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## The Art of Doing a PhD

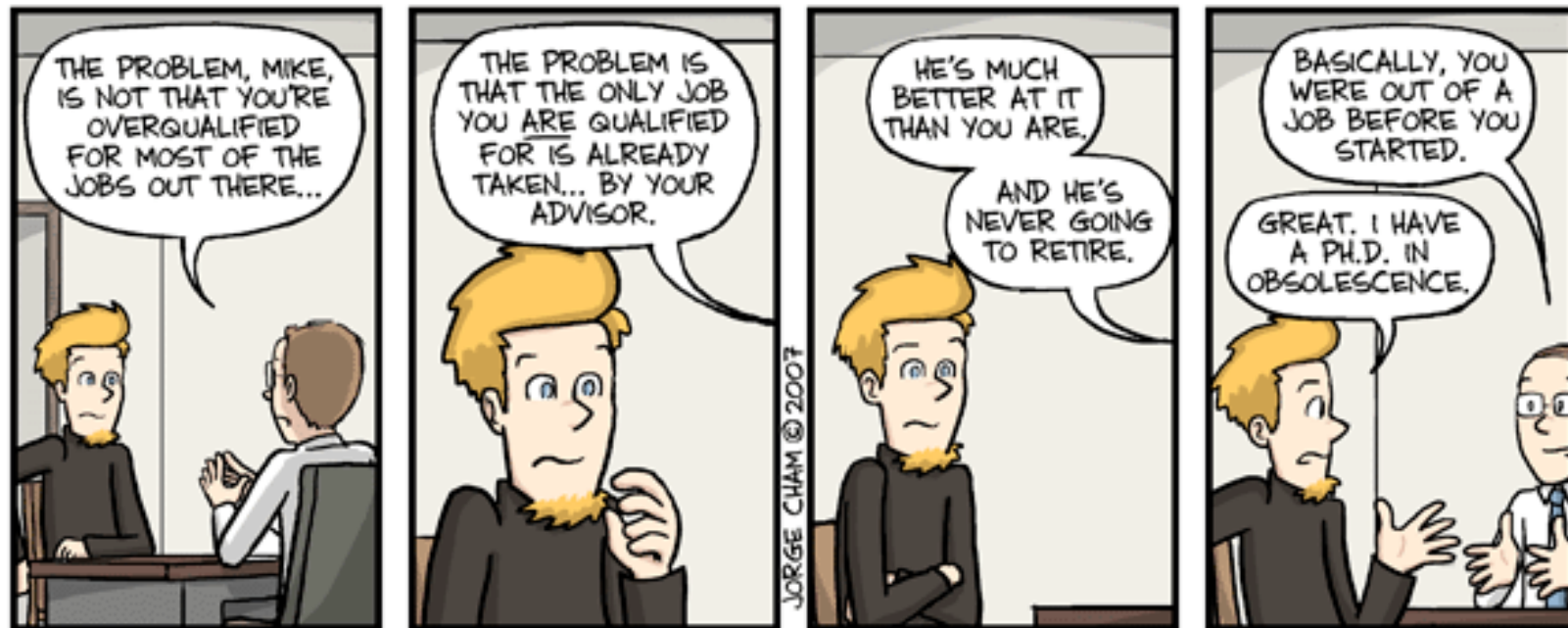
Jakob E. Bardram



- *The Feynman Problem Solving Algorithm:*
  - 1) Write down the problem.
  - 2) Think very hard.
  - 3) Write down the solution.
- Getting a PhD
  - “It's like teaching swimming by tossing students into the deep end of the pool and seeing who makes it to the other end alive and who drowns.” [Ronald T. Azuma]

- Motivation & Compensation
  - Do you really want to be a PhD?
  - Where will it take you?
- The “Fish” Model
  - Overall approach
  - Important milestones
- Where do good ideas come from?
  - ... and what is a “good idea” anyway?
  - ... and what is “plagiarism” by the way?
- Literature review
- How to write a thesis
  - We will make one within the next hour!
- How to referee
- ... and a list of things that there is no time to cover this time

# Why get at PhD?



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# Why get a PhD degree?

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- Getting a PhD is hard work – really hard work!
- So why?
  - Money?
  - Social status?
  - Fame?
  - Becoming a better person – wife, husband, mother, father, ...
- Well – why?
  - Doing research – now and later
  - Devoted to pursue your own ideas
  - Dedication
  - Freedom
  - Future (research) position – being “on the edge”
  - International / Global scene
  - And yes – potential fame within our community.

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## Small exercise

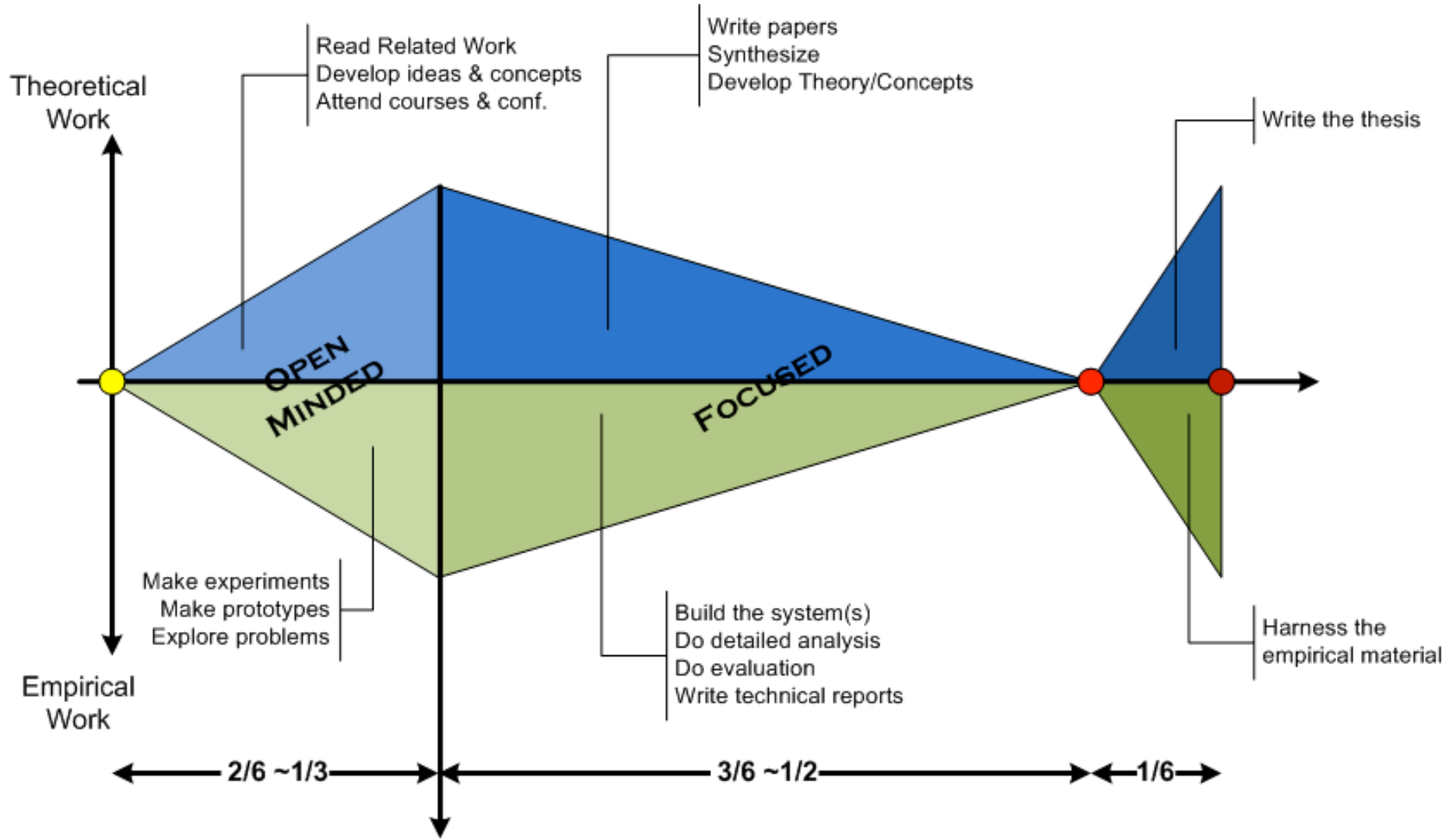
In pairs:

- each give the “elevator pitch” of your PhD topic
- explain why

# The Fish Model

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**Deliverables:**

- related work
- detailed design
- plan
- methods
- hypothesis
- goals
- contributions

# Important Milestone in a PhD

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- Admission
  - celebrate
- 1/3 – exploring
  - know your related work and people
  - know your thesis, goals, plans, methods, and
  - expected contributions, and
  - how you want to demonstrate it
- 5/6 – researching
  - just do it!
  - look out for spin-offs (paper potentials)
- 6/6
  - turn in the thesis
  - prepare for life after the PhD
  - look for job

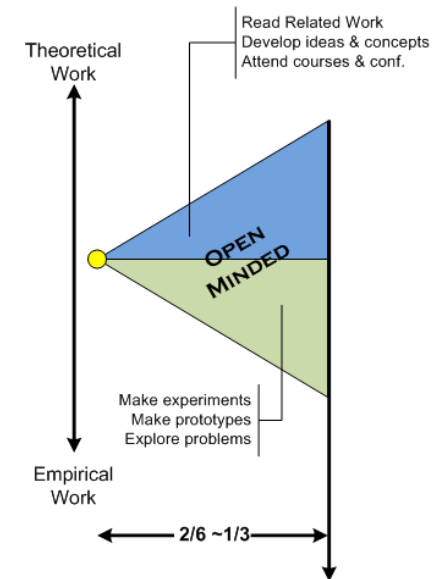
# How to get good ideas?

- Theoretically – “Top-Down”

- start with research area
- read, read, read, read, read
- talk, see, hear, survey, ...
- courses, summer schools, conferences, ...
- (ask your professor)

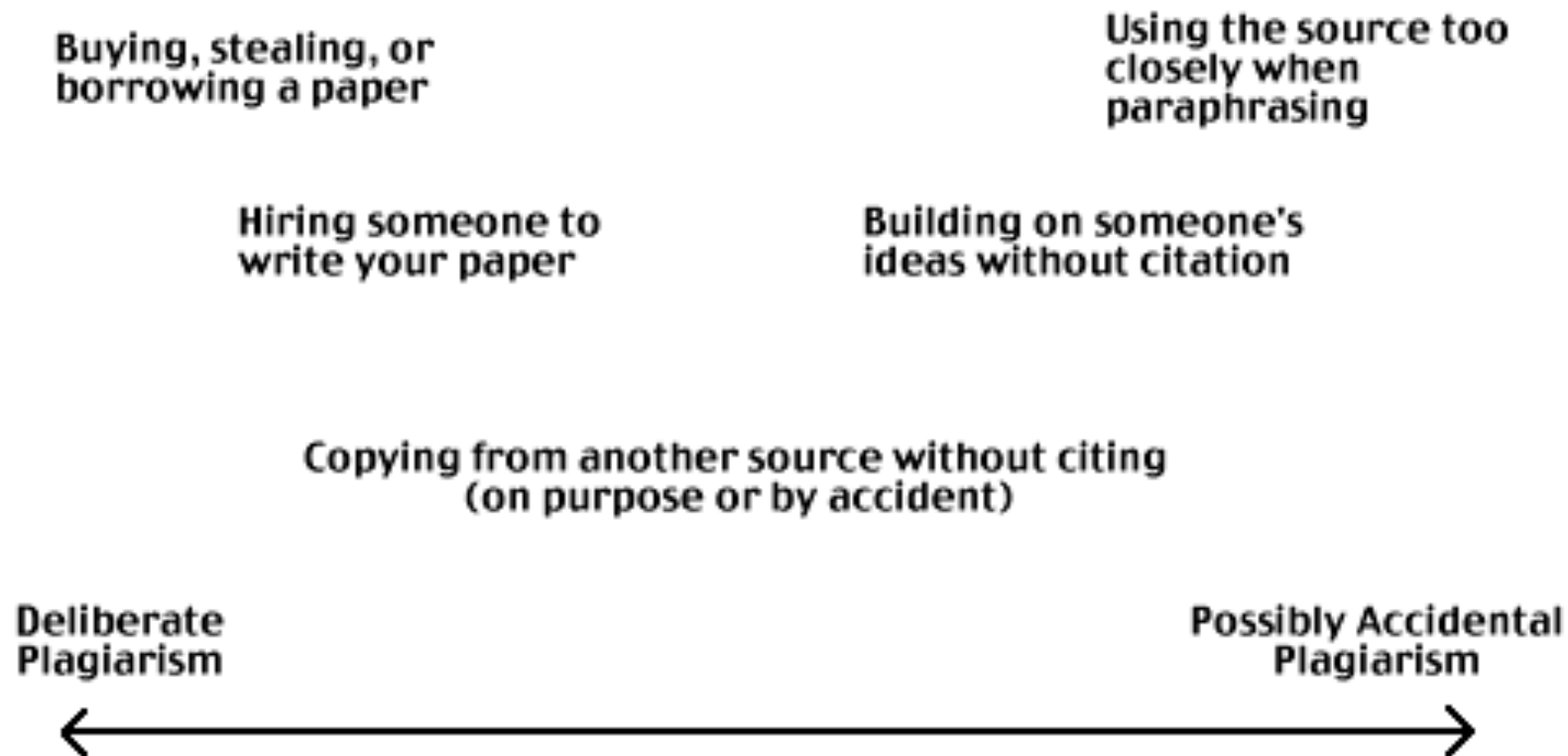
- Empirically – “Bottom-Up”

- find a (real) problem – maybe even for a real person
- study, visit, interview, try, experiment, ...
- download, compile, run, test, stress, ...
- replicate someone else’s work (verify)
- try to generalize and rephrase the problem



## ... a word on plagiarism

- “The act of passing off as one's own the ideas or writings of another” [GeorgiaTown Honors Council]



*Copied from Owl online writing lab,  
owl.english.purdue.edu/handouts/research/r\_plagiar.html*

# How to avoid plagiarism

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- Giving Credit
  - ideas, inspiration, unique phrases, figures, conversations
- Use accurate citations
  - cite
  - quote literal copies
  - cite paraphrased text
  - cite copied images
- Record Keeping
  - in time you forget where (your) ideas come from
  - keep track!

*Source: Saul Greenberg's presentation on plagiarism, "Plag.ppt" from his homepage.*

- “A good literature review adds value. It is not just a catalog of papers you have read” [Greenberg]
- A literature review:
  - Show you know the literature – you must be selective
  - Gives your readers background to understand your work
  - Gives a historical perspective shows how ideas arose and evolved over time
  - Leads into the problem you wish to tackle in your thesis
  - Describes related work
  - Explains why your idea or perspective is new
  - Gives a new view of the problem / solution space

# Types of literature reviews

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- Annotated Bibliographies
  - a list of papers ordered by some means (perhaps alphabetically or by topic), where each paper is represented as a reference plus a summary paragraph.
  - very useful and straightforward to do while reading
  - however, does not add value
- Project summaries
  - useful in systems-oriented research
  - good at describing current state of the art if its fairly new
  - however, quickly become overwhelming
- By ideas
  - typically abstractions that *you* may have made after reading many papers / project descriptions, and so on.
  - this is what you should strive for!
  - however, require some thinking and work!
- Historically
  - useful if you wish to show the evolution of ideas over time.
  - however, only works if this evolution really does lead into your research problem

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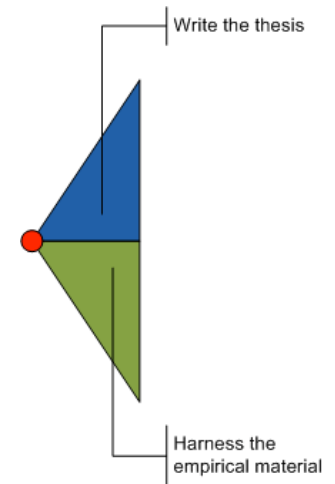
# The "Related Work Matrix"

Table 1. Current location sensing technologies.

Technology	Technique	Physical	Symbolic	Absolute	Relative	LLC	Recognition	Accuracy and precision if available	Scale	Cost	Limitations
GPS	Radio time-of-flight lateration	•		•		✓		1-5 meters (95-99 percent)	24 satellites worldwide	Expensive infrastructure \$100 receivers	Not indoors
Active Badges	Diffuse infrared cellular proximity		•	•			✓	Room size	1 base per room, badge per base per 10 sec	Administration costs, cheap tags and bases	Sunlight and fluorescent light interfere with infrared
Active Bats	Ultrasound time-of-flight lateration	•		•			✓	9 cm (95 percent)	1 base per 10 square meters, 25 computations per room per sec	Administration costs, cheap tags and sensors	Required ceiling sensor grid
MotionStar	Scene analysis, lateration	•		•			✓	1 mm, 1 ms, 0.1° (nearly 100 percent)	Controller per scene, 108 sensors per scene	Controlled scenes, expensive hardware	Control unit tether, precise installation
VHF Omini-directional Ranging	Angulation	•		•		✓		1° radial (≈ 100 percent)	Several transmitters per metropolitan area	Expensive infrastructure, inexpensive aircraft receivers	30-140 nautical miles, line of sight
Cricket	Proximity, lateration		•	◦	◦	✓		4 × 4 ft. regions (≈ 100 percent)	≈ 1 beacon per 16 square ft.	\$10 beacons and receivers	No central management receiver computation
MSR RADAR	802.11 RF scene analysis and triangulation	•		•			✓	3-4.3 m (50 percent)	3 bases per floor	802.11 network installation, ≈ \$100 wireless NICs	Wireless NICs required
PinPoint 3D-ID	RF lateration	•		•			✓	1-3 m	Several bases per building	Infrastructure installation, expensive hardware	Proprietary, 802.11 interference
Avalanche	Radio signal	•			•			Variable,	1 transceiver	≈ \$20	

# Chapter 1

- Context and Motivation
  - Research field / area
  - Is it a real problem
  - Why would anyone care if I solved it?
- Background
  - Small Literature review / Related Work (the full version is in chapter 2)
  - What is the research context?
  - What is the state-of-art?
- Hypothesis
  - Thesis or Problem statement
- Goals and methods
  - What are the *operational* goals you want to achieve?
  - And how will you do it?
- Results
  - Contributions
- Thesis overview
  - Outline of the thesis



Source: Saul Greenberg's homepage.

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## Exercise

Try to outline chapter 1 of your thesis

# How to make the “Abstract”

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- 1<sup>st</sup> model ~ study kind of papers
  - Background
  - However, gab
  - What we did
  - Contributions
  - What it means
- 2<sup>nd</sup> model ~ systems kind of papers
  - Background
  - Innovation
  - Problem
  - Method
  - Result

# Support for Activity-Based Computing Operations

Jakob E. Bardram, Jonathan Bunick  
Centre for Pervasive Health  
Aabogade 34, 8200 Århus N  
{bardram,jbp,mads}@iuh.dk

## ABSTRACT

Research has shown that computers are notoriously bad at supporting the management of parallel activities and interruptions, and that mobility increases the severity and scope of these problems. This paper presents *activity-based computing* (ABC) which supplements the prevalent data- and application-oriented computing paradigm with technologies for handling multiple, parallel and mobile work activities. We present the design and implementation of ABC support embedded in the Windows XP operating system. This includes replacing the Windows Taskbar with an Activity Bar, support for handling Windows applications, a zoomable user interface, and support for moving activities across different computers. We report an evaluation of this Windows XP ABC system which is based on a multi-method approach, where perceived ease-of-use and usefulness was evaluated together with rich interview material. This evaluation showed that users found the ABC XP extension easy to use and likely to be useful in their own work.

Background

Innovation

Problem

Method

Results

## ABSTRACT

The role of computers in the modern office has divided our activities between virtual interactions in the realm of the computer and physical interactions with real objects within the traditional office infrastructure. This paper extends previous work that has attempted to bridge this gap, to connect physical objects with virtual representations or computational functionality, via various types of tags. We discuss a variety of scenarios we have implemented using a novel combination of inexpensive, unobtrusive and easy to use RFID tags, tag readers, portable computers and wireless networking. This novel combination demonstrates the utility of invisibly, seamlessly and portably linking physical objects to networked electronic services and actions that are naturally associated with their form.

Papers

CHI 99 15-20 MAY 1999

**Bridging Physical and Virtual Worlds with Electronic Tags**

*Roy Want, Kenneth P. Fishkin, Anuj Gujar, Beverly L. Harrison*



## Exercise

Try to write an abstract for a paper describing the invention of the paper clip

- Just overhead?
  - your professor hand you all his papers...
- Refereeing is excellent practice for
  - developing critical appraisal skills
  - understanding how good (and bad) papers are written
- Fairness
  - all your papers will be refereed
  - expected duty of all researchers/academics
- Other upsides
  - enhance reputation
  - expedites processing of your own papers
  - get on editorial board or program committee
  - 'previews' to the state of the art

*Source: Saul Greenberg's presentation on refereeing, "HowToReferee.ppt" from his homepage.*

# A Template for Reviewing

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- Meta information
  - paper title, author (if not ann.), manuscript id, ...
- The review
  - brief summary (2-3 lines)
  - “If you can’t, there is probably something wrong with the paper” [ACM CHI FAQ]
  - Contribution
    - what is new? is it significant? (novelty/contribution)
    - would it stimulate further work? (impact)
    - how relevant is it to the community? (relevance)
  - Quality of the *research*
    - how sound is the work?
    - how appropriate/reliable are the methods used?
    - how reasonable are the interpretations?
    - how does it relate to existing work?
    - can an experienced practitioner in the field duplicate the results?
  - Quality of the *writing*
    - outline, language, spelling, grammar, figures, ...
  - Recommend acceptance / rejection

## ADDRESSING REVIEWER COMMENTS

BAD REVIEWS ON YOUR PAPER? FOLLOW THESE GUIDELINES AND YOU MAY YET GET IT PAST THE EDITOR:

### Reviewer comment:

"The method/device/paradigm the authors propose is clearly wrong."

### How NOT to respond:

✗ "Yes, we know. We thought we could still get a paper out of it. Sorry."

### Correct response:

✓ "The reviewer raises an interesting concern. However, as the focus of this work is exploratory and not performance-based, validation was not found to be of critical importance to the contribution of the paper."

### Reviewer comment:

"The authors fail to reference the work of Smith et al., who solved the same problem 20 years ago."

### How NOT to respond:

✗ "Huh. We didn't think anybody had read that. Actually, their solution is better than ours."

### Correct response:

✓ "The reviewer raises an interesting concern. However, our work is based on completely different first principles (we use different variable names), and has a much more attractive graphical user interface."

### Reviewer comment:

"This paper is poorly written and scientifically unsound. I do not recommend it for publication."

### How NOT to respond:

✗ "You #&@\*% reviewer! I know who you are! I'm gonna get you when it's my turn to review!"

### Correct response:

✓ "The reviewer raises an interesting concern. However, we feel the reviewer did not fully comprehend the scope of the work, and misjudged the results based on incorrect assumptions."

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## Other just as important issues...

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- Taking classes, summer schools, etc.
- Doing TA or RA jobs
- How to give presentations
- The Life Cycle Of A Graduate Student
- The Thesis Oral Defense
- Seeking jobs and giving interviews
- ...

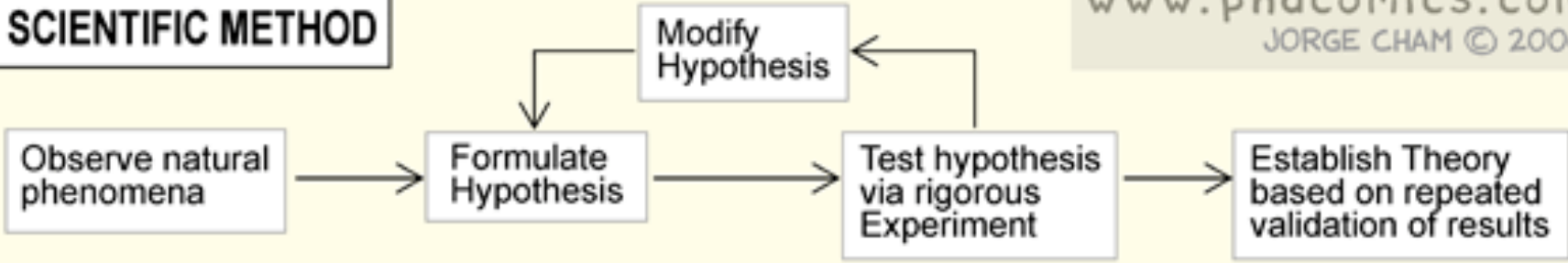
## ... and all the other issues

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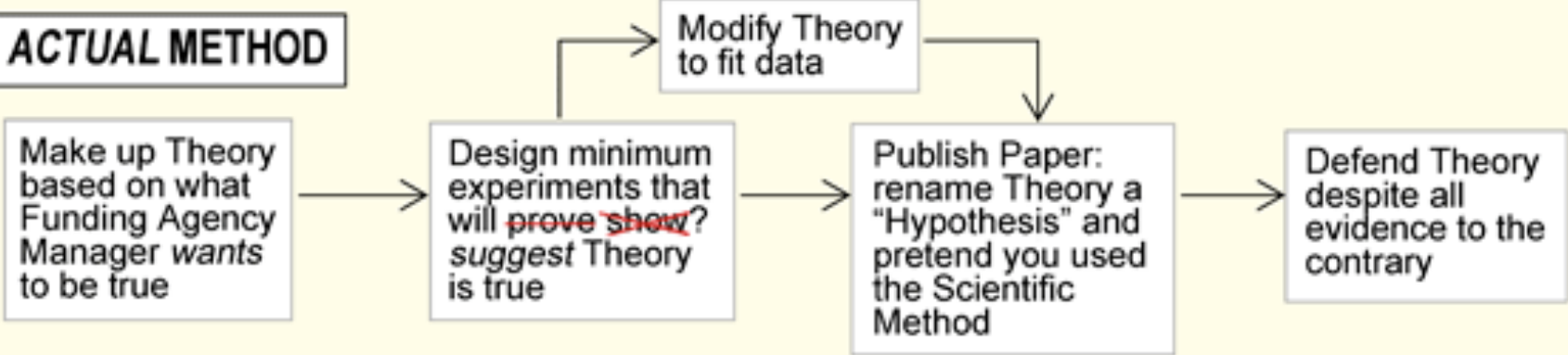
- Academia is business
  - fundraising, TA, RA, ...
  - a very competitive market
  - you (as a PhD student) is a vital resource in this game
- Academia is a social activity
  - (start) networking
  - find fellow PhD students – they are your brothers in arms and may become your friends for life
  - attend conferences – as a SV – summer schools
  - present your work everywhere – also in the elevator
- Academia requires strict time management
  - “Kill your TV” [Randy Pausch, CMU]
  - Planning and organization

- Saul Greenberg's homepage
  - <http://pages.cpsc.ucalgary.ca/~saul>
- "So long, and thanks for the Ph.D.!"
  - a.k.a "Everything I wanted to know about C.S. graduate school at the beginning but didn't learn until later."
  - Ronald T. Azuma, UNC, 1997, 2003
- <http://www.phdcomics.com/>
- ... and a lot of other resources!

### THE SCIENTIFIC METHOD



### THE ACTUAL METHOD



# Seminar BINGO!

To play, simply print out this bingo sheet and attend a departmental seminar.

Mark over each square that occurs throughout the course of the lecture.

The first one to form a straight line (or all four corners) must yell out to win!



## SEMINAR B I N G O

Speaker bashes previous work	Repeated use of "um..."	Speaker sucks up to host professor	Host Professor falls asleep	Speaker wastes 5 minutes explaining outline
Laptop malfunction	Work ties in to Cancer/HIV or War on Terror	"...et al."	You're the only one in your lab that bothered to show up	Blatant typo
Entire slide filled with equations	"The data <i>clearly</i> shows..."	<b>FREE</b> Speaker runs out of time	Use of Powerpoint template with blue background	References Advisor (past or present)
There's a Grad Student wearing same clothes as yesterday	Bitter Post-doc asks question	"That's an interesting question"	"Beyond the scope of this work"	Master's student bobs head fighting sleep
Speaker forgets to thank collaborators	Cell phone goes off	You've no idea what's going on	"Future work will..."	Results conveniently show improvement

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