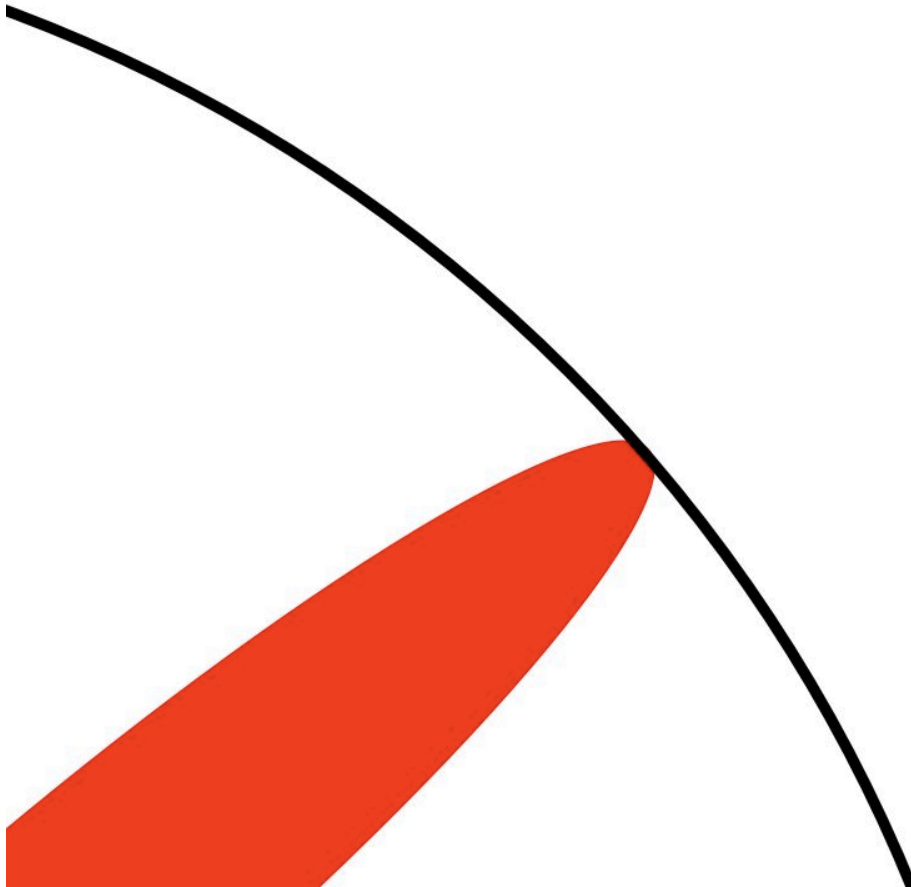
Reading research papers takes you to the edge of human knowledge



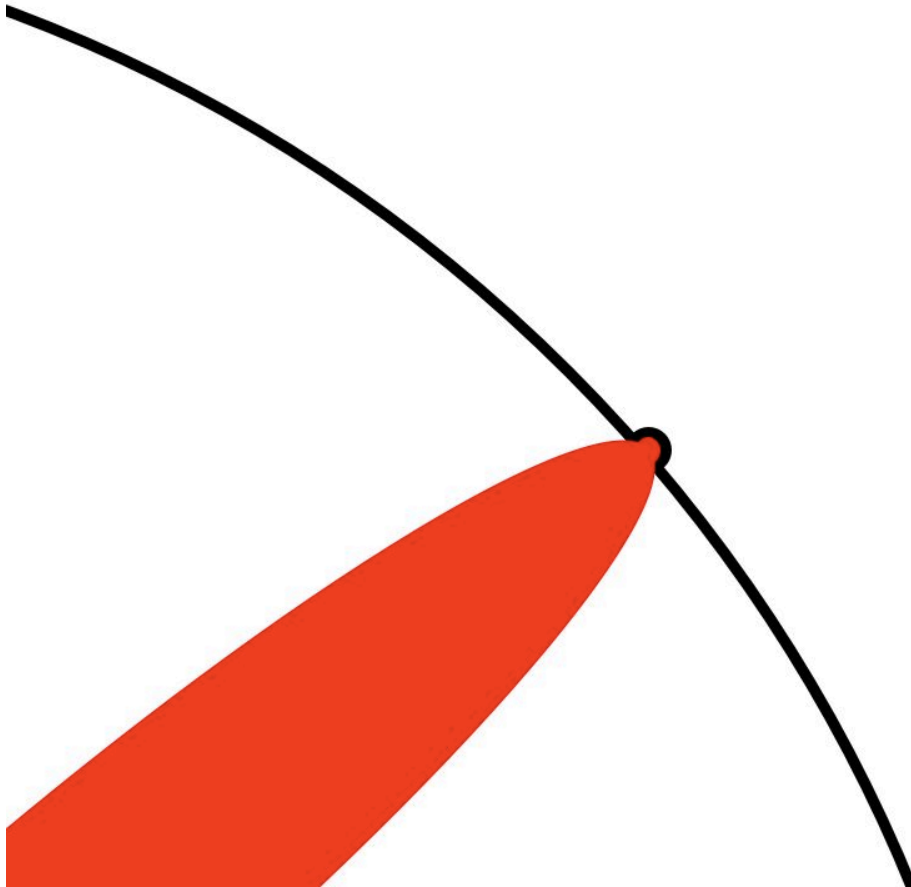
Once you're at the boundary, you focus



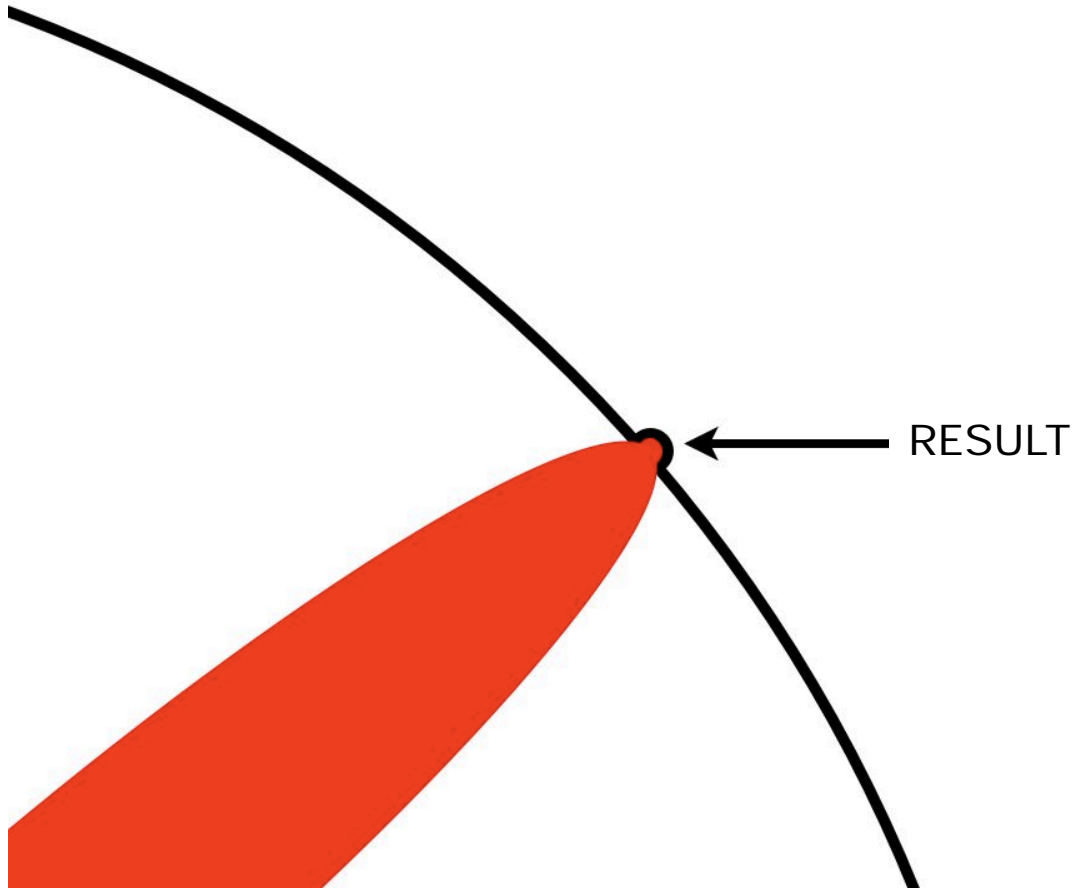
You push at the boundary for some time



Until one day, the boundary gives way



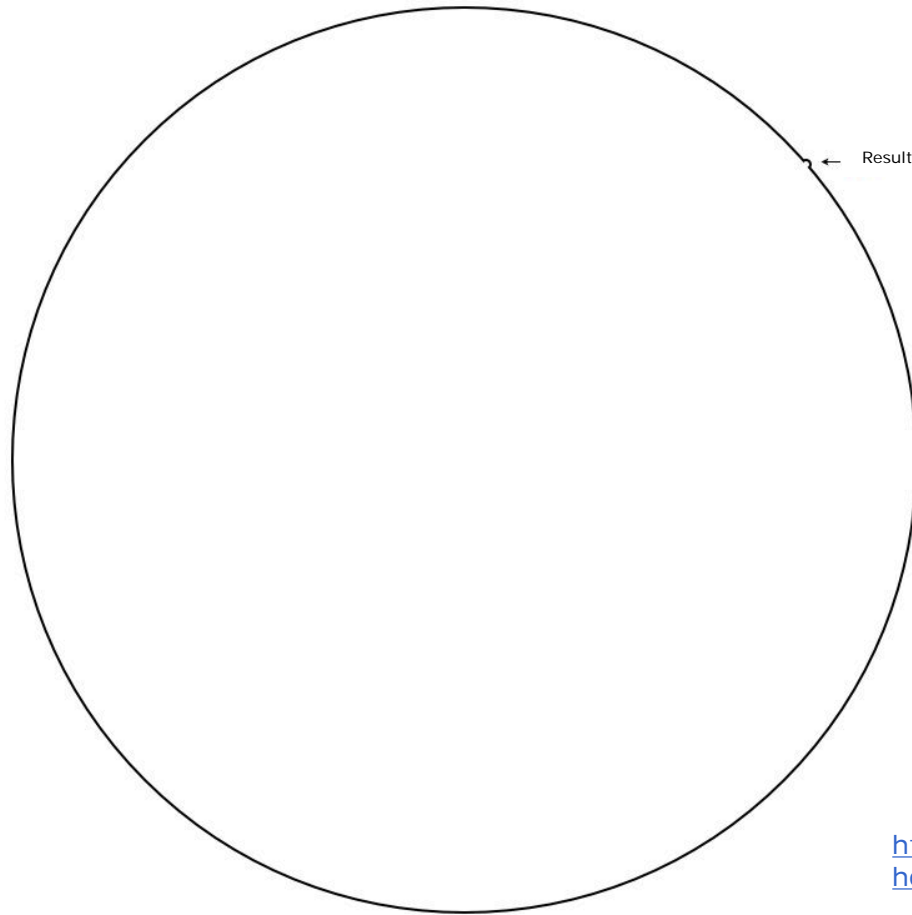
**And, that dent you've made is called a
RESULT**



**Of course, the world looks different to
you now**

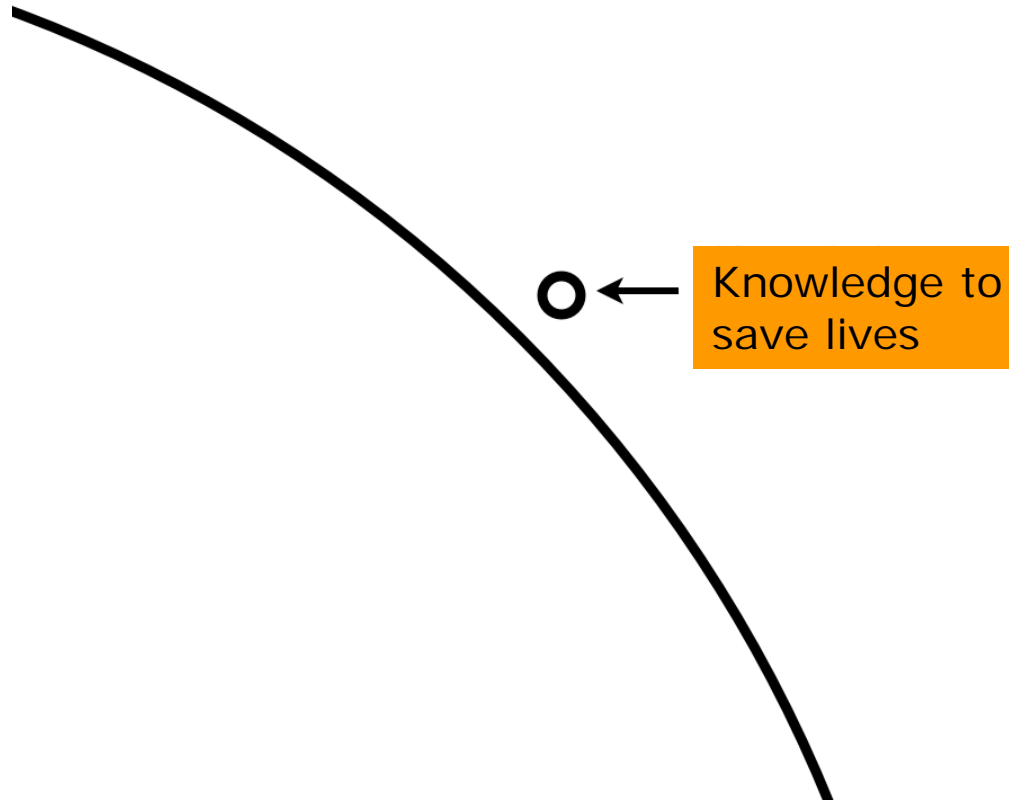


So, don't forget the bigger picture – Keep Working!



<http://matt.might.net/articles/p-hd-school-in-pictures/>

Keep Pushing – your new knowledge makes a difference



<http://matt.might.net/>

Research

$$\frac{\partial T}{\partial t} = \frac{\lambda}{\rho c_p} \frac{\partial^2 T}{\partial x^2}$$

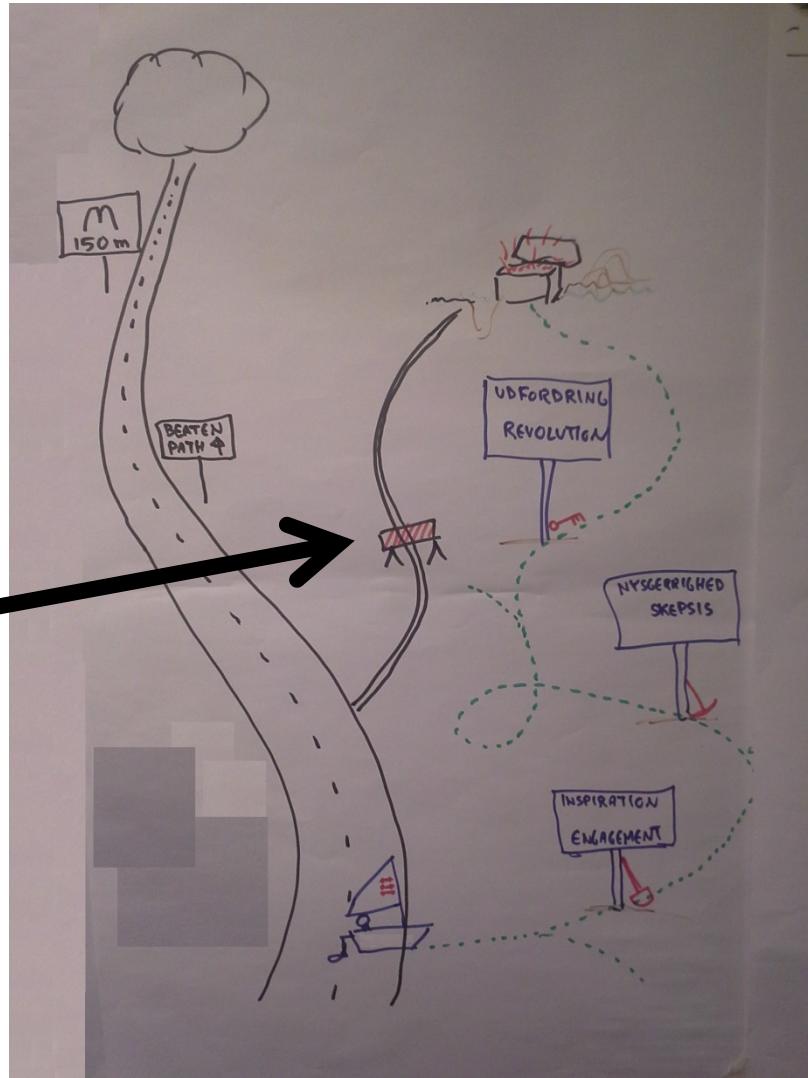
What is research?

In the broadest terms, we do research whenever we **gather information** to **answer a question** that **solves a problem**

It has to be ORIGINAL

Dare to sail in the open!

Avoid the narrow road that appears very direct – it may have single failure modes!



Planning your project

1. Find a topic specific enough to let you master a reasonable amount of information on it in the time you have.
2. Question that topic until you find questions that catch your interest.
3. Determine the kind of evidence your readers will expect you to offer in support of your answer.
4. Determine whether you can find those data. There is no point starting research on a topic until you know you have a good chance of finding data on it.

Be careful not to select a question that may **only intrigue you**.

Problem Identification

Your aim is to explain

1. what you are writing about – *I am working on the topic of...*
2. what you do not know about it – *because I want to find out...*
3. Why you want your reader to know and care about it – *in order to help my readers understand better...*

Distinguish practical and research problems

“Too many researchers at all levels write as if their only task is to answer a question that interests them alone.”

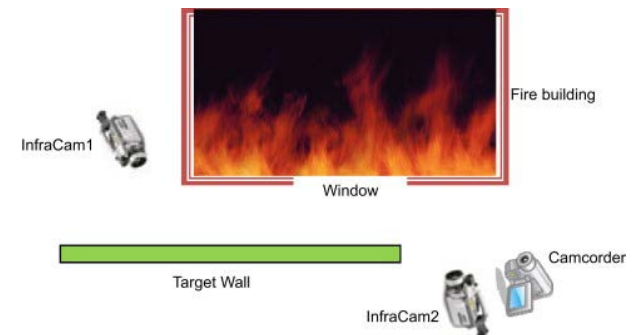
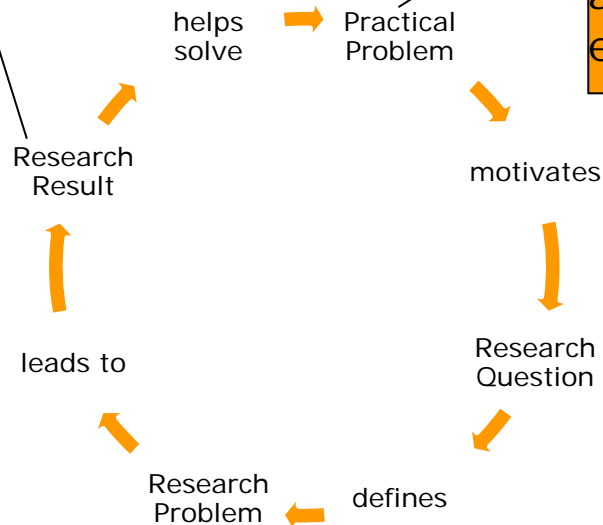
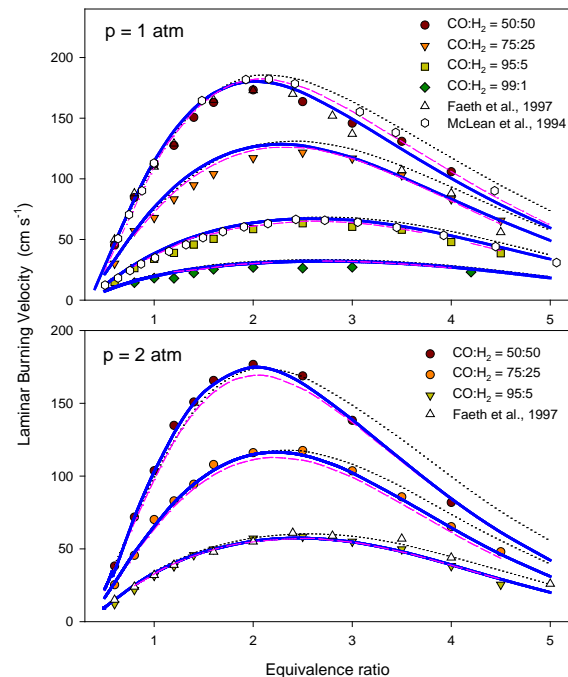


“Solving a problem for a company is not necessarily RESEARCH. Most often it is DEVELOPMENT.”

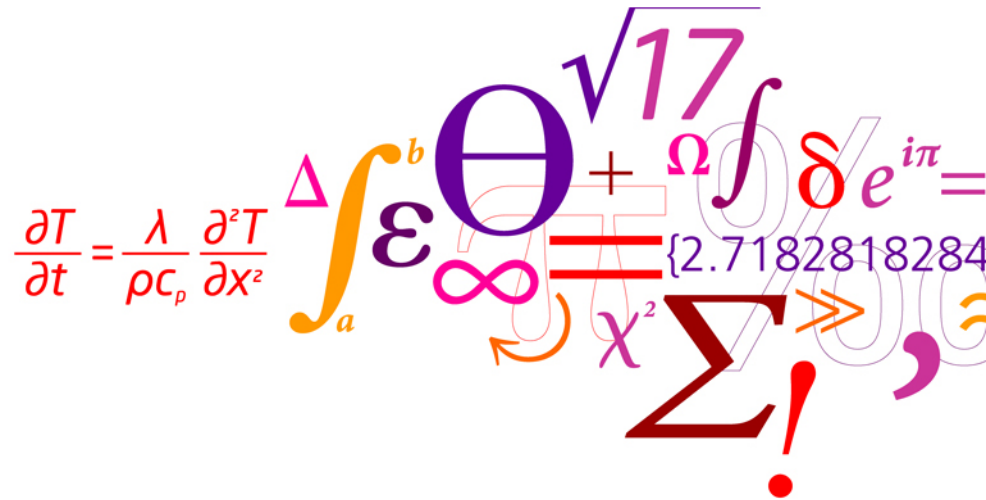
The difference between answers and results

The research **RESULT** can be used to answer many future practical questions, provided that the problem has been properly identified, **AND** the plots have the correct parameters on the x-axis and the y-axis

Solving a practical problem creates an **ANSWER**, and we thus easily end up with a lot of answers – one for each problem.



The Report



A collage of mathematical symbols and formulas, including:

- $\frac{\partial T}{\partial t} = \frac{\lambda}{\rho c_p} \frac{\partial^2 T}{\partial x^2}$
- $\int_a^b \epsilon \Theta$
- Δ
- ∞
- $\sqrt{17}$
- Ω
- $\int \delta e^{i\pi} =$
- $\{2.7182818284\}$
- χ^2
- Σ
- $!$
- $>$
- $,$

Reasons for writing a research report

1. You have new and interesting information
2. You have found a solution to an important practical problem
3. You have found the answer to an important question

Report Structure

- Abstract
- 1. Introduction
- 2. Experimental Set-Up/Numerical Method/Data collection scheme/Theoretical Derivations

3. Results

- 4. Discussion/Perspectives
- 5. Conclusion (and future work)
- References
 - **Look at citations to get to the most current papers**
 - There is a **significant difference** between a **source** and a **reference**

Writing Tips

- Topic Sentence
(<http://www.writingcentre.uottawa.ca/hypergrammar/partopic.html>) so that the reader will know what this particular paragraph is about.
- Transition Words (<https://www.msu.edu/~jdowell/135/transw.html>)
- There should be no surprises in the text. You are presenting results for an audience that is interested in your particular findings, and it should be clear throughout, all the way from the Abstract to the Conclusion, what your work is about.
- Think of who your **audience** is (other than the censor and the supervisor) and write in a style and complexity that is suitable for them. It should neither be too simple nor too difficult.
- Get the units and their format right:
 - <http://www.nist.gov/pml/pubs/sp811/index.cfm>

Create clear and nice figures with caption

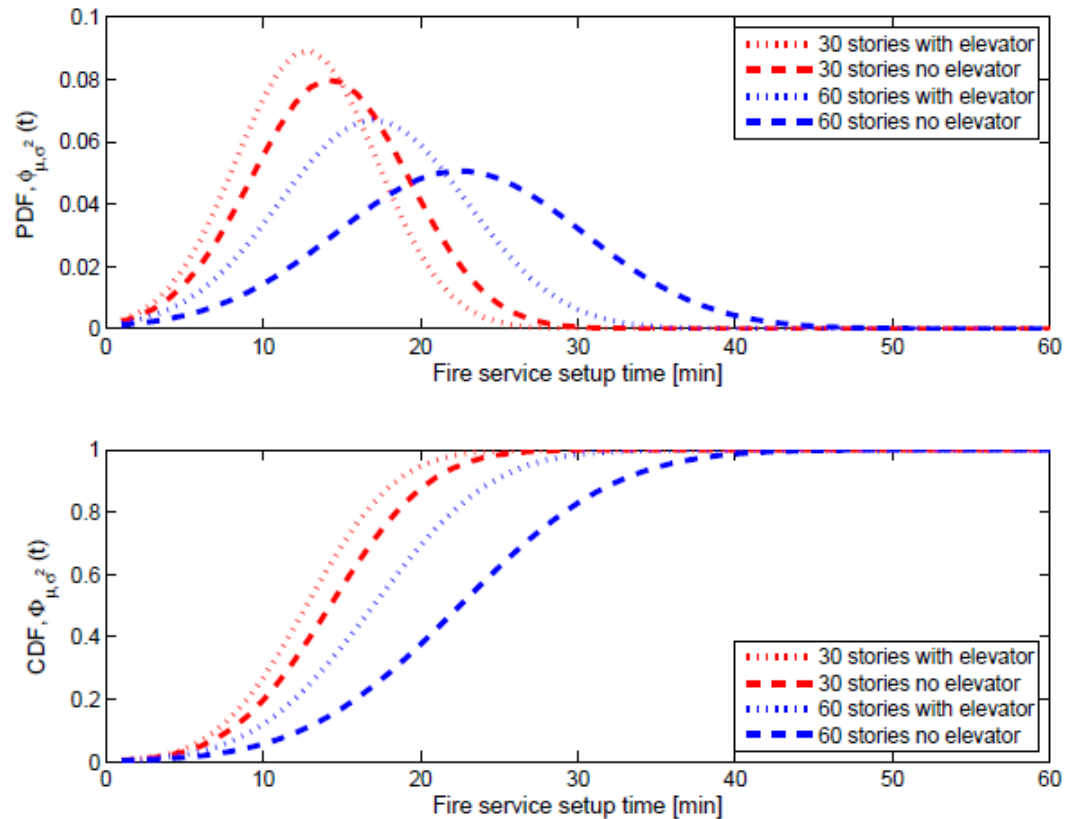
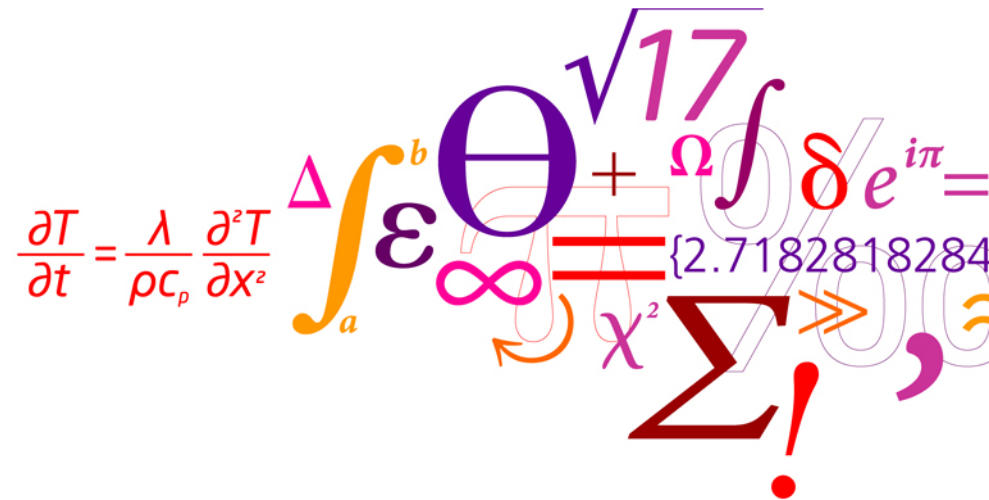


Figure 2.22: Top: Probability density functions. Bottom: Cumulative density functions for setup time in a 30-storey and a 60-storey building. $t=0$ corresponds to time of arrival.

Some words of wisdom – followed by practical information



The Craft of Research

http://www.amazon.com/Research-Edition-Chicago-Writing-Publishing/dp/0226065669/ref=la_B000APH4FY_1_1?ie=UTF8&qid=1346010816&sr=1-1

- You will struggle with your project if you do not know what readers look for in a final report.
- You should think of your project not as solitary work, but as a conversation with sources whose work you read and with those who will in turn read your work.
- No place is more filled with imaginary voices than a library or a lab.
- Sometimes new data alone are enough to interest the right readers. But if you hope to write anything that interests anyone but a tiny group of specialists, you will have offer more than *some new stuff*.
- If a writer asks no specific question worth asking, he/she cannot offer a specific answer worth supporting.
- You cannot use specific ideas (plagiarism), but you do not plagiarize a source when you borrow its logic. Do not worry that your argument will be unoriginal. The logic of a research argument is rarely original. Readers will look for originality in your problem, claim and evidence.
- It is not “research” when you uncritically summarize another person’s work.
- Beginners typically offer too little evidence. They think they prove a claim with one quotation, one number or one personal experience.
 - **An example is not EVIDENCE, even though journalists thinks so**

Manage the unavoidable problem of inexperience

We all feel anxious when we start work in a field whose basic rules we do not entirely understand.

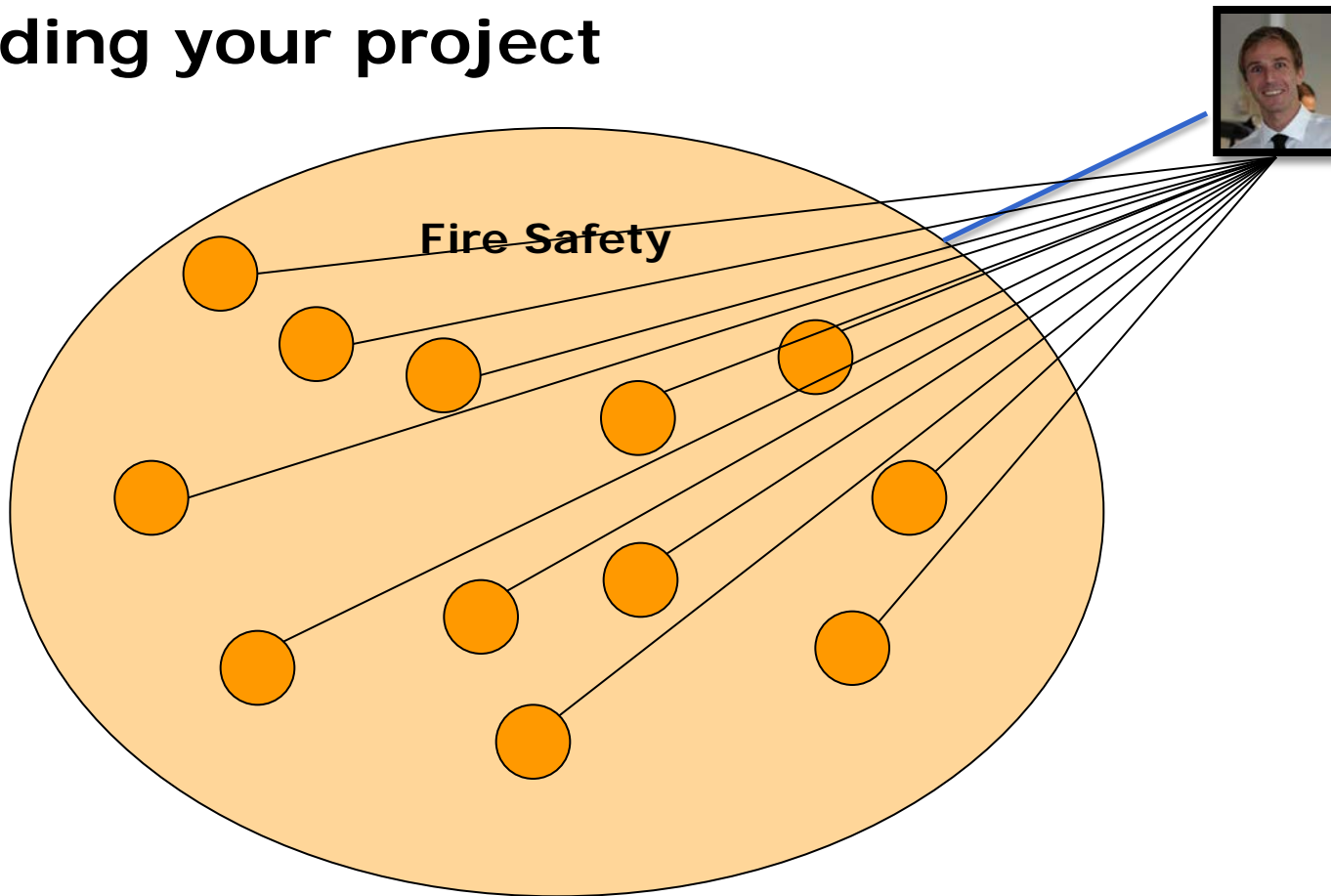
- Know that uncertainty and anxiety are natural and inevitable. Those feelings do not signal incompetence, only inexperience.
- Get control over your topic by writing about it along the way.
- Break the task into manageable steps.
- Count on your advisers to understand your struggles. We want you to succeed, and you can expect our help.
- Set realistic goals.
- Most important, recognize the struggle for what it is – A LEARNING EXPERIENCE

How to proceed?:

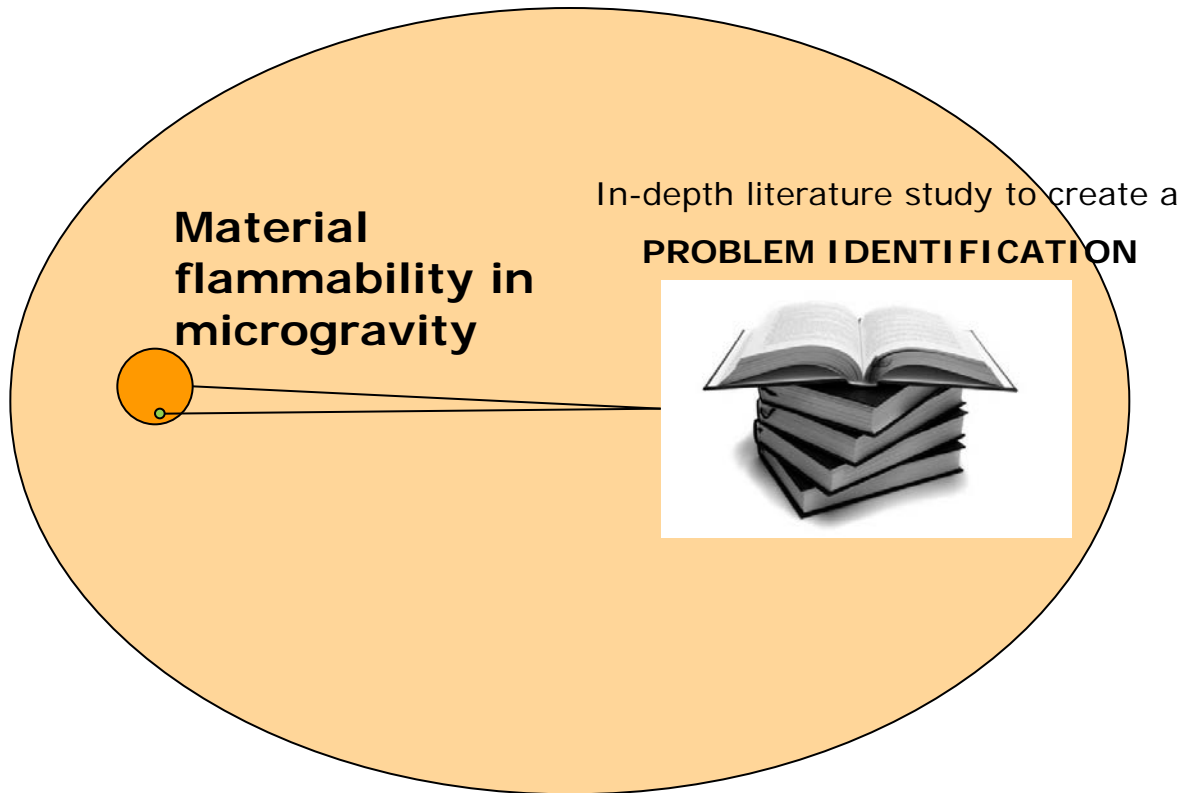
1. The Master thesis is **the final assignment** of the MSc course of study
2. Find a subject area of interest
 - i. Each Section at DTU Civil Engineering has a Project Catalogue
 - <http://www.se.byg.dtu.dk/Education>
 - <http://www.bfi.byg.dtu.dk/english>
 - <http://www.geotechnics.byg.dtu.dk/Education/Student-Projects>
 - ...
 - ii. There are project descriptions in a folder on CampusNet
3. Contact a supervisor within that research area
 - i. DTU Civil Engineering
 - ii. DTU Mechanical Engineering
 - iii. DTU Management Engineering
 - iv. ...
4. Discuss with the prospective supervisor if collaboration with a company is relevant

Thesis supervisor

Finding your project



Finding your project



Thanks to [Jacob Berg Johansen](#) for the last few slides

How to select a supervisor?

- Identify supervisor candidates
 - Good teachers
 - Professor that made an interesting talks
 - Interesting research area
- Look at their [HOMEPAGE](#)
 - Research
 - Publications
 - Research group
 - Previous supervision

How to approach a potential supervisor

- Write a mail
 - Who you are and where you know the supervisor from
 - Which courses have you taken and how did it approximately go
 - What do you want to do and why do you ask this supervisor?
 - Project start
 - Number of ECTS points
 - Relevant experience (Bsc/Msc/special course)
 - Do you have available projects or suggestions?
 - Can we meet?
- It is ok to "shop around" – but not too much and do not skip the project in the last moment

Due diligence for project selection

- Is the project a part of a larger research project? (+)
- Is it possible to be co-supervised by a PhD student? (+ +)
- Is it realistic to write a scientific article? (+)
- What kind of supervision can you expect?
- How much supervision can you expect?
- How many student do the supervisor have?
- Can you get some articles describing the project background?
- Are the necessary data in place and can you get them?
- Are the experimental rig and the needed equipment and material in place?
- Does DTU have the needed program licenses?
- How much manual work is expected?

Thanks to [Rasmus Paulsen](#) for the last few slides

Writing ABROAD is an option

- Collaborators
 - Companies
 - Other students
 - Other universities
- Experiments
- Supervisor involvement
 - Number of meetings
 - Deadlines
 - Report sections
- Expectations
 - Size of thesis
 - Language
 - Workflow



Timeline:

1. About 3-6 months before starting the project
 - i. Think about topics that you find interesting
 - ii. Do you want to write with a company?
2. No later than 3 months before anticipated starting date
 - i. Establish contact with a relevant supervisor
3. About 1-2 months before anticipated starting date
 - i. Start working on the project formulation
 - ii. Find the starting date with your supervisor
 - **NEW DTU RULES ABOUT STARTING DATES:**
 - **First working day of January or August**
 - **Read: <http://sdb.dtu.dk/2014/5/44>**
4. About 1 month before the anticipated starting date
 - i. Submit the signed project registration form (**electronically**)

How to register the project?:

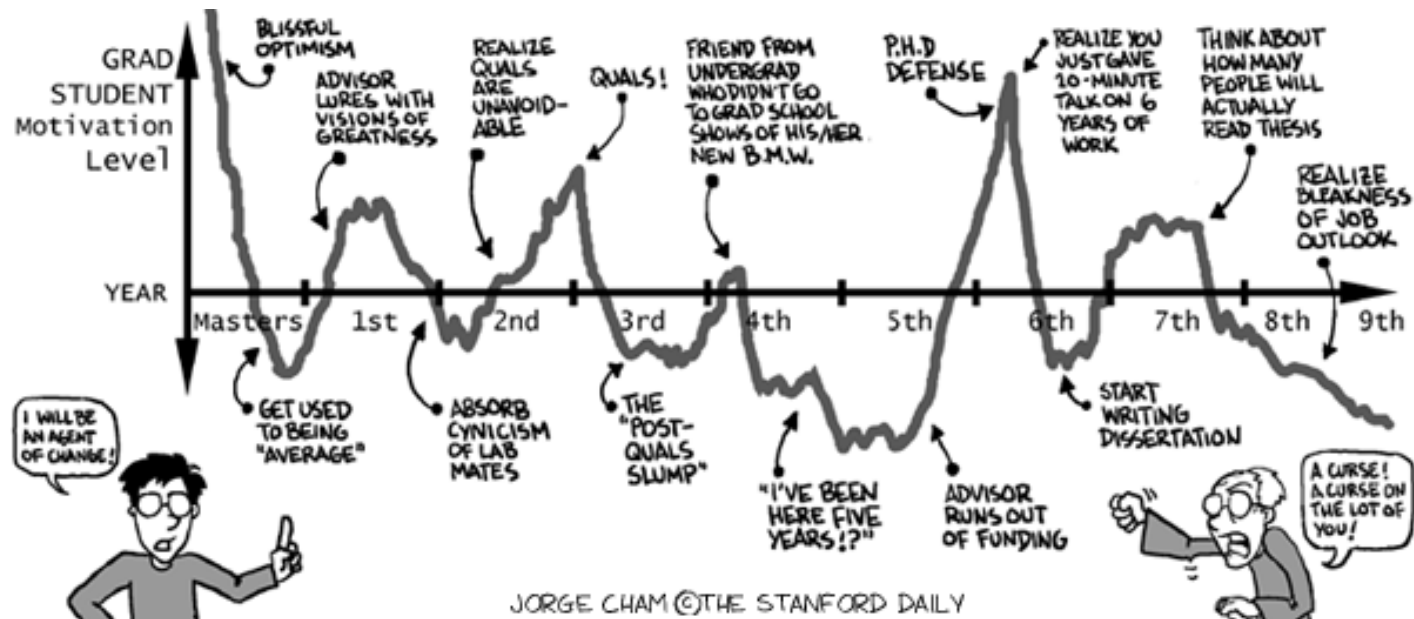
1. Information and the registration form can be found here:
 - i. http://www.dtu.dk/english/Education/msc/Programmes/civil_engineering#study_programme
 - ii. **The form has to be completed and approved BEFORE you start your project (see next slide)**
2. There is no vacation added
3. The writing and presentation language is English
4. Describe the project in detail (experimental, numerical or theoretical work?) and **Identify the relevance and importance of the project**

Project Process

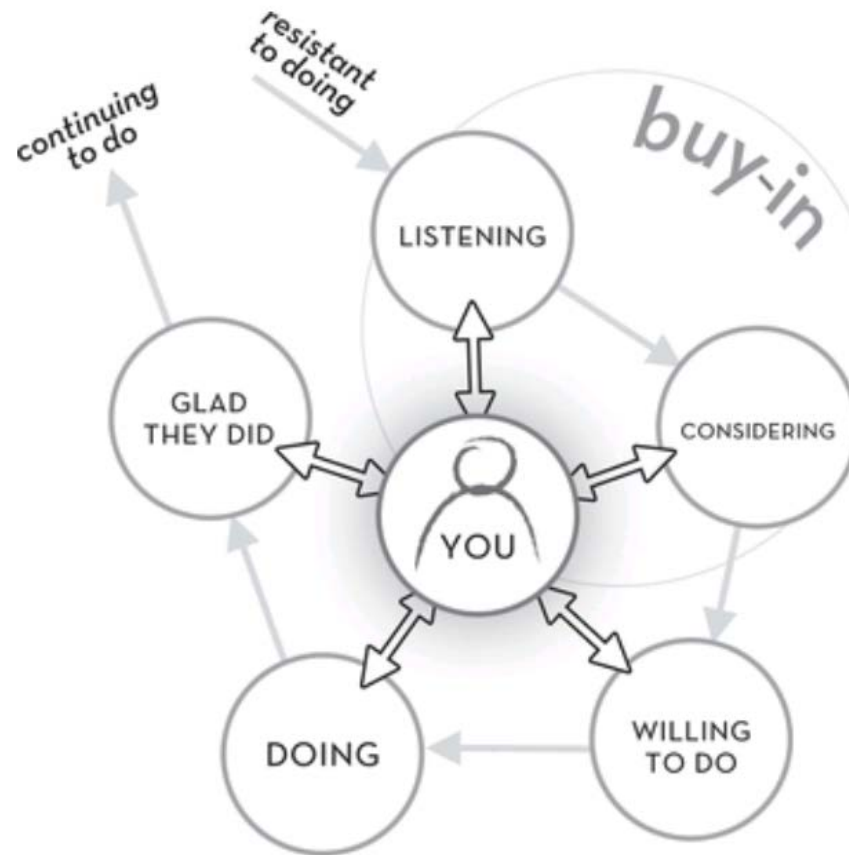
- Learn about the topic
 - Literature search and reading (based on articles supplied by the supervisor)
- Start a report from day one
 - Reference manager : Bibtex, Endnote, RefWorks, Mendeley...
- Write the introduction and problem statement very early
 - At the latest three weeks after project start
- Do not start coding/welding/mixing/experimenting
 - Before your problem statement is clearly written

Project completion:

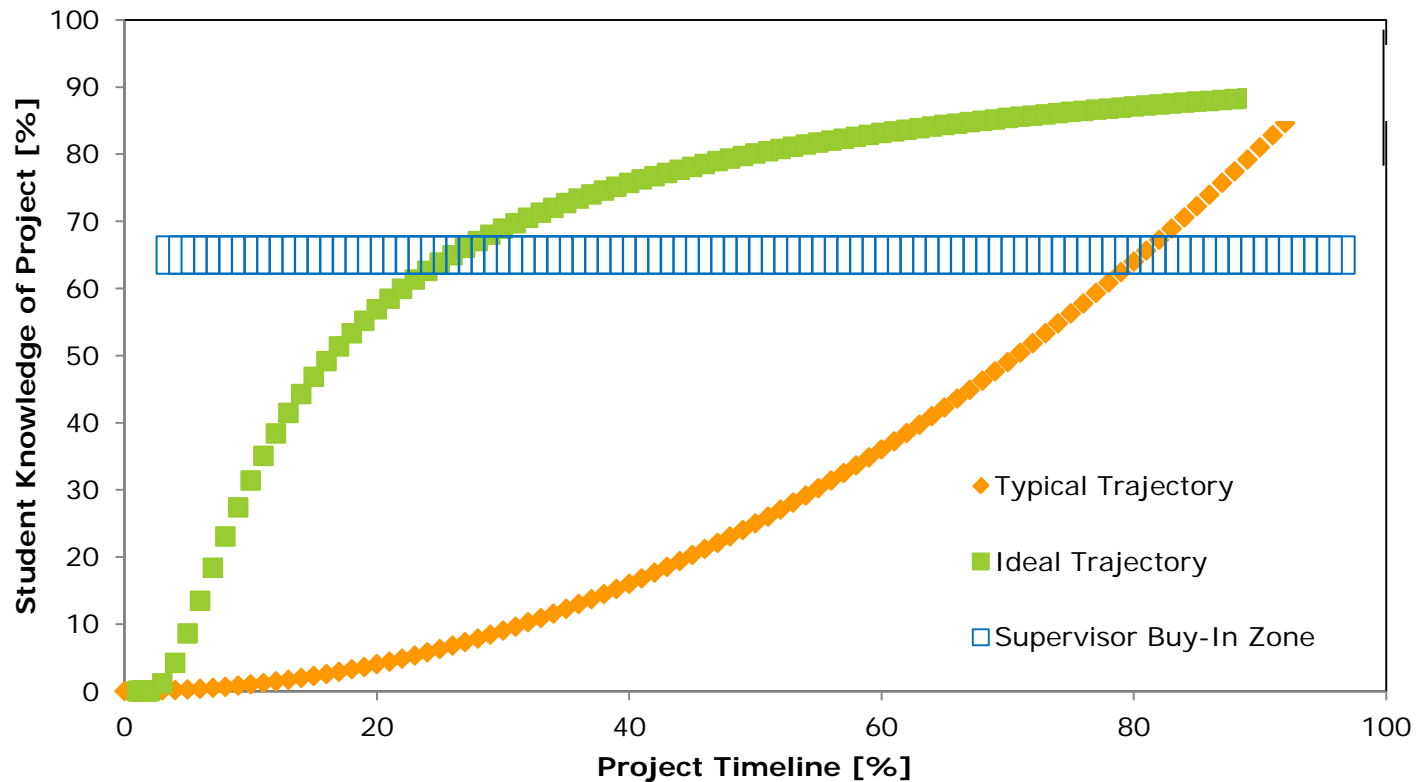
1. Start working right away and work full time from the first day.
2. Schedule regular meetings with your supervisor (contact your Head of Studies if this is not possible)
3. Talk with friends that are also writing their thesis
4. Hand-in on time via CampusNet
5. Present no more than 2 weeks after (except in the summer, when it is a prolonged period) the completion date (ca. 20 minutes presentation in English assisted with slides)



The Importance of Getting Started



Supervisors have a Buy-In Zone



A Very Important Thing to Remember!

- The grade is solely based on the delivered written work – the report!
- No matter
 - How nice you are
 - How much data you have gathered
 - How much manual work you have done
- It is the documentation and written presentation of all this that counts!

